APPENDIX-8 IRRIGATION FACILITIES AND RURAL INFRASTRUCTURE

CHAPTER 1 INTRODUCTION

This APPENDIX-8, IRRIGATION FACILITIES AND RURAL INFRASTRUCTURE, mainly discusses about irrigation facilities design together with the associated issues. In the compilation of this Annex, inputs have been received from concerned officers such as Department of Irrigation (DOI), Sunsari-Morang Irrigation Project Office (SMIP), Eastern Regional Irrigation Directorate (ERID), Sunsari District Irrigation Office (DIO), as well as field observations and field surveys together with findings and results from other Annexes.

This Appendix consists of, aside from this Chapter 1 INTRODUCTION, five chapters; namely, CHAPTER 2 REVIEW OF SIMILAR IRRIGATION FACILITIES, CHAPTER 3 SUNSARI IRRIGATION FACILITIES DESIGN, CHAPTER 4 REHABILITATION OF GERUWA IRRIGATION SUB-PROJECT, CHAPTER 5 FLOOD AND INUNDATION MITIGATION and CHAPTER 6 RURAL INFRASTRUCTURE,

CHAPTER 2 REVIEW OF SIMILAR IRRIGATION FACILITIES describes the brief review of the present condition of similar irrigation facilities in this area. An idea of facility design and the present condition of these facilities are of value for reference of this study.

CHAPTER 3 SUNSARI IRRIGATION FACILITIES DESIGN discusses the proposed facility design of the Study area, namely, headworks and conveyance canal as new construction, main canal and secondary, tertiary canal including their ancillary facilities as rehabilitation and/or new construction.

CHAPTER 4 mentions REHABILITATION OF GERUWA IRRIGATION SUB-PROJECT which exists in the Study Area.

CHAPTER 5 describes FLOOD AND INUNDATION MITIGATION. From mid to down stream area along the Sunsari River in this Study Area, the flood and inundation problem occurred caused due to the defined existing banks. This mentions the present condition concerning the damage from flood/inundation and considers the means for evading that damages.

CHAPTER 6 states RURAL INFRASTRUCTURE from viewpoint of the road improvement in relation to CHAPTER 6 DEVELOPMENT PLAN in APPENDIX-2 REGIONAL ECONOMY.

CHAPTER 2 REVIEW OF SIMILAR IRRRIGATION FACILITIES

2.1 Sunsari-Morang Irrigation Project

2.1.1 General Description

This irrigation project was conceived and implemented to provide irrigation facility to 68000 ha of agri-suitable land of Sunsari and Morang districts. In 1975, Government of India handed over the Chatara Nahar Project to the government of Nepal and later it was renamed as Sunsari Morang Irrigation Project. Then afterward, for renovation of the canal systems and command

area development of the project it received a loan assistance of World Bank in 1978. The progress in the implementation of the work has been made phase wise manner.

First Phase:
- Started in 1977
- Terminated in 1985

Project Area
- Sunsari and Morang District (Eastern Regional Development Zone)

Funds
- World Bank 34 million U.S Dollar
- HMG/Nepal 3.5 million U.S Dollar

During the implementation of First Phase, about 9750 ha of command area was developed in Sunsari district

Second Phase:
- Started in 1987
- Terminated in 1995

Investment
- World Bank 28 million U.S Dollar
- HMG 1.68 million U.S Dollar

Work Description

During the implementation of Second Phase about 16700 ha of command area was developed. New Intake was constructed at about 1300m upstream of the old Intake point. The intake capacity was extended from 45 m3/sec to 60 m3/sec. 1000 m long R.C.C culvert between Old and New Intakes was constructed. Installation of dredging system and operation was started. Micro-Hydro Power plant and generation of 3.2kW electricity power was established.

Third Phase:
- Started in 1996
- Terminated in On going

Investment
- World Bank $ 29.34 million
- HMG $ 9.78 million

Development of 3300ha command area in Biratnagar branch canal system.

2.1.2 Intake

There is a permanent intake structure on the eastern bank of Koshi River. The water simply enters in to the main canal under approaching head of the natural flow of the parent river. To block the large boulders from entering into the main canal, baffle blocks are constructed in the approach river channel.

The intake has been designed to draw the water maximum up to 64 m3/sec. However, the discharge entering into the canal is governed by the water level in the parent river because there is no provision of heading up of the water level.

Koshi river discharge is loaded with heavy silt content in wet season flow. Thus, the silt entered and settled on the desiltation channel has to be dredged out. Virtually the main canal after the dredging channel is fed low silt content water. The main canal crosses many drainage where Siphons and aqueducts are built accordingly.

2.1.3 Distributaries

There are many distributaries off-taken from the parent main canal. The distributaries run southward. Haripur distributary is the first one while Suksena and Shankarpur are second and third in the order from West to East. The distributaries are mostly earthen canal. In the reaches where the seepage is serious concrete linings are provided. All distributaries have O/M service road.

2.1.4 Irrigation Facilities

Basic components of irrigation facilities like head regulators/cross regulators, fall structures, drainage crossings culverts can be seen in the canal system. The performance of these facilities is known to be satisfied.

If the arrival of monsoon is late, Suksena and Shankarpur distributaries, can only irrigate up to Narsinga V.D.C and Harinagara V.D.C respectively. The rest of V.D.Cs on southern part always face scarcity of water during the cultivation of summer paddy. According to the Inerwa Division In-charge, the available flow in these two distributaries is just sufficient to meet winter crop (wheat) demand.

The division staff mentions that a considerable amount of water is lost due to seepage outward through the canal embankment. The main reason behind this is farmers' practice of cutting toe of embankment during cultivation period. The division staff further suggested that the gates in the cross regulator and head regulator should be so designed that unauthentic operation of the gates could be avoided. This would help to manage an equitable distribution of available water. Rigid type of outlets which draw a fix quantity of water, irrespective of discharge and water level in the canal, into the fields has been observed best suited for this area.

One of the major concerning fact of the irrigation project is siltation of the canal beds. In the flood season the river, Sunsari, has been observed carrying silt laden water.

2.2 Chanda Mohana Irrigation Project

2.2.1 General Description

Chanda Mohana Irrigation Project (CMIP) is situated in the southern part of Sunsari District. The command area is located between the tail ends of Sitagunj branch and Shankarpur branch canals of SMIP. Due to high demand of irrigation water in the head reach, both of the above canals can not deliver adequate and reliable water to their tail ends. This project supplies water for irrigation covering 1000 ha in Sitagunj (eastern) side and 1200 ha in Shankarpur (western) side. This project comprises of headworks for canal systems of right and left bank of Budhi

river, two main canals for distributing of the irrigation water and the access roads. The OPEC has financed for this irrigation project.

2.2.2 Command Area

- Total command Area in Eastern side 1000 ha
- Total command Area in Western side 1200 ha

The discharge in various branch canals is controlled by the help of cross regulator and head regulators. Several village road bridges VRB (Total 29 Nos) are provided for easy crossing. The water user association (WUA) is responsible for water distribution at command area and CMIP controls headworks.

2.2.3 Headworks

The headwork (weir cum bridge) is located just downstream of the confluence point of rivers Katleh and Budhi. The dimensions of the headworks are as follows:

- Type of headworks Combined Type (gates and fixed weir)
- Design Discharge 550 m3/s for 1/50 year Return Period
- Average bed level 65.5m from MSL
- Pond Level 69.8m
- Total Span 65m
- Head Regulators 2 Nos. (Designed for 1.65 m3/s each)
- Under sluice 2 Nos. (2 – 3.5 m span)
- Other Components Piers, Divide Wall (2 Nos.), Bridge, upstream and d/s Protection etc

2.2.4 Main Canals

There are two main canals in this project namely the eastern main canal and the western main canal.

The eastern main canal offtakes from the left side of the headworks to the adjacent area. All together 12 branches take off to irrigate 1000 ha command area..

The western main canal off-takes at right side head regulator. It has 3 numbers of branch canals to its western side and 6 numbers of branch canals in the eastern side. All together 800 ha is being irrigated by this main canal.

The dimensions of these main canals and branch canals are as follows:

<u>Main Canals</u>

- Length Eastern Main Canal (Length 7.7 km) and western Main Canal (8.5 km)
- Design Discharge 1.65 m3/s
- Idle Length EMC 2 km, WMC 4.5 km
- Duty 1.6 lit/sec/ha

Few number of Cross Drainage Structures like Aqueduct, Escape, Local Drain Siphon are provided across various places.

Branch Canals

Eastern Branch Canals
- Total Numbers 12
- Total Length 13.8 km
- Capacity 0.064 to 0.256 m3/s

Western Branch Canals
- Total Numbers 9
- Total length 11.4 km
- Capacity 0.08 to 0.24 m3/sec

2.2.5 The Access Road

The access road is one of the main components of this project. A fair weather road (gravel road length 15 km, Gravel thickness 25 cm, width 3.5m wide) connects Harinagara to Biratnagar. Several culverts were made as cross drainages works. Grass turfing were provided for embankment soil protection.

2.2.6 Present Status

The eastern part WUA is very active. They are maintaining eastern canal system properly. The canal is supplying water as per the designed discharge (and sometimes more than that, using free board). The silt deposit at main canal after 3 years in operation is not observed significantly high and that has been cleared by WUA. The WUA of western side is not that much active as of eastern part. The discharge they are getting at present is less than originally designed value. CMIP is trying to make WUA of western part more active.

Due to the raise in water level (back water) in the upstream part of head works, people demanded two bridges for their commutation purpose. CMIP, at present, is about to complete one such bridge across Katleh River and another bridge is about to begin across Budhi River. The total cost (Revised) for all mentioned above works including price escalation is NRs. 200 Million approximately. i.e. Cost per Ha in US $ 1500.

2.3 Other Project

In this section, another similar irrigation projects (facilities) are introduced namely *Bagmati Irrigation Project.*

2.3.1 General Description

Bagmati Irrigation Project (BIP) is located in the Rautahat and Sarlahi (Central Regional Development Zone) District. The command area cover 23000 ha in Rautahat and 37000 ha Sarlahi. Source river for BIP is Bagmati River. The project work has been started in 1977/1978 and still ongoing. The Saudi Development Fund has provided a loan of amount 144.6 Million Saudi Riyal and Japan's Loan Amortization Fund has supported for construction of barrage gates. Furthermore, UNDP has assisted for technical support. The total construction cost is estimated NRs. 3820 Million approximately.

2.3.2 Command Area

- Rautahat District side 23000 ha
- Sarlahi District side 37000 ha

2.3.3 Headworks

The headworks is located 500m upstream of the East-West Highway at Karmaiya V.D.C of Sarlahi District. This headwork was designed for high flood discharge of 8000 m3/sec. In 1993, there was a cloud burst in the catchment area. The flood discharge at the headwork location was observed about 16000 m3/sec. At the time of peak flood, the gates of the barrage had problem in operation which led to havoc in the settlement area downstream and caused a huge loss of lives and property. The dimensions of the headwork are as follows:

- Type of headworks Barrage
- Catchment Area 2720 km2
- Design High Flood Discharge 8000 m3/sec
- Overall Water Way 403.5 m
- No. of Under Sluices 2 Nos. (on both sides of the barrage)
- No. of Bays in each Under Sluices 3 Nos.
- Width of Single Bay 9 m
- No. of Bays in Barrage Bay 30 Nos.
- Width of single Bay 9 m

  (The Crest Level of the Barrage bay is 1 m higher than that of Under Sluices)

- Size of Under Sluice Gates 9m x 4m (9.6 tones each singe gate)
- Size of Barrage gates 9m x 3m (4 tones each single gate)

(The gates are electro-mechanically operated. The electricity is obtained from the National Grid Power supply. For emergency an electric power generator of 300 kW is in stand by. In case of failure of battery to start the generator a compressor chamber is also installed. The gates can be operated manually also.)

2.3.4 Canal Head Regulators

Eastern Side
- Total waterway 37 m (7 bays; each 4 m wide)
- Discharge Full capacity-64.4 m3/sec, Presently passing 15 m3/sec only

Western Side
- Total waterway 26 m (4 bays; each 4 m wide)
- Discharge Full capacity-.48.3 m3/sec, Presently passing 15 m3/sec only

2.3.5 Canal Systems

Eastern
- Design Full Supply Discharge 64.4 m3/sec
- Main canal Total Length 171 km
- Branch Canals 9 Nos. Total Length 102.6 km

Western

- Design full supply discharge 48.3 m3/sec
- Main Canal Total Length 28.2 km
- Branch Canals 9 Nos. Total Length 108.25km

2.3.6 Present Status

Desilatation

The project has no desilting device. Since, there is a siltation in canal, it is removed manually.

Canal Lining Works

In the stretches of main canals and branch canals R.C.C. canal lining have been constructed to reduce the loss of water through the seepage underneath.

Head Regulator/Cross Regulator

For regulation of the discharge into the off taking canals cross regulator and head regulators are used. The regulation is done by manual gate operation. In the main and the branch canals the gate size are constructed up to 5 m width. The gates are manually operated aided by counter weights. In the small off taking canals the single panel steel gates have been observed. The gates are lifted by spindles. Because of its easy in operation and lack of locking system, it is observed that gate regulation is tampered by irresponsible farmers.

Canal Siphons

There are some siphons of different sizes constructed across local drains are functioning properly.

Aqueducts

There are some aqueducts provided in the drainage crossing and depressed topography.

Fall (Drop) Structures

There are many drops provided in the main and the branch canals to maintain the designed canal slopes and are functioning well.

Escapes

Escapes are being provided to flush out the surplus flow into the local drains.

Local drain siphons

There are many drains crossing the canal in the project area. Local drain siphons are provided in the junction. These drains collects water from fields and drain ultimately into the natural streams. Reinforced concrete pipe siphons are mostly used and performing satisfactorily. They are repaired and maintained as and when required.

Environmental Impacts

It has been reported that there is less adverse impact on the natural environment by the implementation of this project. It has been observed that the agro-economic life and standard of the beneficiaries has been uplifted by this scheme.

CHAPTER 3 SUNSARI IRRIGATION FACILITIES DESIGN

3.1 Sunsari Headworks

3.1.1 Design Criteria

The design criteria used in plan of Sunsari Headworks are based on DOI's criteria.

The design criteria used in the basic design for Sunsari Headworks is mainly based on DOI's criteria, which is given in the "Planning and Design Strengthening Project" (PDSP) manuals. On the design of head works, particulary, Hydrology and agro-meterology Manual called "M.3" and Headworks, River training Works and Sedimentation Manual called "M.7". And, the Japanese standard design criteria for headworks is also referred in accordance with the site conditions and/or the design conditions. Furthermore, the views of the DOI staffs have been taken into account as expressed during a number of workshop with the Study Team managed and the senior engineers of the relation agency.

3.1.2 Proposed Dimensions

The dimensions of the proposed headworks are as followed:

-Position of headworks	600m downstream from E-W High Way
-Type of headworks	Barrage (fully movable type using gates)
-Catchment Area	300 km2
-Design High Flood Discharge	650 m3/sec
-Width of headworks	72.0 m
-No. of Spillways	5 Nos.
-No. of Under Sluices	4 Nos. (on both sides of the headworks)
-Size of Under Spillway Gates	6.20m x 3.60m
-Size of Under Sluice Gates	6.20m x 3.85m
-Design Water Intake Discharge	16.93 m3/sec (Command area 10147 ha)
-Related Structure	Fish Path (on both sides of the headworks)

The drawings are shown as Drawing No. HW-1 to No. HW-8 in ATACHMENT.

3.1.3 Design Conditions

At the feasibility study stage, appropriate basic design criteria to ensure that the structure can perform the intended functions must be established. Then, design water intake discharge, design intake water levels, design flood discharge, flood levels, position of headworks etc. must be decided. In this section, these major items is mentioning concerning the basic design of headworks.

1) Design Flood Discharge

The design flood discharge is set at 650 m3/sec.

Hydrology is applied in each engineering field related to use of water resources. Designer's first priority is to allow safely passage of peak flow (discharge) through any structure (dam, eadworks etc.) built across the river. The capacity and size of such structures, and cost thereby, depends upon the amount of peak flow.

Estimation of appropriate amount of peak flow is very difficult. The peak flow depends upon several factors like, size and shape of catchment area, type of soil coverage, other physical characteristics of basin, precipitation and its pattern and so and so forth. The availability of various data like runoff data, precipitation data at desirable places plays an important role in estimation of peak flood.

But records of such data over a long period are not available particularly for Small River like Sunsari river. Therefore, other indirect methods like catchment area formula, flood frequency methods, rainfall analysis, channel analysis (Manning's) etc can be used. These formulae are generalized to cover a wide range of types and sizes of river. The exact value of parameter associated with such formulae is very difficult to decide. So the reliability of results obtained by using such formula should be considered with great care.

Some formulae give higher value of discharge and some give lower value. Some of the records are based on observations over a long period. The E-W highway bridge can be considered as a control structures. The flow passing through this structure can be represented as actual flow over these years. The estimation of discharge through this structure also bears some assumed parameters like Manning formulae coefficient and slope of water surface during flood. So this may be a common thing to expect some error associated with this formula. The other place where the high flood discharge of Sunsari River is observed over a long period is the cross point across Eastern Main Canal of Kosi Project (in India). The catchment area of this place is higher than of the place of proposed SRIP headwork axis point, but gives some idea for comparison.

Several floods magnitudes, based on different calculation methods, are presented in Table3.1.1 below.

Modified Dicken's formula is based on empirical formula ($Q = cA^{3/4}$) applicable for the rivers of northern India, where Q is discharge (m3/s) and A is catchment area (sq km). The coefficient C has a value over a range of 1.5 to 10.5 (from large to Small river in size). The value of coefficient, C, for Sunsari River is adopted as 8.

Table 3.1.1 High Flood Discharge Based on Various Method (in cu m/s)

No	Name of Method	Relationship	Type of Formula	Discharge m3/s	Remarks
1	Modified Dickens Formula	Catchment Area	Empirical	568-610	
2	WECS Method	CA, Regional Coefficient	Empirical	488	
3	Area Velocity Method (EW Bridge)	River X Section Parameters	Manning's Formula	647	
4	Sunsari crossing at Eastern Kosi Main Canal (In India)		Observed	680	Catchment Area increased 500 sq km

WECS methods is also a regionalized formula giving relationship between Q and A ($Q = K_t\ b\ A^c$). In this formula, Nepal is divided into four hydrological zones, namely, Karnali, Gandaki, Kosi and Southern zones. Sunsari River falls under Southern category,

where

Q	=	Discharge in m3/s
K_t	= 2.3,	coefficient based on 50 years Return period
b	= 3.03	regional coefficient
A	=	Catchment area in sq km
c	= 0.745	Index coefficient

Area Velocity Method is based on Manning's formula. This is based on the field observation. The cross section area and bed slope are measured. The rugisity coefficient has to be selected based on experience (adopted as 0.03). The East-West highway bridge built across Sunsari River is serving for about three decades. The full capacity of flood that can pass through this structure is calculated as 647 cu.m/sec. That means, this structure has not experienced more than this figure from its beginning.

The maximum observed discharge (flood) of Sunsari River at the crossing point with Kosi Eastern Canal (in India) is 680 cu.m/sec. The catchment area at that point is quite higher than at EW highway crossing point. Comparing this figure with 647 cu.m/sec at EW highway, we may conclude this figure as reasonable.

Therefore, the maximum flood that may pass at our proposed axis is near or equal to 647 cu.m/sec.. Finally after rounding and considering some safe factor, a figure of Q=650 m3/s is appropriate hence adopted as designed discharge at Headwork Site.

2) Design Flood Level

The design flood level is settled at W.L 82.00 m.

The design flood level has not been given under the basic river control plan on the Sunsari River. Then, on this study, the design flood level is decided as tentative one. In the site, Sunsari Bridge which exists on E-W High Way crossing Sunsari River located 600m upstream from the

proposed site of headworks becomes an obstacle on decision of design high flood discharge. Then, the design high flood level at the E-W High Way Bridge point is settled W.L 82.3m that means the elevation of 0.1m below of the under edge of the bridge beam. The design flood level, therefore, is set at W.L 82.00m based on calculation as followed.

Table 3.1.1 Design Flood Level (tentative)

E-W High Way Point (the elevation of 0.1m below of the under edge of the bridge beam) W.L (m) (1)	distance between E-W highway bridge and the headworks (m) (2)	The proposed gradient of the Runsari river I=1/m (3)	Head Loss loss (m) (4)=(2)*(3)	W.L at the headworks as Design Flood Level W.L (m) (5)=(1)-(4)
W.L 82.30	600	1/2000	0.30	82.00

3) Design Water Intake Discharge

The design water intake discharge is required of 16.93 m3/sec.

The design water intake discharge must be the intake discharge at maximum design intake. The intake discharge which governs the weir design height and the dimensions of intake must be set at the design maximum intake of the overall irrigation plan. As a result, the design water intake discharge is calculated above. The distribution plan is as follows:

- Suksena side Qmax = 9.23 m3/sec
- Shankarpur side Qmax = 7.70 m3/sec

4) Design Water Intake Level

The design water intake level is settled at w.l 80.50 m.

The design intake level must be the higher of either one of the following:

Table 3.1.2 Design Water Intake Level

The benefited area (Main Canal)	The required W.L at the confluence point w.l (m) (1)	The design condition of the conveyance canal: distance between the headworks and the confluence point (m) (2)	gradient of canal I=1/m (3)	Head loss (m) (4)=(2)*(3)	The required W.L at the headworks (Design Wtaer Intake Level) w.l (m) (6)=(1)+(4)
Suksena Main Canal	79.73	3,318	1/4,310	0.77	80.50
Shankarpur Main Canal	80.10	2,012	1/5,000	0.40	80.50

The total of the water level required to be secured at the start of the canal and the total loss of head between the intake and the confluence point of existing main canals which are namely Suksena and Shankarpur Main Canal, or the total of the level of intake threshold established to prevent the inflow of sand and intake depth, whichever is higher. In these conditions, however, it does not need to consider concerning the latter. Because, intake threshold can establish the higher portion enough. Then, design water intake level is calculated at the headworks in the table above:

3.1.4 Position of Headworks

The position of headworks is proposed at 600m downstream from East-West High Way.

The site for constructing a headworks must be selected in consideration of several things, namely the river condition, the relationship of elevation between intake water level and the irrigation benefit area ground level, the effect of headwork construction from view point of environmental aspects, and should be such that the required water intake function as well as the stability of the structure and conveyance for operational maintenance are achieved.

From river condition and water intake function aspect

The Sunsari river is meandering through the Study Area. Generally speaking, the spot to insure sufficient intake and satisfy the condition of sand control during floods is said the vicinity just downstream center point of outer side of a loop in the river. This, however, meets the case of intake from one side of the bank. According to the allover irrigation plan on this study, the irrigation water taken from the Sunsari river would be delivered two benefited fields from both bank.

The intake of water at both banks can be considered possible when the intake levels of both sides are almost equal, the intake site is at a straight way of the river, or when raising of water level by a movable weir is relatively large.

In the case of this study, the design and site conditions are in conformity with any requirement mentioned above. Namely, the intake level is completely equal between right (Suksena side) and left (Shankarpur side) bank, the river course at the proposed site is going in alignment and raising of water level will be operated by movable weir (gates).

From required intake level required aspect

When the maximum required water to the irrigation area is established, the conveyance canal is planned. The position at which the water level in the river becomes equal to the one at the upstream end of the proposed conveyance canal is found out. This position is first assumption for the proposed headworks. Required intake water level is calculated to w.l 80.90m as mentioned above. Then, when the equal elevation point to required intake water level is sought along the upstream of river, it needs the several distance from the proposed site to upstream. This is due to that this river is very gentle, and that position is not realistic.

From environmental and constructional aspect

The construction of headworks may give variety to the natural environment (scenery, ecosystem of animals and plants, etc.) and life of people living around. In addition, special care should be taken in selection of construction methods and periods which cause noise pollution and vibration, etc. to residents around the site. Furthermore, the routes for transportation of equipment and construction materials by large-size dump trucks should be considered to prevent noise and vibration effects.

With considering these conditions mentioned above, the upstream area of E-W High Way is not

fit clearly for construction. Because, there are housings, power cables, crematory etc. along the river in this side, then this side has the function of the radius of daily livelihood for inhabitants. On the other hand, it can not find such kind of conditions around of proposed headwork site. There are, however, the outlets of waste water from the paper factories near the proposed site. The new headworks have to prevent from inflowing of this waste water and mixing to river flow for irrigation used water. In consideration with all these things mentioned above, the location headworks is proposed at the downstream of E-W High Way.

3.1.5 Type of Weir and Direction of Weir Axis

Type of weir is selected the fully movable type (all gate type) .

Being a structure constructed in a river, as headworks are river structures they (the weir, in particular, being a structure erected across the river) need to be stable enough to withstand floods while at the same time not being a serious obstacle to disturb the flow of floods. Basically, it is not better to make an obstacle like headworks for flood time, then the fully movable type can pass the high flood through to downstream safely by full open operation.

In addition to above, the evolution of river bed is to be anxiety in case of fixed weir due to the unbalance of supply and demand of the river bed materials between upstream and downstream across the headworks. Actually, it can find such kind of cases at the fixed weir existed around the Study Area. The river bed materials deposited in front of the fixed weir, and then the supply of bed material has been forced to stop to downstream. Consequently, the degradation of river bed at downstream of headworks has been caused. Adopting the fully movable type (all gate type) can head off this matter.

The weir should be erected on a straight axis perpendicular to the river. The reason that the weir should be constructed at right angles to the river is due to advantages of economy and ensuring the flushing function of the scouring sluice.

3.1.6 Gate

Type of gate is adopted the fixed wheel type gate (roller gate), and they are operated by manual.

1) Size of gates

This proposed headworks has nine gates. They consist of seven spillway gates (3.60m height and 6.2m width) and two under scouring gates (3.85m height and 6.2m width).

2) Conditions to be required

The gate structure must be watertight to ensure stable water intake and firm enough against several external forces like flowing water. Steady and smooth operational workability is also required for its function.

A gate is one of the most important facilities to control both water utilization and floods. The following conditions are to be fulfilled for the purpose of water use and flood control.

Conditions required from viewpoint of water use are;

- To keep a constant required water level and to control intake level and discharge.
- To have water tightness.

On the other hand, conditions required from viewpoint of flood control are;

- Capability of being operated quickly and smoothly so as to release water safely.
- To remain workable without accumulation of material carried by water.

Structural stability and durability are also required.

3) Selection of Type of Gate

Type of gate is decided after considering its purpose, installation location, ease of operation, safety, dependability and economy of water intake function etc.

Fixed wheel type gate (roller gate) is typical type of gate. The gate leaf usually is raised vertically by wire or spindle hoist. Since this type gate is mechanically and structurally simple hoisting load is lighter than for slide gate and is more dependable, this type is the most frequently used as a headwoks gate. The applied range is also been wide from small gates to long span gates.

By the reason mentioned above, the gate type adopts fixed wheel type (roller gate).

4) Gate Operation

The gates are manually operated. The electricity could be obtained by the transmission line along the East-West highway which is approximately 600m north of the proposed headwork. In this study, however, the operation of gate is planed by manually. Then, before starting the actual operation, the training of gate operation is needed for gate operators.

3.2 Conveyance Canal Design (Head Race)

3.2.1 Design Criteria

The design criteria used in design of conveyance canal is based on PDSP manual.

As mentioned above section 3.1.1, the design criteria used in the basic design for irrigation facilities based on DOI's criteria, which is given in the "Planning and Design Strengthening Project" (PDSP) manuals. On the design of conveyance canal, in particular, the criteria referred is Distribution Systems, Canals and Canal Structures Manual called "M.8". Also in this case, Japanese criteria concerning the canal design can refer as occasion calls.

3.2.2 Design Concept

In the irrigation plan on this feasibility study, the irrigation water taken from Sunsari River will be shared two benefited fields where is covered by existing Suksena and Shankarpur "branch" canal of SMIP. This conveyance canal carry the irrigation water from the river to the confluence point on existing canal respectively.

Two conveyance canals are proposed on this study, namely called "Suksena Conveyance Canal" and "Shankarpur Conveyance Canal". Judging from the function required the conveyance canal and the condition of the site, the items to be considered in designing the conveyance canal facilities are as follows;

-To satisfy the given hydraulic and structural requirement.
-To guarantee the safety against the loose sand foundation with high permeability.
-To enable the easy operation and maintenance in addition to the provision of necessary safety devices.
-Not to give hindrance and/or inconvenience to the inhabitants and the existing facilities such as road .
-To keep new land acquisition down to a minimum.

The basic concept is to design the facilities of economical with satisfaction of mentioned items above.

3.2.3 Hydraulic Design Conditions and Calculations

1) Design Discharge

The design discharge is given as following by the overall irrigation plan and the analysis;

-Suksena Conveyance Canal	Q=9.23 – 8.05 m3/sec
-Shankarpur Conveyance Canal	Q=7.70 – 7.64 m3/sec

2) Allowable Velocity , Manning's Roughness Coefficient and Freeboard

According to Manual "M.8" and Japanese criteria, these items are set as followed:

-Allowable Minimum Velocity	0.45 – 0.9 m/sec
-Allowable Maximun Velocity	1.50 m/sec (Thin concrete approx. 10cm)
-Roughness Coefficient	0.015 (Concrete lining)
-Freeboard	0.35 m(Q=5-10 m3/sec)

3) Design Water Depth in Canal

Design water depth in canal is planned to 1.2m around.

Judging from the field observation, the items to be considered in designing of water dept the conveyance canal facilities are as follows;

-Where considering maintenance when desiltation work by farmers, it is fitted that canal depth

is lower.
-From view point of land acquisition, canal width can not widen extremely.
-Inhabitants use the canal as one of tool of their livelihood.

4) Relationship of Water Level between Headworks and Main Canals

4.1) Targeted Water Level at The Confluence Point on Main Canal

The water level at the confluent point on main canal is targeted around the present full supply water level as a result of field observation.

Suksena Main Canal

-Confluence Point Ch. 2.0km point from E-W High way
-Targeted Water Level W.L 79.73 m

Shankarpur Main Canal

-Confluence Point Ch. 2.4km point from the bridge on the way to Inaruea
-Targeted Water Level W.L 80.10 m

4.2) Effective Head

Design intake water level (at headworks) W.L 80.50 m

Effective Head

- Suksena side W.L 80.50 m – W.L 79.73 = 0.77 m
- Shankarpur side W.L 80.50 m – W.L 80.10 = 0.40 m

4.3) Head Losses

Major head losses in open canal are classified as follows:

Friction head loss (hf)

Friction fead loss in a constant cross section of open canal will be computed by the following equation:

$hf = I \cdot L$ where; hf :Friction Head Loss in m
I :Hydraulic Gradient
L :Length of Canal in m

Then, friction head loss from the proposed headworks to the confluence point at main canal is calculated as followed:

- Suksena Conveyance Canal hf=1/4310・3318m=0.77 m
- Shankarpur Conveyance Canal hf=1/5000・2012m=0.40 m

3.2.4 The Proposed Dimensions

The proposed dimensions of the conveyance canal are as followed:

Suksena Conveyance Canal

-	Command Area	5529 ha	
-	Design Discharge	9.23 – 8.05 m3/sec	
-	Canal Length	3.32 km	
-	Canal Slope	1/4310	
-	Cross Sections	Bed Width	6.80 – 5.90 m
		Side Slope	inside 1:1.0
		(Ver. : Hor.)	Outside1:1.5
		Lining	Concrete Lining t=10cm

Shankarpur Conveyance Canal

-	Command Area	4619 ha	
-	Design Discharge	7.70 – 7.64 m3/sec	
-	Canal Length	2.01 km	
-	Canal Slope	1/5000	
-	Cross Sections	Bed Width	6.00 m
		Side Slope	inside 1:1.0
		(Ver. : Hor.)	Outside1:1.5
		Lining	Concrete Lining t=10cm

The drawings are shown as No. CN-1 in ATACHMENT.

3.2.4 Determination of Route

The route has been selected as most economical route taking account of items mentioned in 3.2.3 by using the topographic maps with a scale of 1/25000 and field observations.

The outline of route decided is shown as drawing No. GP-1 – GP-4 in ATACHMENT.

3.2.5 Profile and Typical Cross Section

The profile of the conveyance canal shall be decided in consideration of the following items:

-The invert slope the open canal shall ensure the velocity to avoid sand deposition in the canal bottom.
-The profile of the conveyance canal shall cope with the topographic profile so as to minimize the construction cost.

In order to prevent sand deposition in the canal, the hydraulic gradient should be decided in consideration of minimum velocity to ensure the transport capacity. The design discharges are given at 9.23-8.05m3/sec (Suksena conveyance canal) and 7.70-7.64m3/s (Shankarpur conveyance canal) as described in “3.2.3 1) Design Discharge”.

The hydraulic gradient of 1/4310 – 1/5000 could be applied in the design of open canal section of the conveyance canal. A rectangular shaped hydraulic cross section with bottom of 6.80-5.90m (Suksena C.C), 6.00m (Shankarpur C.C) and side slope of 1:1 gives hydraulic dimensions for the design discharge as shown Table 3.3.1.

The concrete lined canal section mentioned above has a height of 1.60m. Thickness of lining for the side slope is planned to be 0.10m with norminal reinforcement bars. The operation and maintenance road having a net wide 4m and 2.5 m each side is provided along the canal. For maintenance such as desilting works , slipway and steps are provided.

3.3 Water Distribution System

3.3.1 Design Criteria

The design criteria used in design of water distribution system is based on PDSP manual.

As it has been mentioned above section 3.1.1 and 3.2.1, the design criteria used in the basic design for irrigation facilities based on DOI's criteria, which is given in the "Planning and Design Strengthening Project" (PDSP) manuals. On the design of water distribution system, in particular, the criteria referred is Distribution Systems, Canals and Canal Structures Manual called "M.8". Also in this case, Japanese criteria concerning the canal design is referred as occasion calls.

3.3.2 Main Canal Design

1) Design Concept

The irrigation water which will be carried by the conveyance canal from the proposed position of headworks will flow down in the study area through the existing canals, namely Suksena and Shankarpur canal. Then, in this study, the Suksena and Shankarpur branch canal of SMIP called are renamed Suksena Main Canal and Shankarpur Main Canal respectively

All of the proposed main canals are planned as the rehabilitation plan of capacity of the existing canals due to increasing discharge. And then, Judging from the function required the main canal and the condition of the site, the items to be considered in designing the main canal facilities are as follows:

-To incorporate the existing facilities into the new canal system as much as possible.
-To consider the bed width and water depth relationship, freeboard of main canal based on practices used in the Terai area.
-To guarantee the safety against the loose sand foundation with high permeability.
-To enable the easy operation and maintenance in addition to the provision of necessary safety devices.
-Not to give hindrance and/or inconvenience to the inhabitants and the existing facilities such as road .
-To keep new land acquisition down to a minimum.

2) Hydraulic Design Conditions

2.1) Design Discharge

The design discharge is given as following by the overall irrigation plan and the analysis;

-Suksena Main Canal Q=8.05 – 0.73 m3/sec
-Shankarpur Main Canal Q=7.64 – 0.81 m3/sec

2.2) Allowable Velocity , Manning's Roughness Coefficient and Freeboard

According to Manual "M.8" and Japanese criteria, these items are set as followed:

-Allowable Minimum Velocity 0.45 – 0.9 m/sec
-Allowable Maximun Velocity 1.50 m/sec (Thin concrete approx. 10cm)
-Roughness Coefficient 0.015 (Concrete lining)
-Freeboard 0.35m (Q=5-10 m3/sec)
0.30m (Q=3- 5 m3/sec)
0.25m (Q=2- 3 m3/sec)
0.20m (Q=1- 2 m3/sec)

2.3) Design Water Depth in Canal

Design water depth in canal is planned to 1.2m around.

Judging from the field observation, the items to be considered in designing of water dept the conveyance canal facilities are as follows;

-Where considering maintenance when desiltation work by farmers, it is fitted that canal depth is lower.
-From view point of land acquisition, canal width can not widen extremely.
-Inhabitants use the canal as one of tool of their livelihood.

3) The Proposed Dimensions

The dimensions of the proposed main canal are as followed:

<u>Suksena Main Canal</u>

-	Design Discharge	8.05 – 0.73 m3/sec	
-	Canal Length	15.20 km	
-	Canal Slope	1/4000 – 1/3000	
-	Cross Sections	Bed Width	5.20 – 2.00 m
		Side Slope	inside 1:1.0
		(Ver. : Hor.)	Outside1:1.5
		Lining	Concrete Lining t=10cm

Shankarpur Main Canal

-	Design Discharge	7.64 – 0.81 m3/sec	
-	Canal Length	15.30 km	
-	Canal Slope	1/2800 – 1/2500	
-	Cross Sections	Bed Width	4.50 – 2.00 m
		Side Slope	inside 1:1.0
		(Ver. : Hor.)	Outside1:1.5
		Lining	Concrete Lining t=10cm

Minimum of bed width is set at 2.0m from the view point of construction and maintenance work.
The drawings are shown as No. CN-1 to No. CN-16 in ATACHMENT.

4) Determination of Route

The planned route is followed the existing route.

In consideration of land acquisition, the proposed route is set based on the existing one.

5) Profile and Typical Cross Section

The profile of the main canal shall be decided in consideration of the following items:

- The invert slope the open canal shall ensure the velocity to avoid sand deposition in the canal bottom.
- The profile of the conveyance canal shall cope with the topographic profile so as to minimize the construction cost.
- The velocity of siphon shall be more than 1.5 times of the velocity of the open canal to provide the economic canal system and to make sure that sand transport capacity

In order to prevent sand deposition in the canal, the hydraulic gradient should be decided in consideration of minimum velocity to ensure the transport capacity. The design discharges are given at 8.05-0.73 m3/sec (Suksena main canal) and 7.64-0.81 m3/s (Shankarpur main canal) as described in “2.1) Design Discharge”.

The hydraulic gradient of 1/4000-1/2500 could be applied in the design of open canal longitudinal section of the main canal. A rectangular shaped hydraulic cross section with bottom of 5.20-2.00m (Suksena M.C), 4.50-2.00m (Shankarpur M.C) and side slope of 1:1 gives following hydraulic dimensions for the design discharge as shown Table 3.3.1.

The concrete lined canal section mentioned above has 1.60-1.30m height. Thickness of lining for the side slope is planned to be 0.10m. The operation and maintenance road having a net wide 4m and 2.5 m each side is provided along the canal. This canal has slipway and steps for maintenance such as desilting work.

Table 3.3.1.a Proposed Hydraulic Dimensions of Conveyance Canal and Main Canal (Suksena side)

Canal Type	Design Discharge (m3/s)	Bed Slope	n	Side Slope	Bed Width (m)	Cross Section Area (m2)	Weted Perimeter (m)	Hydraulic Radius (m)	Mean Velocity (m/s)	Water Depth (m)	Froude Number
SSC1	9.30	1/4310	0.015	1:1.0	6.80	9.554	10.180	0.939	0.973	1.195	0.305
SSC2	8.70	1/4310	0.015	1:1.0	6.30	9.002	9.695	0.929	0.966	1.200	0.304
SSC3	8.10	1/4310	0.015	1:1.0	5.90	8.474	9.278	0.913	0.956	1.194	0.302
SSC4	8.10	1/3400	0.015	1:1.0	5.20	7.650	8.583	0.891	1.059	1.196	0.337
SSC5	7.10	1/3400	0.015	1:1.0	4.50	6.835	7.892	0.866	1.039	1.199	0.333
SSC6	6.50	1/3400	0.015	1:1.0	4.10	6.348	7.489	0.848	1.024	1.198	0.331
SSC7	5.90	1/3400	0.015	1:1.0	3.70	5.858	7.084	0.827	1.007	1.196	0.328
SSC8	4.20	1/3400	0.015	1:1.0	2.50	4.438	5.893	0.753	0.946	1.200	0.318
SSC9	3.80	1/3000	0.015	1:1.0	2.10	3.904	5.459	0.715	0.973	1.187	0.333
SSC10	3.40	1/3000	0.015	1:1.0	2.00	3.590	5.231	0.686	0.947	1.142	0.330
SSC11	2.60	1/3500	0.015	1:1.0	2.00	3.122	4.914	0.635	0.833	1.030	0.303
SSC12	1.50	1/4000	0.015	1:1.0	2.00	2.201	4.232	0.520	0.682	0.789	0.278
SSC13	0.80	1/4000	0.015	1:1.0	2.00	1.409	3.561	0.396	0.568	0.552	0.269

Remarks: -Canal type SSC1 to SSC3 are applied in Suksena Conveyance Canal (Head Race).
-Canal type SSC4 to SSC13 are applied in Suksena Main Canal.

Table 3.3.1.b Proposed Hydraulic Dimensions of Conveyance Canal and Main Canal (Shankarpur side)

Canal Type	Design Discharge (m3/s)	Bed Slope	n	Side Slope	Bed Width (m)	Cross Section Area (m2)	Weted Perimeter (m)	Hydraulic Radius (m)	Mean Velocity (m/s)	Water Depth (m)	Froude Number
SPC1	7.70	1/5000	0.015	1:1.0	6.00	8.637	9.393	0.920	0.892	1.200	0.281
SPC2	7.70	1/2800	0.015	1:1.0	4.50	6.759	7.861	0.860	1.139	1.188	0.367
SPC3	6.90	1/2800	0.015	1:1.0	4.00	6.164	7.361	0.837	1.119	1.188	0.364
SPC4	6.20	1/2800	0.015	1:1.0	3.50	5.630	6.889	0.817	1.101	1.198	0.360
SPC5	5.20	1/2800	0.015	1:1.0	2.90	4.880	6.272	0.778	1.066	1.192	0.354
SPC6	4.60	1/2500	0.015	1:1.0	2.40	4.229	5.740	0.737	1.087	1.181	0.369
SPC7	4.20	1/2500	0.015	1:1.0	2.10	3.929	5.475	0.718	1.069	1.193	0.365
SPC8	3.30	1/2500	0.015	1:1.0	2.00	3.286	5.027	0.654	1.000	1.070	0.360
SPC9	2.70	1/2500	0.015	1:1.0	2.00	2.839	4.714	0.602	0.951	0.959	0.357
SPC10	1.80	1/2500	0.015	1:1.0	2.00	2.119	4.167	0.509	0.849	0.766	0.350
SPC11	1.00	1/2500	0.015	1:1.0	2.00	1.397	3.550	0.393	0.716	0.548	0.340

Remarks: -Canal type SPC1 is applied in Shankarpur Conveyance Canal (Head Race).
-Canal type SPC2 to SPC10 are applied in Shankarpur Main Canal.

3.3.3 Secondary Canal and Tertiary Canals

1) Design Concept of The Secondary and Tertiary Canals

All of the proposed secondary canals are planned as the rehabilitation plan of capacity of the existing canals due to increasing discharge. Similarly the tertiary canals are designed as new and/or rehabilitation work taking the site conditions into consideration.

Main canal and secondary canals are designed as a rehabilitation plan for its capacity due to increasing irrigation water. The secondary and tertiary canal type (size) is distinguished according to proposed discharge. Similarly, the tertiary canal is planned with due consideration of the possibility of new construction and existing network of SMIP. Procedures of canal type selection are described below.

Canal Alignment

The proposed alignment of secondary and tertiary canal follows the existing one as much as possible from viewpoint of effective use of existing canal alignment and its facilities.

Canal Bed Slope

Standard bed slope is set 1/2000 in consideration of ground slope for both the secondary and tertiary canal.

Canal Type

For the design of secondary and tertiary canals, standard canal type is an earthern type and side slope ranges from 1 (Ver.) :1.0 (Hor.) to 1(Ver):1.5(Hor.).

For the secondary canal, bottom width ranges from 0.55m to 3.3m, where, the minimum bottom width is set to 0.55m considering maintenance and desilting works on the secondary. And then, canal sizes are categorized by proposed discharge, namely type A (0.2 m3/sec of canal capacity) to type L (3 m3/sec of canal capacity). But for the secondary canal named 4SRR (Sukhsena Side), lining have been proposed and categorized as a M type canal (offtaking discharge 3 m3/sec).

For tertiary canals, five types namely T1 (0.1m3/sec of canal capacity) to T5 (0.5m3/sec of canal capacity) have been proposed. Bottom width of these tertiary canal ranges from 0.45m to 1.5m.

On secondary canal, the operation and maintenance road having a net width 2m and 3m on each side is provided along the canal. For the tertiary, its width is 1.5m and 3m is considered respectively.

2) Proposed Dimension

Proposed dimension of secondary and tertiary canal is shown as follows and the drawing is presented in ATTACHMENT CN-1.

Along the Suksena Main Canal

1. Secondary Canal

- Design Discharge 0.20 –3.00 m3/sec
- Total Proposed Length 34.72 km
- Canal Density 4.66 m/ha (Net command area is 5529ha)

2. Tertiary Canal

- Design Discharge 0.1-0.5 m3/sec
- Total Proposed Length 100.01 km
- Canal Density 18.08 m/ha (Net command area is 5529ha)

Table 3.3.1 Proposed Secondary Canal (Sukhsena Side)

Canal Type	Design Canal Capacity (m3/s)	Proposed Length (Km)
A	0.2	0.45
B	0.4	12.47
C	0.5	2.70
D	0.7	7.25
E	0.8	3.75
F	1.0	0.75
M	3.0(lined type)	7.35
Total		34.72

Table 3.3.2 Proposed Tertiary Canal (Sukhsena Side)

Canal Type	Design Canal Capacity (m3/s)	Proposed Length(Km)
T1	0.1	10.20
T2	0.2	51.85
T3	0.3	19.51
T4	0.4	11.30
T5	0.5	7.15
Total		100.01

Along the Shankarpur Main Canal

1. Secondary Canal

- Design Discharge 0.2 – 3.0 m3/sec
- Total Proposed Length 25.8 km
- Canal Density 5.58 m/ha (Net command area is 4619ha)

2. Tertiary Canal

- Design Discharge 0.1-0.5 m3/sec
- Total Proposed Length 72.4 km
- Canal Density 15.67 m/ha (Net command area is 4619ha)

Table 3.3.3 Proposed Secondary Canal (Shankarpur Side)

Canal Type	Design Canal Capacity (m3/s)	Proposed Length (Km)
B	0.4	5.25
C	0.5	0.90
D	0.7	7.15
F	1.0	12.5
Total		25.8

Table 3.3.4 Proposed Tertiary Canal (Shankarpur Side)

Canal Type	Design Canal Capacity (m3/s)	Proposed Length(Km)
T1	0.1	9.2
T2	0.2	22.75
T3	0.3	24.25
T4	0.4	9.8
T5	0.5	6.4
Total		72.4

3.3.4 On-farm Irrigation Facilities

Based on the concepts and proposed irrigation method in this command area, the preliminary end on-farm irrigation is designed up to the field level irrigation considering 4 ha farming area. Further, one watercourse is designed for about 20ha (5 on-farms) irrigation block. Collector drainage systems has also been designed on farm level

One tertiary will comprise of 1 to 9 watercourses as per the size of command area (about 20ha to 180ha) it has to serve. Similarly one secondary serves 1 to 4 tertiaries about 150 to 400 ha except one secondary named 4SRR in Suksena side.

Water distribution in the watercourse and tertiary block will be shared as per the requirement through ungated propotional distributors.

In every secondary irrigation block, Water User Association (WUA) will be formed to organize and control the operation and maintenance (O/M) works of the all irrigation facilities within their jurisdiction.

The proposed on-farm irrigation and collector drainage plan is mentioned below.

1) On-farm Irrigation Facilities

In an average, there are five field channel offtaking from a water course and each field channel serve about 4ha. Considering the duty of 2.5 liters/sec/ha, the amount of water required for 4 ha block is about 10 liters/sec/ha. The following parameters are considered while designing watercourse.

Canal bed slope: 1/2000, canal coefficient of roughness (n):0.035
Manning equation: V=1/n*R2/3*I1/2, Q=A*V

The typical drawing is presented in ATTACHMENT CN-17.

2) Field Drainage Facilities

The proposed drainage system consist of collector, tertiary and major existing streams draining into the Sunsari River, Old Sunsari River and Budhi River. The function of a collector drainage canal is to receive excess run off from each plot of watercourse irrigation block. Then, tertiary

drainage canal collects water from collector drainage canal and drain into existing streams. Drains should be improved with provision of outfall structures near the confluence with existing streams.

Generally, present farming is being carried out by existing streams. Further, drainage reuse structure will be constructed in some portion of the study area to reuse the drain for the irrigation purpose. Since the percolation rate of the study area is very high, Drainage requirement is considered only 4.0 liters/sec./ha. All together 42 drainage canals have been proposed, 23 in Shankerpur side and 19 in Sukhsena side.

The drawing is presented in ATTACHMENT GP-1 to 4 and DR-5.

3.3.5 Ancillary Facilities

1) Cross Regulator (Check)

Cross regulator are designed across irrigation canals (main canals) in order to maintain and regulate the head in main canal. Water levels and discharges will be regulated manually. As far as possible, Cross regulator are positioned in such a way that it can be used as a bridge for the consideration of road network as well as drop to maintain the slope of the main canal. Water level is regulated by movable gate during the irrigation time, but its handle will be taken off during the non-irrigation time, to reduce the tampering of equipment by local people. 13 Cross regulators have been proposed, 7 in Sukhsena side and 6 in Shankarpur side respectively.

The drawing is presented in ATTACHMENT AF-1.

2) Drop

Drop structures are proposed of reinforced concrete type, where upstream and downstream portions are protected by stone pitching (or gabions). The combination of bridge and drop structure with cross regulator have been proposed where ever possible from the economic point of view.

3) Siphon

There is a siphon in the Suksena Main Canal across the Sunsari River. This will be replaced based on the revised design. The new siphon has been proposed of reinforcement concrete type (box culvert) with the following dimensions.

- Design Discharge 4.16 m3/sec
- Total Length 115.8 m (including inlet and outlet portion)
- Size of Box Culvert 1.55m width, 1.55m height
- Head Loss 0.50 m
- Velocity in Siphon 1.73 m/sec (more than 1.5 times the velocity in open channel 0.95 m/sec---OK)

The drawing is presented in ATTACHMENT AF-3.

4) Aqueduct

An aqueduct in Shankarpur Main Canal has to be constructed to cross Mariadhar (Old Sunsari River) to replace the existing siphon. The condition of the existing siphon is poor. This may be the due to poor maintenance. The proposed aqueduct is designed as reinforced concrete flume type. The dimensions are proposed as follows:

- Design Discharge 5.20 m3/sec
- Total Length 63.70 m (including inlet and outlet portion)
- Size of Flume 5.00m width, 1.60m height

The drawing is presented in ATTACHMENT AF-4.

5) Drainage Facilities Planning

When canal system starts delivering water to the field, it has two consequences in regards to the drainage. The canal embankment(s) obstruct natural flow after rainfall (in the form of sheet flow) which starts accumulating upstream of embankment causing local inundation problem. The second consequence is the water applied in the form of irrigation needs a safe passage after its use. Therefore, a proper drainage system is always felt essential to develop. In SRIP command area, a minimum network of drainage system is minutely studied and proposed. The drainage structures to accommodate the drains are provided sufficient in numbers. The drainage ditches are proposed parallel in the upstream side of nearby canal. The lands covered by such drains are to be acquired and considered in estimate. However, the soil excavated from the drain ditch can be used in making the embankment of the nearby canal. Hence this part (i.e. the earthwork in excavation in drain ditch) is not included in the cost estimation.

CHAPTER 4 REHABIRITATION OF GERUWA IRRIGATION SUB-PROJECT

4.1 Rehabilitation Work Required

1) General Description

Geruwa Irrigation Sub-project is situated at Jalpapur VDC 5, Sunsari District. This project was taken up under Irrigation Sector Project (ISP). The initial estimate of the sub-project was NRs. 8,398,000 based on the rate as of FY 2052/53 (1995/96). The project was completed (?) one year latter at the cost of NRs. 5,889,880. The targeted command area was 421 ha. (Jalpapur VDC ward No 1,2,3,4,5,6, and 9). DIO, Sunsari was responsible for the planning, constructing and maintaining of this project.

2) Project Component

The project comprises of one barrage (3bays) cum bridge, one under sluice, two head regulators and two main canals (for both sides), divide wall, protection works both upstream and downstream side and necessary gates for regulation.

3) Present Status

The project is not supplying the water at all. The gates for regulation were never installed (reports say that it is due to budgetary constraint). The earthwork in main canal could not be done because WUA was supposed to work as per the terms of conditions and WUA was never made active. Therefore, it can be inferred that there is no water flowing through those (proposed) canals. The workmanship of the construction for the headwork seems of very poor quality. Under this condition, the farmers are not expected to deliver the irrigation water from intake to irrigation field. At present, they are using the intake as a bridge for transportation purpose only.

4.2 Cost Estimate

This project is located within the Sunsari Morang Irrigation Project command area. Farmers are getting water from Sankarpur branch of SMIP. Because of this reason, WUA is not responding well towards this project. Hence, it would be very difficult to rectify this problem and bring back into the order with the farmers' cooperation. Further huge investment is required (tentative estimate NRs 10 million) if we go for the new construction.

HAPTER 5 FLOOD AND INUNDATION MITIGATION

5.1 Flood Mitigation (River Training)

1) General Description

Sunsari River originates from hilly area near Dharan. It crosses several creeks and drains at different points. The terrain is very steep in upstream part (because of hills) and is flattering when it flows southward. The size of river bed material changes from very coarse (boulders) to fine silt accordingly. The catchment area of this river at the point EW Highway Bridge near Inarwa is 300 sq.km.

The catchment area, in Siwalic Region, is covered by forest, agriculture land and barren fields. Big amounts of debris is being carried by flood during monsoon season. When bed slope of the river (gradient) gets reduced, deposition takes place.

The deposition of debris causes an inundation problem in the downstream part of the river (particularly from Bhutaha village onwards). A huge agricultural land gets inundated and farmers of that area loose their standing crops, their houses and properties.

2) Flood Observation

There is a gauge station at the crossing of Eastern Kosi Main Canal with the river (in India).

Maximum discharge observed at that crossing in different years is as follows:

Table 5.1.1 Flood Observation Record

Year	1979	1981	1982	1983	1984	1988	1989	1990	
Discharge	162	276	254	327	218	181	218	242	m3/sec

Source:- *Extension of embankments on Sunsari River on both banks in Nepal territory, Item 13, ANNEX II. Indo-Nepal Joint Committee report, 1990*

But the maximum discharge, observed at the crossing point of Rajmarg (EW Highway) near Inerwa was 670 m3/sec in 1974, though design discharge adopted for construction of bridge over Rajmarg is 510 m3/sec only based on calculation on catchment area (equal of 186 sq km).

There are only four structures constructed so far over Sunsari river from EW Highway (In Nepal) to Eastern Kosi Main Canal (in India). The discharge adopted is as follows:

- For bridge over Rajmarg (Nepal) 510 m3/sec
- For Suksena Distributary siphon (Nepal) 510 m3/sec
- For bridge over Bathnaha Bhimnagar road (India) 630 m3/sec
- For 76 RD siphon on EMC (India) 630 m3/sec

The maximum observed discharge (flood) of Sunsari River at the crossing point with Kosi Eastern Canal (in India) is 680 cu.m/sec. The catchment area at that point is quite higher than at EW highway crossing point, means 500 sq km. Catchment area of Sunsari River at the EW Highway Bridge point is 300 sq km. Then, the high flood discharge is going to be decreased. Comparing this figure with 647 cu.m/sec, means existing capacity calculated manning method at EW highway, we may conclude this figure as reasonable. Consequently, we have adopted a high flood discharge of 650 m3/s as design high flood discharge.

Every year, the flood brings lot of sediment and other debris from upstream part. Several meanders have been developed along the river courses. As a result of these meanders, outer banks are being continuously eroded and inner bank silted up. Farmers are loosing significant part of their land during flood period. To mitigate the damage caused by flood, there must be a following steps.

3) Improvement of Catchment Area

Rapid deforestation, improper agriculture practices and quarry sites (for collecting construction materials) are responsible for flash flood with high concentration of debris. Heavy rainfall after a long spell of dry season is also one of the major problem in these areas. Because the grass covering the soil gets wilted during the dry season as a result of that the top soils become very loose. Awareness among the people and vegetation technique can be a sustainable solution for the improvement of catchment area.

4) River Training

Locally, the river is controlled by the help of gabion, spurs and revetment particularly in river bends. Bio-engineering may be a good, economic and sustainable approach for straight reach of river. The cost of river training works can only be assessed after detail study of the river (upstream part of proposed headworks).

5.2 Inundation Mitigation

Due to the defined existing banks in upstream side of EW highway, the inundation problem in is not significant, but rather a big effort is necessary to make the people safe from the flood in the down stream part of proposed headworks. Flood starts getting spilled right from about 1 km downstream of EW Highway Bridge near village Badia. The bank heights of existing banks in down stream part of the river are less. The loose type of non-cohesive bed materials (sand and silt) and flatter bed slope help the river to form several local meanders along its course. As a result, the river is changing its course frequently.

In 1962, the river changed its own course near Bhutaha and started flowing towards south-east direction. It remained on the same way for 16 years and responsible for an inundation for area 124 km^2 (in India and Nepal). It was brought under control and re-started flowing on its original course in 1978 (i. e. towards south-west from Bhutaha) at its present form.

The abandoned part is called Maria Dhar (Old Sunsari) and remains at present as a waste water-logged area. If there is a development of infrastructures like canal system network, inhabitant must be safe from the ravage of this river during the flood time. The risk of lives and property loss enormous if flood devastation occurs. So, it may be a wise thinking to train the river at its desired waterway to minimize the losses. Following steps are recommended to mitigate the damages caused by the flood in Sunsari River.

Embankment with sufficient free board parallel to the river, can control the spill of high flood during monsoon season. The size and spacing of these embankments depend upon the available topography as well as the selection of the design flood. From the Past records, about 22 km stretch of Sunsari River is affected by the flood. So, it requires 44km length of embankments considering bothside of river to protect from flood. Moreover, few numbers of inlet structures are required to pass the accumulated water behind the embankments.
If embankment is considered of dimnesions 3 m top width, 1 in 2 side slope and 3 m in height, the approximate volume of earthwork in filling would come around 1.2 million m3 and approximate cost will be approximately NRs. 100 to 150 Million.

CHAPTER 6 RURAL INFRASTRUCTURE

6.1 Road Improvement

The rural road improvement is put on high priority for this project.

As it has been mentioned in the CHAPTER 6 of APPENDIX 2, the improvement of road network and condition shoulders an important performance for agricultural development in the study area. And, the detail of this matter has already discussed in that chapter. The improvement plan including on going project based on field investigation is presented as follows. The drawing is presented in ATTACHMENT RI-1.

1. DDC has set priority to construct roads that connect administration centre of adjoining VDCs and such roads are termed as DDC Road. The feeder roads for DDC road should be constructed by VDCs itself.

2. Mainly three VDCs Basantapur, Ghuski and Sahebgunj remain out of access during flood time, so they should be prioritized.

3. Recommended Size of Roads: Embankment of 5 m wide, 50 cm raised (as per flooding condition) and covered by gravel over the top (4m wide and 15cm thickness)

4. Improved length is proposed 11.8km in this study.

5. Approximately, the cost of construction is NRs 1400 per linear meter length.

Table 6.1.1 Road Net Work Development Plan in The Study Area

Name of VDC	Name of Road	Total Length km	Made so far Km	This Year Target km	Remarks
	Bhutaha – Basantapur	4.00	1.00	0.60	DOR has also flashed the tender for Devangunj – Ghuski) part, Bridge at Mariya Dhar (by DOR)
Kaptangunj	Kaptangunj to Sahebgunj	6.00	2.50		
	Kaptangunj to west up to India border and back via custom office			0.50	
	Kaptangunj to east side via Krishna High School up to Chanda Mohana	2.00	1.00	0.40	
Ghuski	Ghuski Market to south upto India Border	3.00	1.50		
	Ghuski Market to south upto India Border via Ghurna Bazar	1.50		0.50	
	Ghuski Market to West via Arnawa			0.60	
Rajgunj Sinuwari	Upto Dewangunj-Brt road via Yadavtol	5.00	3.85	1.00	Agriculture Road
Madhya Harsahi	Harinagara main road to Madhya Harshahi			0.50	
	Main road via Police Office			0.25	
Jalpapur	No Program				
Narsingh	Babiyu Bridge to west side towards ulti bazaar			0.80	Bridge across Sunsari River is under construction (DOR)
Gautampur	Chandamohana upper bridge to East part	6.00		1.50	Not being constructed at present

APPENDIX-9 INSTITUTIONAL DEVELOPMENT

CHAPTER 1 INTRODUCTION

1.1 Background

His Majesty's Government of Nepal (HMGN) requested the Government of Japan (GOJ) three years back to conduct a feasibility study for the envisioned Sunsari River Irrigation Project (SRIP). The request was made because about 14,000 ha located in the downstream reaches of Shankarpur and Suksena Branch Canals of Sunsari Morang Irrigation Project (SMIP) have long been unable to avail of adequate irrigation water, if at all, from said canals. The GOJ, through the JICA, commissioned SANYU Consultants to undertake the study together with the Nepali counterparts.

With the main objective to formulate an efficient water use plan aiming at agriculture development in the 13 VDCs of Sunsari District, the JICA Study Team carried out the "Feasibility Study of SRIP" in two phases. The First Phase, which started April 2001, dealt with 1) the review of the Sunsari Morang Irrigation Project (SMIP), 2) the review of other development projects/plans related to the study area, 3) collection and analysis of relevant data through field surveys, 4) formulation of preliminary irrigation and drainage development plan, and 5) the conduct of an initial environmental examination.

The Second Phase started in June 2002 and continued the work through 1) field surveys to collect supplementary data and information, 2) formulation of effective irrigation and drainage development plan, 3) formulation of agriculture development plan, 4) design of irrigation and drainage facilities, 5) formulation of O& M plan, 6) formulation of institutional development plan, 7) preparation of implementation schedule, 8) estimation of project costs and benefits, and 9) evaluation of project and preparation of recommendations.

It is in the Second Phase that the institutional development component of the Study has been activated. In line with the TOR and objectives of this component, the following activities were undertaken:

- Review and analysis of the existing Water Users Organizations (WUOs) in the SMIP area relative to levels, composition, boundaries and functions; their performance as well as their strengths and weaknesses;
- Assessment of the organization and performance of officers of SMIP engaged in institutional development and the identification of the constraints and problems;
- Review of the institutional arrangements between the SMIP/DOI and the WUOs in the areas of water distribution, maintenance and ISF collection;
- Formulation of the institutional development plan on WUOs in the Study area,
- Proposal preparation on the institutional arrangement plan in irrigation management system (O&M system) of the Sunsari river irrigation project, and
- Preparation of the institutional development report concerning the above items.

The methodology involved collection of available documents/secondary data such as acts, policies, irrigation rules, publications, study reports and progress reports. The collected

secondary data were reviewed and notes on relevant matters were taken. Also, key informants for interview were selected among the officers of SMIP and the different levels of the WUOs of selected secondary canals. The aim was to gather information on the general situation of O&M and the respective arrangements between the WUOs and the SMIP, the procedures and practices of O&M internal to the WUOs, the support of SMIP, ISF collection and mechanisms, general conditions of the facilities and canal systems. Informal discussions and group interviews were held among the beneficiaries in selected areas in SMIP, Chanda Mohana Irrigation System, Kankai Irrigation System and Chandra Nahar Irrigation System focusing on the above institutional concerns of the study.

Consultation meetings among the farmers of the 13 VDCs in the command area of the proposed SRIP were conducted by the JICA Study Team following the upstream, midstream and upstream groupings. The preliminary plans on the various components such as engineering, institutional, agricultural, environmental and socio-economic aspects of the proposed project were presented in these meetings with some 280 farmers in four batches. The farmers' reactions, comments and suggestions to the preliminary plans were, indeed, needed inputs in the formulation of the development plans of the proposed project. In addition, a one-page institutional development scoping questionnaire was administered among the participants in these farmers' consultation meetings.

The data gathered from the above data-gathering techniques were recorded as field notes. The field notes were reviewed and expanded as categories of information and consolidated with the rest of similar information from the different sources. As the data/information were highly qualitative and, therefore, descriptive, these are presented as generalizations of findings in each particular area of concern. Some quantitative data which were drawn from the socio-economic survey conducted in the study area and the institutional development scoping questionnaire were processed and analyzed using Excel and SPSS computer softwares. The results are presented as tables and the quantitative findings are compared with the qualitative findings wherever this is appropriate.

1.2 Scope of the Report

This report is essentially structured along the following major points:

Chapter 1 spells out the rationale of the feasibility study of the Sunsari River Irrigation Project (SRIP), particularly the institutional development component; the evolution of institutional development in the Nepal irrigation sector; the current status of institutional development and irrigation system operation and management as documented in the various studies conducted for HMGN; and the issues and directions of irrigation development in the country in terms of overall performance of its irrigation institutions.

Chapter 2 discusses the HMGN response to the irrigation issues cited in Chapter 1 through its Department of Irrigation (DOI) by way of laws, policies, and regulations that affect irrigation development; closer scrutiny of DOI's previous and existing structure and sub-structures; the history of farmer participation in irrigation management in Nepal; and the current performance, status and directions of its

water users' organizations .

Chapter 3 discusses two lines of institutional development efforts which have been implemented in the country through its various irrigation projects. The discussion dwells on the analysis of institutional development goals, objectives, structures, processes, performance, and lessons learned from the documented experiences of institutional development in these projects.

Chapter 4 presents in-depth the proposed institutional development component of the proposed SRIP which include project rationale and approach, project area description, proposed program design, goals, structure and processes, proposed joint irrigation system management model, and the projected constraints of the program and recommended countermeasures to these constraints.

Chapter 5 discusses the review of the rules and regulation in the context of two areas: irrigation development and operation and maintenance. Given what are the provisions of the rules and regulations, suggestions are made where these are appropriate on the two areas mentioned in the context of the proposed SRIP.

Chapter 6 illustrates the management organization of the IDP in the context of the whole Structure of DOI and the PMO and suggests arrangements of Consultants and NGO working with the PMO/DOI.

1.3 Institutional Development: Nepali Context

1.3.1 Definition of Institutional Development

The word "institutional development" needs to be defined. By saying "institutional development", it also means "development of institution". Norman Uphoff defines the term institution as a "complex of norms and behaviors that persist over time by serving collectively valued purposes. [1]" Similarly, Bandaragoda[2] defines the word "institutions" as a set of formal and informal rules used for collective action, and the organizations which are governed by such rules. The term "development" refers to a change from the existing condition to a desired one. In the context of an institution, it has something to do with capacity development. Dr. Acharya and Wright have defined capacity development as the processes, strategies and methodologies used by national participants (local agents) or outside intervenors (outside agents) to help organizations and/or systems develop specific capacities or abilities.[3] Both authors pointed out that these processes, strategies and methodologies, as Morgan and Wanasinghe4 have stated, include: "…ideas and techniques to do with the management of organizational change, facilitation, learning, participation, awareness raising,

[1] Uphoff, N. (1986). Local Institutional Development: An Analytical Sourcebook with Cases. West Hartford, CT: Kumarian Press.

[2] Bandaragoda, D. J. 1998. *Need for institutional impact assessment in planning irrigation system modernization.* Research Report 21. Colombo, Sri Lanka: International Water Management Institute.

[3] Dr. Meena Acharya and Art Wright (2000), An Evaluation Of The Impact Of The United Nations System On Capacity Building For Poverty Eradication In Nepal 1985-2000: A Report for the Department of Economic and Social Affairs Of the United Nations, New York.

[4] Peter Morgan and Shelton Wanasinghe, 1998, February 27, An Evaluation of the Impact of the United Nations System on Capacity Development in Basic Health and Education in Pakistan, 1980-95, New York: United Nations, DESA.

compulsion, protection and support, changes to incentives, conflict management, self diagnosis and empowering, …advocacy and social mobilization, (that) help to create an enabling environment or remove constraints to improved performance".

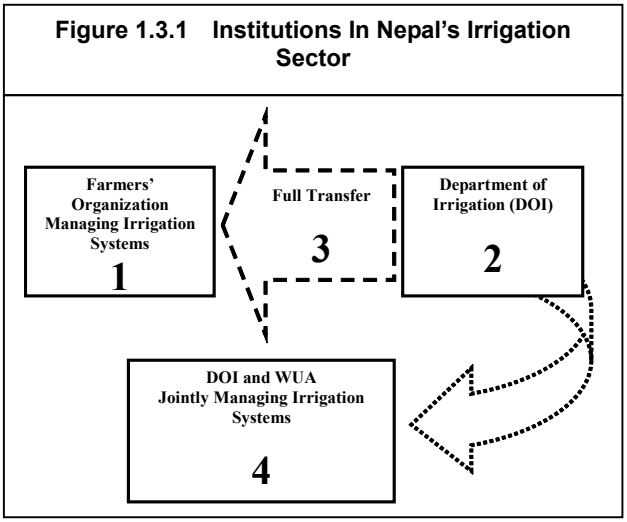
In the context of the above definitions and for the purposes of this report, the term "institutional development" is defined herein as the processes, strategies and methodologies which are used by national participants (Department of Irrigation) or outside intervenors to help organizations or people to be organized (Water Users Association) acquire abilities for adopting formal and informal rules or norms and behaviours to serve collectively their valued purposes over time.

Institutional development, particularly in the irrigation sector of Nepal, can be understood by focusing on the historical conditions before and after the establishment in 1951 of the Department of Irrigation (DOI), the principal government institution responsible for the planning, development and management of irrigation schemes in the country. However, before the establishment of DOI and the start of the planned development of irrigation works in 1957, the institutions in the forefront of the development and management of irrigation systems to support agricultural production had been the farmers themselves, on the one hand, and the State on the other hand.

1.3.2 Institutional Development: Nepal Irrigation Sector Context

A farmer needs water to grow his crop. It is demonstrated in Figure1.3.1 that the institution of irrigation started all with a farmer or a group of farmers who have to work together to divert water from a small river to irrigate their fields. Thus, since time immemorial in Nepal, there have been innumerable canal systems built by the farmers and are still functioning even now. These small irrigation systems had flourished because, even in the 17th century, the edict of King Sham Shah stated that irrigation and its management is the responsibility of the community. The State intervened, directly financed, and carried out the construction of irrigation facilities. An example of such intervention is the Raj Kulos (King's canals) around Kathmandu which had been state-built facilities where the day to day operation, maintenance and repairs were left to the farmers (water users).[5] As the technology of irrigation developed from simple to complex, small to big or primitive to modern due to the rising demand for food production, the Government had to create an agency such as DOI for the planning and construction of the so-called modern irrigation systems. Over time, recognizing that irrigation is in reality a farmer-based tool, the agency has to move forward by giving back the management of irrigation systems to the farmers (full transfer) and pursuing towards the institution

Figure 1.3.1 Institutions In Nepal's Irrigation Sector



[5] Achyut Man Singh, Irrigation Development In Nepal It's Trend & Direction: A Review, http://www.doi.gov.np/doi/ID9/newletters/53/6.html

of joint irrigation management.

The history of irrigation institutions in Nepal has already gone in a full circle; that is, from the farmers through DOI and back to the farmers through the so called full transfer as shown in Table 1.3.1. The indigenous farmers' groups or organizations managing their own irrigation systems have survived the test of time, become famous today as the Farmer Managed Irrigation Systems (FMIS) of Nepal and dominated the irrigation sector landscape even to this day.

Table 1.3.1 Evolution of the Institutions In The Irrigation Sector

Institutions	Time Horizon	Management Feature
▪ Farmer and Farmers' Group or Organizations	▪ Since time immemorial to present and continuing	▪ Farmers Managed Irrigation Systems
▪ Revenue Office (Mal Adda)	▪ 1846 to 1920	▪ State-Managed Irrigation Systems
▪ Public Works Department	▪ 1921 to 1950	▪ Agency-Managed Irrigation Systems
▪ Department of Irrigation	▪ 1951 to present and continuing	▪ Agency-Managed Irrigation Systems
▪ Full Transfer or DOI and WUA Joint Management	▪ 1985 to present and continuing	▪ Full Management Transfer or Jointly-Managed Irrigation System

On the other hand, the Government institutions had evolved from the Revenue Office. A significant landmark in the development and management of canal irrigation systems in the country was highlighted by the enactment of the 1854 Penal Code (Muluki Ain) during the Rana period (1846-1920). This Code provided a legal foundation for canal administration in the Terai region. It made the Revenue Office (Mal Adda) in each Terai district responsible for the construction, operation and maintenance of the irrigation systems within the District. The Chief of the District Revenue Office was legally empowered to mobilize both cultivators and villagers from nearby villages to repair and maintain the irrigation canals within his jurisdiction.[6]

The Government efforts to develop canal irrigation systems in the Terai started in 1920. Nepal and (British) India negotiated and agreed on the sharing of Sarda (Mahakali)[7] river water for irrigation and power. Nepal's unique relationship with the British in India during the Rana period not only shaped the use and sharing of water of the common rivers between Nepal and India but also led to the modern canal irrigation systems being introduced in Nepal. The Public Works Department constructed the first modern canal irrigation system in the country, the Chandra Canal in the Saptari District of eastern Terai - having a command area of 10,000 hectares, was constructed in the years 1922-28 with the assistance of British engineers. This Chandra Canal Irrigation System was the first so-called Agency Managed Irrigation System (AMIS). The Public Works Department (PWD) constructed a few more canal irrigation systems in the period 1928-51. These were the: Jagadishpur in the western tarai in 1942 with the command area of 1,000 hectares and was renamed as Banganga Irrigation System after being expanded in 1978. The other is the Judha Canal in the central tarai in 1946 with the command area of 2,000 hectares which became Manushmara Irrigation System after being expanded in 1976.

[6] Ibid.
[7] However, the construction of the Mahakali Irrigation Project did not get under way until 1971.

The Department of Irrigation was established in 1951 even before the first five-year plan period (1957-62). The construction of large-scale government canal irrigation systems in the Terai followed after Nepal and India agreed on the use of the Koshi river water in April 1954 and on the Gandak (Narayani) river water in December 1959, both for irrigation and power. The Irrigation Act was enacted in 1963 and became essentially the basic Code for exercising the right of the public on issues related to water use.[8] The construction of large canal irrigation systems such as the Chatara Canal Project (now Sunsari Morang Irrigation Project) started in 1964 with assistance from India. The Government introduced the Minor Irrigation Program called Laghu Sinchai in the second three-year development plan (1962-65) up to the Third Plan Period (1966-70) to provide low-cost irrigation facilities to farmers within a short period of time. Although it was planned to provide irrigation facilities to 4,455 hectares during the total period of both Plans under this program, the actual achievement was insignificant.[9]

The Government investments in irrigation development - especially in the large-scale irrigation systems in the Terai increased tremendously from the Fourth Plan (1970-75) to the Sixth Plan (1976-80) periods. The irrigation development targets swelled in both periods. Construction and construction was the name of the game. All these were made possible due to the increase in Government borrowing of international capital in the form of loans and grants for the country's overall economic development. The Government's focus on irrigation development was largely on the construction of physical infrastructure of canals and structures. There was very little attention given to the effective management of the constructed irrigation systems.

The concern of the Government for improved management of government-operated irrigation systems started to emerge during the Seventh Five Year Development Plan (1985-1990).[10] This is reflected in the implementation of a number of management-oriented projects in 1985-89:

- the USAID-funded Irrigation Management Project (IMP) in 1985,
- the Irrigation Line of Credit(ILC) in 1988 financed by the World Bank,
- the Irrigation Sector Project(ISP) in 1988 financed by the ADB, and
- the Irrigation Sector Support Project (ISSP) in 1989 under the co-financing of the UNDP, the World Bank and the Asian Development Bank (ADB).

All these projects have specifically emphasized the participatory approach to irrigation development and management of irrigation facilities.

Parallel to the emphasis on participatory approach of the above foreign-assisted projects, the Basic Needs Program (BNP) was introduced in 1987. The working Policy on Irrigation Development for the fulfillment of Basic Needs was formulated in early 1989. This was

[8] Ministry of Agriculture and Cooperatives, Nepal and Asian Development Bank, Final Report: Nepal Agriculture Sector Performance Review (ADB TA No. 3536-NEP) Volume 1: Main Report, ANZDEC Limited, New Zealand in association with Consolidated Management Services Nepal (P) Limited, March 2002

[9] http://www.doi.gov.np/doi/ID4/1/index.html

[10] op. cit, Nepal Agriculture Sector Performance Review

immediately followed by the promulgation of the Irrigation Regulations (IR) in April 1989. These Regulations placed emphasis on the greater collaboration with water users in all phases of irrigation projects - planning, construction, operation and maintenance. The Irrigation Regulations gave water users, for the first time, a legal mandate to form water users' associations in accordance with the 1976 Association Registration Act.[11]

The strategy for increasing farmer participation was mainly based on the recognition that government resources alone were inadequate to meet the country's irrigation development objectives and sustain the management of government irrigation systems after their completion. In this context, however, it has institutionalized the participation of actual water users in irrigation. In 1989, the action plans and policies for the turnover of small irrigation systems and the participatory management of large irrigation systems were formulated.

1.3.3 The Current Irrigation Development Status

The total cultivated lands of the country stand at 2.641 M ha., of which the total irrigable area is 1.766 M hectares.[12] At present, only 1.109 M ha or 42 percent of the total cultivated lands are irrigated.[13] To date, surface irrigation schemes in the country cover 0.9 million hectares. About 680,000[14] ha or 76% of the total surface schemes' areas are served by 22,000 FMIS - 15,000 FMIS in hill areas and 17,000 systems in the Terai.[15]

On the other hand, the AMIS under DOI provide irrigation to the other 24% of the areas under surface irrigation schemes although the government constructed systems have been estimated to cover a total area of about 339,000 ha.[16] Groundwater schemes cover 0.2 million hectares of land. FMIS are those systems, which are constructed, operated, and maintained by the beneficiary farmers themselves. It also includes those systems, which were constructed by government agency but operated and maintained solely by farmers. Agency Managed Irrigation Systems (AMIS) stand for those systems, which are constructed, operated and maintained by DOI through its 5 Regional Directorates, District Irrigation Offices and Project Offices in the country.

It has been said that, in Nepal, several irrigation systems managed by farmers for centuries perform better in terms of crop yield, equity and farmers' satisfaction than most agency-managed irrigation systems.[17] Chhattis Mauja Farmer-managed System (CMIS) is the oft-repeated example of the most successful community managed irrigation system in

[11] op. cit, Achyut Man Singh. This 1976 Association Registration Act was intended for all kinds of associations but some water users' associations were also registered in this Act.
[12] op. cit., Nepal Agriculture Sector Performance Review
[13] HMG/N, Water and Energy Commission Secretariat, Executive Summary: Water Resources Strategy NEPAL, January 2002
[14] Paudel S.N. and C.K. Sharma, Irrigation and Water Control Vol. 1 – Main Text, Agriculture Perspective Plan, Technical Paper
[15] Prachanda Pradhan, Farmer Managed Irrigation Systems In Nepal At The Crossroad, A paper prepared and presented to the 8 th Biennial Conference of the International Association for the Study of Common Property (IASCP) held in Bloomington, Indiana May 30 to4 July, 2000.
[16] Sharma, D.S. and N. Ansari, 1997. "Development of Participatory Managed Irrigation Systems: Lessons Learnt From ISP" in Neupane and K.C. Prasad (eds.) Evaluation of Management Transfer Process and Performance, Workshop Proceedings, Kathmandu; RTDB and IIMI.
[17] Indra Lal Kalu, Modernization Of Irrigation System Operations: Institutional Development And Physical Improvement, http://www.fao.org/DOCREP/003/X6626E/x6626e17.htm

Nepal.[18] A review of the status and performance of AMIS may highlight what is referred to by such comparison.

1.3.4 AMIS Status and Performance

The performance of AMIS or any irrigation system is best indicated by the extent it is able to irrigate the lands it is designed to irrigate to support production both in the summer and winter seasons. A list of 34 AMIS under DOI is found as of today. Here, its summary is presented in Table 1.3.2 and categorized as large, medium or small AMIS. The 6 large AMIS account for 77% of the total area of the 34 AMIS. The medium and small AMIS account for 20% and 3% respectively. As a whole, the 34 AMIS irrigate 66% of the total area during summer and 42% during winter. Thus, the AMIS cropping intensity[19] is only 108. When one looks at the performance of the AMIS in terms of their sizes, what is striking is that it is the small AMIS that has the highest cropping intensity of 152 compared to the lowest cropping intensity of the large AMIS of 103 in a cropped year. The cropping intensity of 123 of the medium-sized AMIS is also far better than that of the large AMIS. While the performance of the small AMIS may be comparable to that of the FMIS, it can still be said that the performance of AMIS as a whole is relatively low.

Table 1.3.2 Performance of AMIS As Of 2000/01

No. of Systems	Total Area (Ha) for Irrigation	% Against Total Area	Cropped Area (Ha) Summer	Cropped Area (Ha) Winter	Total Cropped Area (Ha)	Cropping Intensity
6	165,500	77	101,850	69,000	170,850	103
16	44,193	20	35,570	18,740	54,310	123
14	5,511	3	5,401	3,000	8,401	152
34	215,204	100	142,821	90,740	233,561	108

Besides the low cropping intensity of AMIS, its performance in Irrigation Service Fee (ISF) collection is also correspondingly low. The ISF rate varies from one AMIS to another but, on the whole, AMIS ISF collection performance can not recover its O&M costs. The recovery of O&M costs from ISF collection in various AMIS ranges from 0.1% to 15% with an overall recovery of 1.3%. The low recovery of O&M costs reflects the overwhelming dependence of AMIS on the Government budget. A study carried out by the National Planning Commission in 1994 (NPC, 1994) has analyzed the trend of ISF collection and costs incurred in the O&M of AMIS. The study has pointed out that that water charge collection in Nepal has covered only two percent of the total O&M costs. Hence, 98% of the O&M costs is borne by the Government.[20] The AMIS, therefore, is highly subsidized by the Government in terms of O&M costs despite its relatively dismal performance in cropping intensity.

Thus, the recent "Irrigation Operation and Maintenance (O&M) Cost And Water Charge Recovery Study" has concluded that:

[18] Dirgha N. Tiwari, Environmental Change and Community Irrigation Organizations in Terai Areas of Nepal: Co-evolutionary Analysis and Lessons Learned, A Case Study for The World Bank/WBI's CBNRM Initiative, January 26, 1998

[19] Cropping intensity is defined here as the ratio of the total cropped area for both seasons against the total area for irrigation. It is the measure of the irrigation system's performance for the cropped year.

[20] op. cit, Nepal Agriculture Sector Performance Review. Also see Dr. Khem Raj Sharma, "The Agricultural Performance Review As Related To Irrigation", IRRIGATION NEWSLETTER: Quarterly Newsletter of Irrigation Development and Management in Nepal, No. 56, 16th Oct. 2001 – 15th March 2002

> *… the study reveals that most of the existing AMIS are in very poor operating condition. This is mainly due to non-responsive feelings of the WUA farmers on the one hand and due to the poor management of O&M on the part of the agency. Budgets available for O&M of the schemes are inadequate and the handling of the budgets by the agency is not proper. Timely assessment of maintenance needs and preparation of O&M estimates is always lacking. There is hardly any involvement of WUA farmers in the preparation of O&M cost and maintenance needs assessment in most of the existing AMIS. The agency allocates O&M budget and at the end of the fiscal year maintenance works are being carried out. The end result is the poor performance of the maintenance work.*[21]

The poor management of O&M on the part of the agency is aggravated by the fact that, for a proper operation and maintenance of an irrigation system in the Terai, at least NRs 500 to 1000 per hectare is required annually. However, the Government could generally allocate only about NRs 50 to 100 per hectare and sometimes the allocated budget was also curtailed.[22] In this context, the low performance of AMIS will remain low and will get even lower. This has remained as a continuing challenge, and if not vigorously responded to, and due to the accumulated deferred maintenance over time will, in turn, greatly reduce the capacity of the systems to deliver water.

[21] HMG/N, MOWR, DOI; Phase II, Main Report, Nepal Irrigation Sector Project, Irrigation Operation And Maintenance (O&M) Cost And Water Charge Recovery Study, Under The Main Component Implementation (IDA Credit – 3009-NEP), Royds Consulting in Association with ARD, Inc./CMS Nepal (P) Ltd/MULTI Disciplinary Consultants, February 2001

[22] Achyut Man Singh, Irrigation Development In Nepal It's Trend & Direction: A Review, http://www.doi.gov.np/doi/ID9/newletters/53/6.html

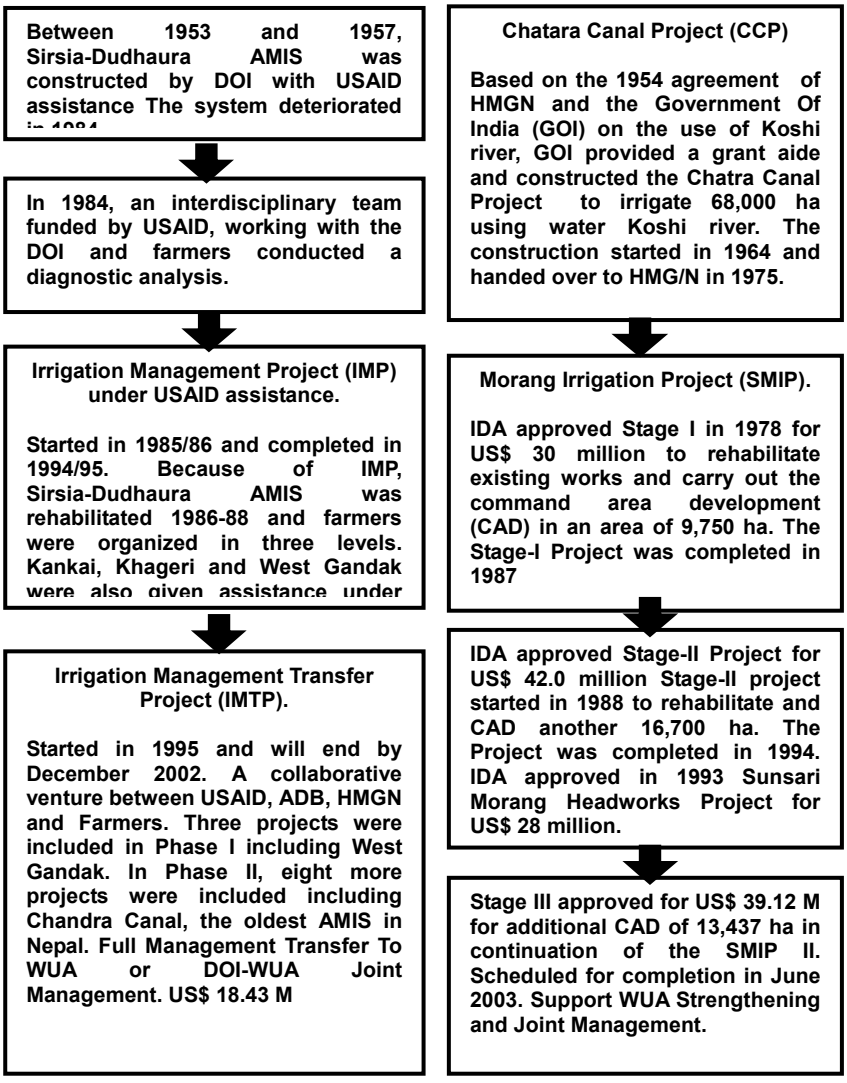
CHAPTER 2 DOI's INSTITUTIONAL DEVELOPMENT RESPONSE: A REVIEW

2.1 Authority, Laws, Regulations, and Policies

The authority over the AMIS lies within the DOI as it has been the principal government organization responsible for the planning, development and management of irrigation schemes in the country. For more than three decades up to the mid eighties since its establishment, DOI has focused on the planning and development of irrigation schemes as its Regional Directorates were established only during the Fourth National Development Plan period (1975-80) and its District Irrigation Offices (DIOs) in 1987 to 1988. Thus, before the Regional Directorates and the DIOs were in place, the DOI did not have institutional capability nor the manpower to cater to the management of the O&M routine of its constructed irrigation systems. These systems were left out for sometime to deteriorate due to its recurring lack of budget for O&M. Correspondingly, their performance to deliver water declined resulting to the complaints and dissatisfaction of the farmers.

The DOI started to shift its focus on O&M when an interdisciplinary team funded by USAID came in 1984 to work with the DOI and the farmers relative to a diagnostic analysis that was conducted for the Sirsia-Dudhaura irrigation system. Sirsia-Dudhaura is one of the older AMIS in Nepal constructed by DOI between 1953 and 1957 with USAID assistance. The system was designed to serve a command area of 1,400 hectares. The USAID Team found out that the system had already deteriorated and observed that it was a system designed to be constructed; it was not designed to be operated and maintained. The farmers had many problems on how to make use of the system and the DOI Engineer assigned in the area could not just do anything about the

Figure 2.1.1 Flow of Foreign-Assisted Projects Which Facilitated DOI's Shift in Focus For AMIS Management



problems.[23] The visit of the Team resulted in the formulation of the Irrigation Management Project (IMP).

The IMP was implemented in 1985/86 with the USAID grant of US$ 7.26 M. Its objectives include: 1) enhancing the project's capability for management and operation, 2) increasing DOI's accountability, 3) the improvement of the farmers' participation, 4) the strengthening of the WUA and eventually 5) turnover of the systems to the WUA. It is during the IMP that, including Hadetar irrigation system, the Sirsia-Dudhaura scheme was rehabilitated during 1986-88 where the physical works were improved and the farmers were organized at three levels: a) sub-block units (4-5 ha); b) block units (20-50 ha); and c) at the system level. Aside from Sirsia-Dudhaura, five Terai projects were included: Khageri, West Gandak, Kankai, Manushmara and Banganga for a pilot on joint management. The IMP was implemented up to 1994/95.[24]

As Figure 2.1.1 shows, the IMP was instrumental in the institutional development of DOI in adopting a management orientation for AMIS. Its 10-year implementation (1985 – 1995) had given DOI the opportunity to learn from the first hand experiences in the implementation of projects supported by IMP. Also, IMP not only provided some DOI staff study tours to learn from the experiences of other countries in irrigation management but also, it hired Consultants who reviewed the experiences in IMP and provided recommendations on policies relative to the strengthening of DOI and to the participatory procedures for the development of both the technical and social infrastructures in irrigation.

It was during the IMP implementation period that DOI formulated the Irrigation

Box No. 1 – Framework of DOI's Institutional Development

Irrigation Regulation (IR) in April 1989

Emphasized on the greater collaboration with water users in all phases of irrigation projects – planning construction, operation and maintenance. Given legal mandate to form WUA based on the 1976 Association Registration Act.

Irrigation Policy 2049

The 7th objective (out of nine objectives) states the future direction of government involvement in irrigation development as: to gradually decrease the government's responsibility in construction, repair and maintenance and operation by gradually increasing participation of organized users without diminishing the effectiveness in the implementation of irrigation development projects at different stages and to increase the role and responsibility of the organized users in different stages of program implementation.

Provision 2.2.3 states that the projects larger than 2000 hectares in Terai, which cannot be turned over to the Water Users Association for their operation, maintenance and management shall be jointly managed by the concerned Irrigation Office and the Water Users Association.

Water Resources Act

Persons willing to make use of water resources for collective benefits on an institutional basis may form a Water Users Association (WUA). This WUA shall be autonomous and a corporate body having perpetual succession; a separate seal of its own for the purpose of all its business; have the right to acquire, enjoy, sell, dispose or arrange by any means of movable and immovable property; and may sue as a person or be sued.

All concerned WUA shall have the ownership over the project turned-over to it and shall operate such project as if it has got license under this Act.

Irrigation Regulation 2056

Provides greater details of the Water Resources Act of 1992 and incorporates provisions of the previous Irrigation Rule and the Irrigation Policy of 1992 as amended in 1997. Specifies the functions of the WUA, farmers' contribution to project development, joint management, operations, maintenance, ISF and late payments. It also provides administrative mechanism relative to the irrigation sector.

[23] David M. Freeman, "Creating a Supportive Policy Environment For Irrigation System Turnover And Joint Management," His Majesty's Government Ministry of Water Resources, Department of Irrigation, Irrigation Management and Water Utilization Division, Research and Training Branch and System Management Branch, Irrigation Management Project HMG/USAID/Nepal (Contract No. 367-0153-C-00-1235-00), Technical Assistance Team Computer Assisted Development, Inc., USA And GEOCE, Nepal, Kathmandu, January 1992

[24] HMGN, Department of Irrigation, Irrigation Diary, 2002

Regulations in 1989 and the Irrigation Policy of 1992. Also, the Government has enacted the Water Resources Act in 1992. As shown in Box No. 1, the Irrigation Regulation of 1989 has given the farmers a mandate to form a WUA to collaborate with DOI in projects' planning, construction, operation and maintenance.

The Irrigation Policy (IP) of 1992 sets the orientation for the decreasing role of DOI and in the increasing role of the farmers/WUA in the construction, repair and maintenance and operation of irrigation projects. It also specifies joint management for projects in the Terai larger than 2,000 hectares.

The Water Resources Act of 1992 has a provison for the organization of WUA as the rural institution that can avail of water resources for the farmers' collective benefits. The most important provision of the Act is the immediate ownership of the project (facilities) that has been turned-over to the WUA.

The IP and the Water Resources Act both of 1992 serve as the basic framework for the institutional development of DOI and the WUA relative to the administration of irrigation systems through joint management. The details of both the IP and the Act are provided for in the Irrigation Rules of 2000 which also serve as a framework in reviewing projects of AMIS on the ground such as the IMP and its sequel, the Irrigation Management Transfer Project (IMTP) as well as Sunsari Morang Irrigation Project.

2.2 Institutions/Organizations: DOI and WUA

2.2.1 Department of Irrigation

As pointed out earlier, the DOI is the principal government organization responsible for the planning, development and management of irrigation schemes in the country. It has been implementing IMP and IMTP since 1985 up to 2002 and Sunsari Morang Irrigation Project from 1978 up to June 2003. For the last 17 years, the DOI had carried out irrigation development through the Division and Sub-division Offices located at key places in the country. Figure 2.2.1 shows the DOI's organizational structure as of February 2002. It has five Divisions, 5 Regional Directorates and 75 District Irrigation Offices aside from its project offices.

This organizational structure of DOI has about 2,400 sanctioned posts of which almost 85 percent are filled. Of the total sanctioned posts, about 9 percent have been approved for the central office, 13 percent for the pool, 8 percent for the five regional directorates, and the remaining 70 percent for the district offices as well as project offices. The DOI organizational structure has been reorganized where the shaded portion below appears to be strengthened. In the new organizational structure, the River Training and Machinery Management Division has been dismantled. The River Training function has been transferred to flood control and the machinery management section is moved down to the level of the Regional Directorates. The new organizational structure is shown in Figure 2.2.2 below.

Figure 2.2.1 Organizational Structure of DOI

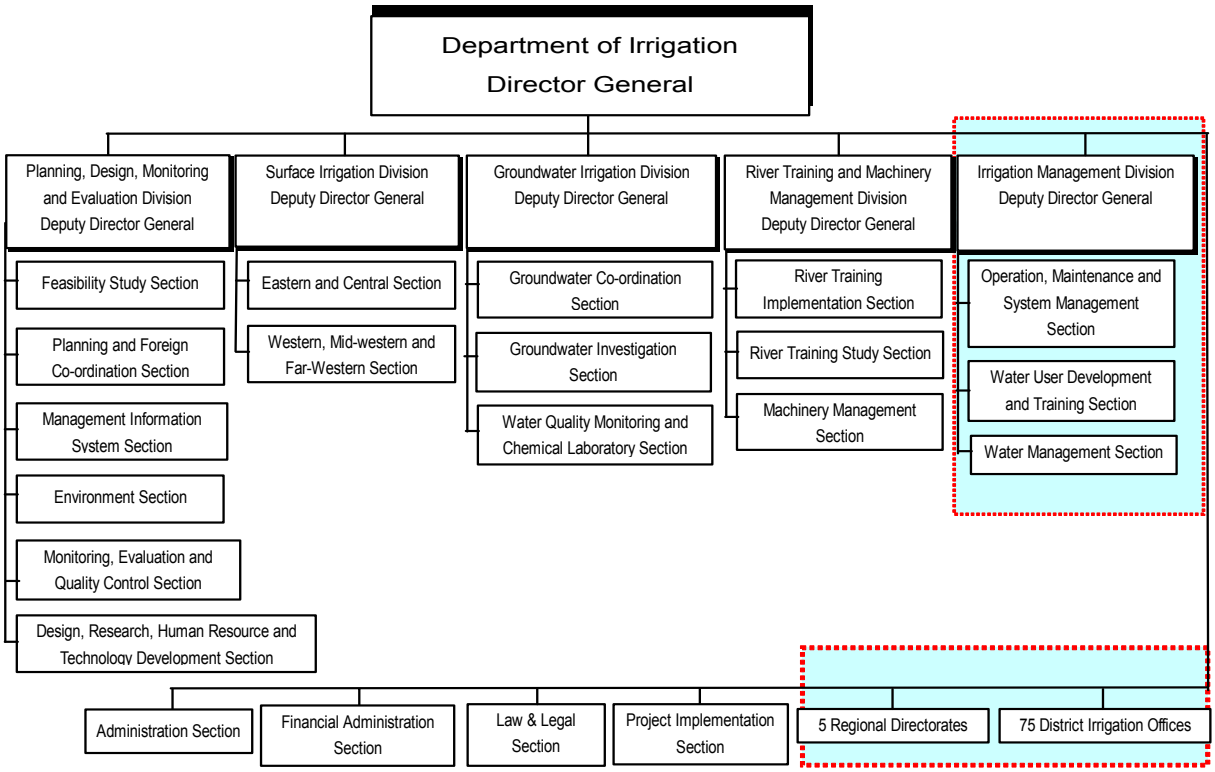
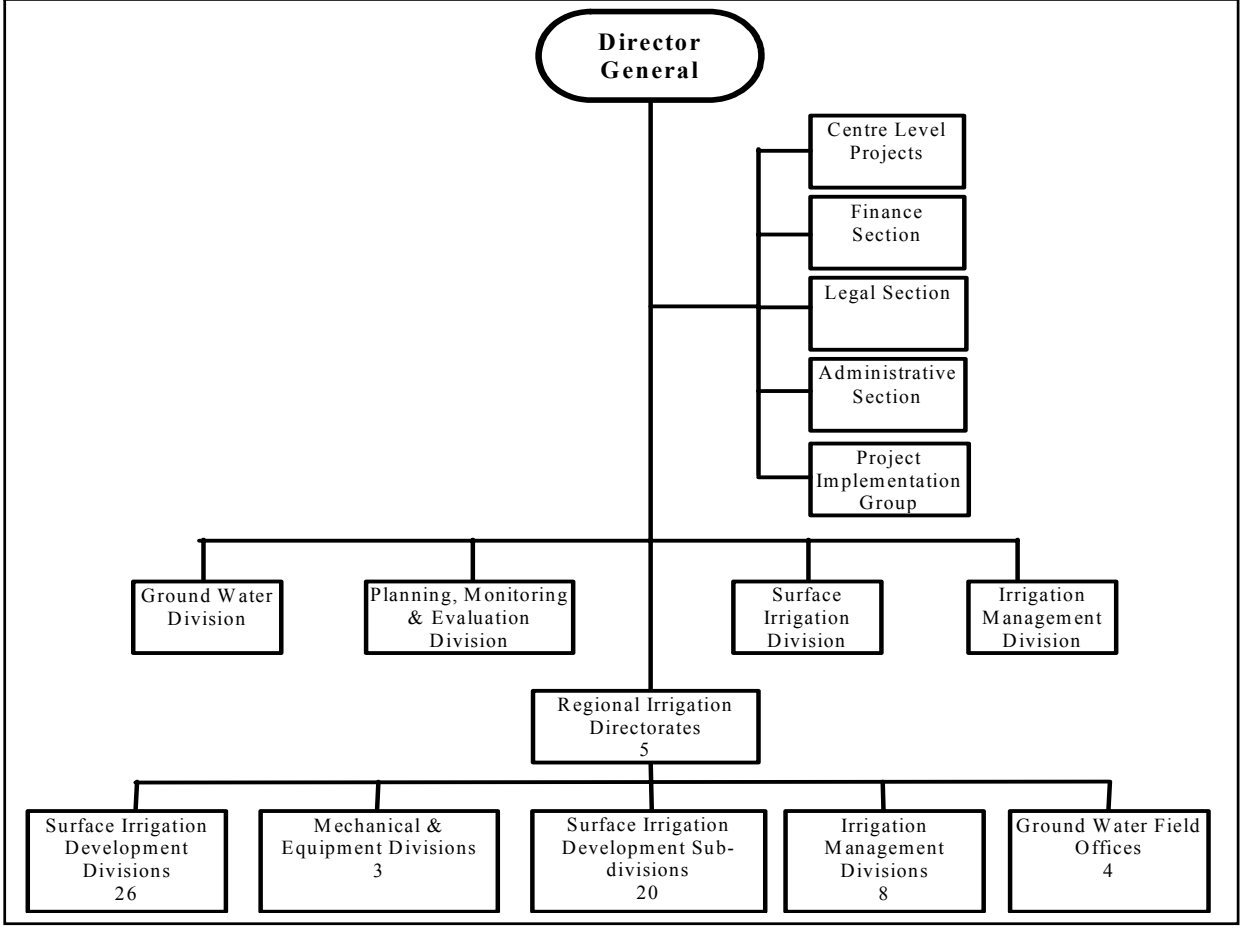


Figure 2.2.2 The New Organizational Structure of DOI



Its IMTP has been basically carried out through the Irrigation Management Division down to the concerned Regional Irrigation Development Directorates and District Irrigation Offices. While the DOI as an institution has to develop as a whole, it is through the shaded portions of the its organizational structure above that its institutional development relative to the joint management direction will have to depend on. Along with the WUA development as an institution that DOI will have to forged irrigation management partnership, the shaded portions have to play significant roles now and in the future. In the new structure, the Director General is assisted with four divisions: planning, groundwater, surface irrigation and irrigation management divisions and four sections: financial, administrative, laws and legal as well as project implementation sections. The sections of the remaining 4 Divisions as shown in Fig. 3 basically remain the same. At the zone or Regional Directorate levels, five clusters of divisions are established. The seventy five irrigation districts are clustered into 26 surface irrigation development divisions and 20 surface irrigation development sub-divisions. Throughout the Kingdom, the remaining clusters are established as follows: 3 clusters of machinery and equipment divisions, 4 cluster of groundwater field offices and eight clusters of irrigation management divisions to cater to the AMIS with the technical support of the Irrigation Management Division from the Central level.

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The surface irrigation division is given mandate to assist the planning division in various aspects of planning, design and implementation through the exploration of alternative technology. This division also monitors and supervises the performance of the projects being implemented in the field. The groundwater division works to develop the understanding of potential groundwater endowment of the Kingdom along with promoting groundwater uses for irrigation purposes. The planning division plays a key role to develop appropriate laws, policies, programs and strategies for the development of irrigation sector. Likewise, this division is assumed to develop periodic irrigation planning along with the various medium

and small-scale projects, coordinating with the planning commission and the financing institution of the country and donor agencies.

Among the main divisions of DOI, irrigation management division works as the coordinating unit to the field offices regarding irrigation management such as the operation and maintenance of the irrigation system under AMIS or Joint Management. Its primary responsibility is to work as a facilitator in the development of farmers' organizations, enhance their capabilities and facilitate better performance of irrigation systems.

2.2.2 Water User's Associations

The Water Users Association in Nepal abound in the 22,000 FMIS which account for more than 70% of the irrigated lands in the country. However, for the AMIS, the Water Users Associations emerged only during the implementation of the USAID-assisted IMP starting in 1985. As pointed out before, the organization of Water Users Associations was one of the components during the rehabilitation of Sirsia Dudhaura scheme during 1986 to 1988. The organization effort continued in the follow-up IMTP project financed jointly by USAID and ADB. Under the IMTP, 11 more AMIS are included where Water Users Association have been organized since the start of the project in 1996 up to its completion in December 2002.

As shown in Figure 2.1.1, the IDA/World Bank-supported Sunsari Morang Irrigation Project (SMIP), which commenced in 1978 during the Stage I project, started farmers' organization or Water Users Organization during the Stage II project. The organization of Water Users Groups (WUGs) in the SSJ pilot area commenced in 1991. Parallel to these activities, farmers training as well as JT/JTAs training were also conducted. In May 1994, organization of all 567 WUGs in Stage-II area have been accomplished. Some of the organized WUGs had been registered officially at the Sunsari CDO office starting in 1993 to 1994. The representatives of all the 567 WUGs (three farmers from each field outlet) had received two-day farmers training, which introduced the function and operation of the newly adopted rotation water supply system.[25]

The basic purpose of the organization of Water Users Associations in AMIS is in line with the intent of the Irrigation Policy and Water Resources Act of 1992 and Irrigation Regulations of 2000; that is, for DOI to turnover the O&M of small AMIS to organized water users association and to manage O&M of big AMIS jointly with the Water Users Associations. Because of the Government's policy on joint management, DOI has initiated a good deal of effort in organizing the users of the concerned large AMIS into WUA. Some small AMIS had already been fully transferred to the WUAs. Under the IMPT, some WUAs have already full joint management with DOI while, in other AMIS, the WUAs are only partially having joint management with DOI.

Based on the monitoring data of the System Management Branch (SMB)[26] under the

[25] His Majesty's Government of Nepal, Sunsari Morang Irrigation and Drainage Development Board, Project Completion Report, Sunsari Morang Irrigation Project Stage II (Credit No. 1814 – NEP), , NIPPON KOEI CO. LTD., Consulting Engineers, Tokyo, Japan, December 1994

[26] J.M. Shrestha and S.K. Shrestha, "Status of Irrigation Systems Under Operation and Maintenance", IRRIGATION NEWSLETTER: Quarterly Newsletter of Irrigation Development and Management in Nepal, No.

Irrigation Management Division of DOI, the following aspects on financial, operational, institutional and resource mobilization aspects of the AMIS have been reported:

- The trend of annual O&M budget allocated for most of the AMIS from 1992/1993 to 1999/2000 along with the O&M cost required had resulted to the accumulation of high deferred maintenance.
- The canal operation schedules are not available in most of the small irrigation systems and also in some large irrigation systems. The discharges and gauge reading at the source are taken only in few AMIS.
- The present status of training activities in the irrigation system has shown that there is lack of training needs assessment to identify which institution needs what type of training. Most of the irrigation offices do not give training to the WUAs. If given, trainings are only provided to the upper tiers of the WUAs and not to the lower tiers.
- Out of the 27 irrigation systems having registered WUAs, only four WUAs are institutionally capable of making decision on their various activities. Only 4 WUAs are fully established with their offices and their record-keeping units. The above performance shows that more emphasis is given only to WUA registration rather than important activities like enhancing decision making capability, record keeping, mobilizing local resources and creating a sense of accountability in most of the irrigation systems.
- Sustainability of the irrigation system depends upon resource generation and mobilization. Resource may be in cash, kind or labor. ISF is one of the main sources of resource generation. ISF collection not only represents the resources collection but also reflects the status of institutional development. The present status is such that ISF is collected only in few systems and the collected amount is very low.

The Irrigation Policy calls for greater farmer participation. However, the technical expertise within the DOI is often not adequate to do social mobilization work necessary to initiate effective water users associations or to convince farmers of the benefits of alternative irrigation schemes. Institutionalizing the social mobilization units within the department for promoting the formation and strengthening of the farmer organizations has been stressed. With reference to the ASPR report, it has been pointed out that, in large-scale surface irrigation projects, the management transfer and joint management programs introduced by the Government have not been successful in achieving the stipulated objectives. This implies that remedial measures should be taken to promote the approach further.[27]

2.2.3 Institutional Development Directions

For almost two decades, the DOI has been learning, promoting, and implementing institutional development in many of its AMIS. But still, the AMIS performance in terms of cropping intensity and ISF collection efficiency has been low. The chronic dependence of AMIS for O&M subsidy from the Government has remained a great problem. The WUAs

56, 16th Oct. 2001 – 15th March 2002

[27] Dr. Khem Raj Sharma, "The Agricultural Performance Review As Related To Irrigation", IRRIGATION NEWSLETTER: Quarterly Newsletter of Irrigation Development and Management in Nepal, No. 56, 16th Oct. 2001 – 15th March 2002

having been organized so far and managing some AMIS jointly with DOI, have not delivered the expected impact in terms of increasing cropping intensity and collection efficiency in most of the AMIS. The situation does not call for new institutional development directions. The directions are clearly stipulated in the Irrigation policy and Water Resource Act of 1992 and detailed in the Irrigation Rules of 2000. Simply put, the directions are for the DOI to help in the establishment of WUAs in small AMIS for O&M transfer purposes and in large AMIS for joint management purposes.

However, what remains to be an area of inquiry is how DOI is organized to move towards those directions and achieve the results in terms of AMIS sustainability. With reference to the suggested definition of institutional development, the directions will call for the review of the processes, strategies and methodologies which DOI is adopting in helping the WUAs get organized to acquire the abilities in developing formal and informal rules or norms and behaviours to collectively serve their valued goal in the equitable, efficient and sustainable management of the irrigation systems. Where to go is not the challenge but how to get there calls for definite institutional development directions.

CHAPTER 3 PERFORMANCE REVIEW OF INSTITUTIONAL DEVELOPMENT

3.1 SMIP Performance in Institutional Development

The Chatra Canal Project (CCP) in the eastern region of Nepal was constructed by the Government of India in 1964 to divert water from the country's biggest river, the Koshi, for the irrigation of 68,000 ha in Sunsari and Morang districts. After trial operations, it was handed over to HMG/N in 1975. With the assistance of IDA/World Bank to rehabilitate existing works and carry out the command area development (CAD), CCP was renamed as Sunsari Morang Irrigation Project (SMIP).

SMIP has a big command area and has required high investment. Thus, HMG/N and IDA decided to proceed with stage-wise implementation of the project. Since April 1978 and up to June 2003, the stage-wise implementation has passed through Stages I, II and III (phase I). Stage I was implemented between 1978 and 1986 for 9,750 ha; Stage II in 1988 to 1994 for 16,700 ha and Stage III for 13,437 ha due for completion in June 2003. To date after more than two decades, the stage-wise implementation is still at 59 percent of the total command area of SMIP. The institutional development work has also been undertaken here in 1991 since the middle of Stage II implementation.

3.1.1 Institutional Development: WUG Organization

The development of farmers into Water Users Groups in SMIP did not start during the Stage I implementation nor at the commencement of the Stage II implementation in 1988. The WUG organization began in mid Stage II project implementation in 1991 as a pilot area in SSJ minor. This effort was in line with the issuance of the Irrigation Policy in that same year. Parallel to the WUGs' organizing activities, farmers training as well as JT/JTAs training were also conducted. The pilot effort was expanded to all Stage II areas (S8, S9, S10 and S12). Thus, in May 1994, the organization of all 567 WUGs in Stage-II areas had been accomplished.

The Water Users Groups (WUGs) were all officially registered at the Sunsari CDO Office; SSJ on 15 April 1993, S12 on 20 March 1994, S9 on 10 April 1994, S8 on 5 July 1994, and S10 on 7 July 1994. Upon completion of the official registration, the respective systems were turned over to the Water Users Groups in SSJ, S8 and S12 areas as of November 1994. The representatives of all the 567 WUGs (three farmers from each field outlet) had received two-day farmers training, which introduced function and operation of the newly adopted rotation water supply system.[28]

The WUGs were formed in every developed watercourse units, mostly about 28-50 ha each in size. They were expected to maintain the watercourses and the tertiary canal systems, distribute water by rotation and collect water charges. It was also during the Stage II project implementation that the Water Users Committees (WUCs) were formed at tertiary levels. The WUCs also collected water charges and remitted the government share to the national treasury.

[28] His Majesty's Government of Nepal, Sunsari Morang Irrigation and Drainage Development Board, Project Completion Report, Sunsari Morang Irrigation Project Stage II (Credit No. 1814 – NEP), NIPPON KOEI CO. LTD., Consulting Engineers, Tokyo, Japan, December 1994.

Also established were the Water User Coordination Committees (WUCCs) at the secondary canal level and the Water User Central Coordination Committee (WUCCC) to represent the beneficiary farmers at the project management level.[29]

From the interviews with NEDECO and SMIP staff, the present information on the status of WUA organization in SMIP as of August 2002 are as follows:

WUO or WUA	No.	Description
• WUGs	1307	the organization of executive body and members at watercourse level selected or elected by the Water Users of each watercourse command area.
• WUSCs	45	the organization formed by all chairperson of WUGs under the tertiary channel originated from each Sub-secondary channel.
• WUCs	72	the organization formed at tertiary level by all chairperson of WUGs of tertiary canal originated directly from CMC or Secondary or Sub-secondary Canal.
• WUCCs	22	the organization formed at secondary canal or sub-secondary canal level by all chairperson of WUCs of SC or SSC originated directly from CMC.
• WUCCC	1	the organization formed by including all WUCC chairpersons of all SMIP command area, Project Manager and concerning HMG official representatives.

Although information as to the status was difficult to obtain and varied from one source to another, the details of said status of WUA organization in all stages of SMIP are shown in Table3.1.1. [30] The institutional development work in SMIP has already reached 63 percent of the currently declared command area of 63,875

Table 3.1.1 Status of WUA Organization in SMIP as of August 2002

SMIP Stages	Area (Ha)	No. of WUGs	No. of WUCs	No. of WUCCs*	Single WUCCC
Stage-I	9,750	217	7	4	
Stage II	16,700				
- SSJ	(946)	34	-	1	
- S8 & S9	(8,293)	283	15	2	1
- S10 & S12	(7,271)	250	12	2	
Stage III	14,069				
- S13	(2,670)	58	6	1	
- S14	(11,399)	388	30	1	
Total	40,519	1,230	70	11 (22?)	1

*The No. of WUCCs in each stage does not equal with the number, 22 WUCCs, which was gathered during interviews with SMIP staff and NEDECO.

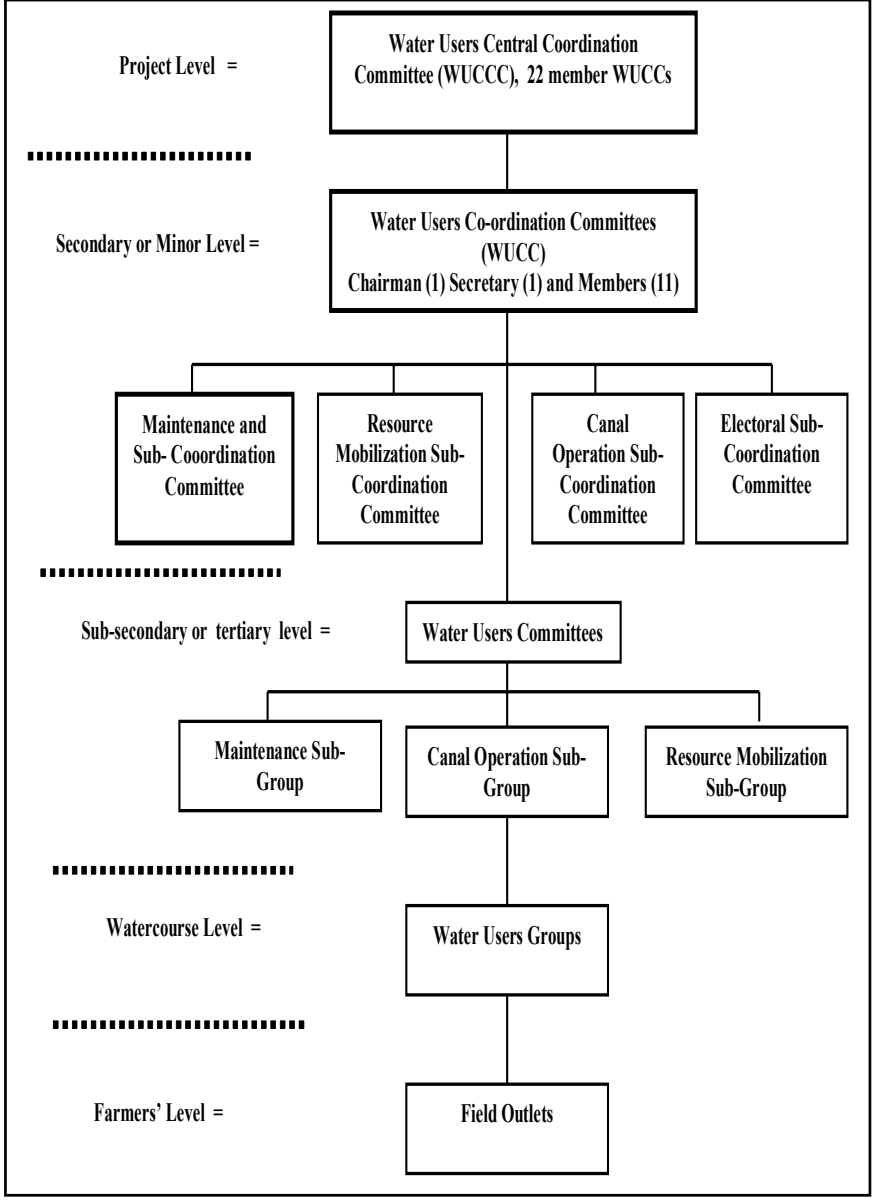
[29] World Bank, Implementation Completion Report (Report No. 15336), Nepal Sunsari Morang Irrigation II Project (Credit 1814-NEP), February 7, 1996

[30] The data from this Table had been sourced from interviews and review of reports together with the reports as follows: His Majesty's Government of Nepal, Sunsari Morang Irrigation and Drainage Development Board, Project Completion Report, Sunsari Morang Irrigation Project Stage II (Credit No. 1814 – NEP), NIPPON KOEI CO. LTD., Consulting Engineers, Tokyo, Japan, December 1994; World Bank, Implementation Completion Report (Report No. 15336), Nepal Sunsari Morang Irrigation II Project (Credit 1814-NEP), February 7, 1996 and NEPAL IRRIGATION SECTOR PROJECT, Irrigation Operation and Maintenance (O&M) Cost and Water Charge Recovery Study, Phase II. Lloyds Consulting Ltd. In association with Associates in Rural Development, Inc., Consolidated Management Services Nepal (P) Ltd.and Multi Disciplinary Consultants (P) Ltd., February 2001.

hectares. It can be inferred from the table that the average area of a WUG is about 33 hectares. The Stage I WUGs are bigger in areas of coverage with an average size of 45 ha. Stage II has an average of 29 ha and Stage III, 31 ha.

Generally, the WUCs are organized as WUSCs in direct tertiary canals and as WUCs in the minor or sub-secondary canal levels. Every WUC or WUSC is composed of about 11 WUGs (1,230 WUGs divided by 70 WUCs + 45 WUSCs). The WUCs are set up as WUCCs to coordinate water distribution on rotational basis along said secondary canal during periods of scarce water supply. The WUCC can be established in a minor canal like SSJ since the groups of WUCs here are taking water directly from the main canal. Only one WUCCC is established for the 22 WUCCs to coordinate with the Project in matters of water scheduling and distribution along the main canal. As mentioned earlier, the Stage II WUGs were registered with the Cief District Officer (CDO). Also, the WUCCs and a single WUCCC are registered with the District Water Resources Development Committee and have legal validity. These WUOs reportedly hold regular meetings every month. Water charge collection is the responsibility of the WUCC. The WUCC generates resources also through executing maintenance contracts awarded by the project.

Figure 3.1.2 Organizational Structure of Stitagunj (CMC5/S9) Water Users Organization



3.1.2 Organizational Structure and Organizing Process

The organizational structure of the Sitagunj Secondary Canal Water Users Organization as shown in Figure 3.1.2 is derived from its constitution of 1994 (2050). Similarly, the constitution of Water Users Association of Ranjani minor of 1998 (2054) was also reviewed and its organizational structure is basically similar to that of the former.

The objectives of the WUO or WUA, as indicated in the structure, deal with canal

operation, maintenance and resource mobilization. In all levels, the provision of timely and equitable water is required by all water users at different levels in order to enhance farmers well being and overall development of the Kingdom by ensuring production and productivity. Also, it is the objective of the WUO or WUA to be involved in the operation of canals, maintenance, repair and protection of different canal structure (branch, sub-secondary, tertiary, watercourse & field channel) and to coordinate with concerned project office in order to ensure optimum utilization of available water.

The process of organization of the WUA or WUO in SMIP is made possible with the help of the project-paid Association Organizers (AOs) who were recruited to be involved in the formation of WUGs and to provide various types of training to motivate and guide the WUOs. The WUG organization starts with the election/selection of a representative by the water users within the command area of each outlet of the watercourse. A general assembly of all the farmers within the watercourse elects or selects a Chairman and a Secretary. The elected Chairman and Secretary plus the outlet representatives form the Executive Committee of the WUG. The WUG is responsible for the water distribution, maintenance and water charge collection within the WUG command area and may form sub-groups (one convenor and two members) for said responsibility. The representative of irrigation office will be an ex-officio member of WUG. The term of office of all elected executives is 3 years.

The second tier of the organization is the WUSC or the WUC. This level is automatically composed of all WUG Chairmen as ex-officio members. The WUG Chairmen will elect from among themselves a chairperson and a secretary to form the WUC as the Executive Committee of the watercourses along the sub-secondary or tertiary canals. The representative of related irrigation office will also be the member of the WUC. The functional procedure of WUC will be decided by WUC itself. The term of office of the WUC is 3 years as well.

At the WUC level, the constitution stipulates for the organization of three sub-coordination committees which comprise: (I) canal operation sub-coordination committee; (ii) repair and maintenance sub-coordination committee, and (iii) resource mobilization sub-coordination committee. The canal operation sub-committee keeps record of the operation schedule of the canal and furnishes it to the WUG levels, provides necessary advice and direction to the WUGs regarding the utilization and distribution of the water and rotational irrigation, resolves conflicts between and among farmer irrigators through mediation/arbitration, supervises the functions of the canal operation sub-committee of WUG and provides advice and cooperation, maintains contacts with irrigation office for technical and other cooperation and makes arrangements for users participation. The repair and maintenance sub-coordination committee prepares programmes and budget by taking necessary technical help, makes arrangement for the repair of canals and desilting, removes unauthorized water blockades and closes illegal outlets and protects the whole structure of the canal. Resource mobilization sub-coordination committee makes arrangement for the collection of water charges, donations and fines and reviews the income and expenditure of WUGs.

The third tier of the organization is the WUCC. All the chairpersons of subordinate WUC shall be the ex-officio members of the WUCC. The members shall elect a chairperson and a secretary from among themselves and the rest will remain as executive members of WUCC. The tenure of the functionaries and members is 3 years. The main functions, duties and rights

of WUCC are the following: (i) preparing the plans and programmes by convening the general assembly and executing these programmes; (ii) maintaining coordination between and among the WUGs; (iii) framing and managing the necessary policy for water charge recovery; (iv) helping solve the water distribution problems of the farmers by maintaining necessary contacts with the irrigation office; (v) encouraging farmers to manage farming systems by adopting appropriate cropping pattern on the basis of water availability; and (vi) managing repair and maintenance activities in sub-secondary and tertiary canals.

The fourth tier is the WUCCC of which the 22 WUCC Chairmen are the ex-officio members and comprise the Executive Committee. The WUCC Chairmen will select/elect a Chairman and a Secretary of the WUCCC. The WUCCC coordinates the activities of the entire system in consultation with the SMIP Project Office. The WUCCC makes certain management decisions and regulations for the system as a whole, such as policy to prevent cattle damage, illegal pipes or whether to allow pumping from the system and, if allowed, how much to charge for it.

3.1.3 Joint System Management or Hand Over Agreement

The Irrigation policy of the Government to share the O&M responsibilities of large-scale irrigation systems between the water users and the irrigation agency has led to the implementation of joint management programs. This has resulted to Jointly Managed Irrigation System (JMIS), a development away from the current conditions of the AMIS. Of the irrigation schemes that would be brought under joint management, the WUA could retain from the irrigation service fee, the share (portion of the fee) in proportion to its managerial responsibilities. Furthermore, the Irrigation Rule of 2000 (2056) stipulated that big Projects, like SMIP, may be operated jointly by concluding an agreement between His Majesty's Government and the Users' Association. This agreement shall specify the obligation and responsibility of the activities to be carried out in accordance with the Water Resources Act and this Regulation including collection of Service Charge, share percentage of Users' Association and arrangement for maintenance.

Some reports mentioned that SMIP is one of the projects in Nepal jointly managed by the government and the WUOs. However, instead of Jointly Managed Irrigation System (JMIS), SMIP has entered into an "Agreement between SMIP and the WUCC on the Operational Handing Over of the ..... (Secondary or Minor) Canal." Such agreement stipulates that "… the WUCC, authorized by its by-laws, agrees to accept all rights of and fulfill all responsibilities associated with operating and maintaining the irrigation and drainage system within the .....(name) canal command area" and "… SMIP agrees to handover the full responsibility of maintenance and operation of the irrigation and drainage system with effect from the date of both parties signing this operational handing over agreement." While the intent of joint management is evident in the Agreement, the operational handing over is concretized in Table 3.1.3 below.

As Table 3.1.3 shows[31], the responsibility for maintenance from the system's head reach, the

[31] WUO and SMIP – Joint Management Workshop, RAD, Biratnagar, Consultancy Services For Sunsari Morang Irrigation Project, Stage III (Phase I), NEDECO Netherlands Engineering Consultants, DHV Consultants BV, SILT Consultants (P) Ltd., Consolidated Managemnt Services Nepal (P) Ltd., Masina Consulting Services (P)

CMC, the secondary, sub-secondary and tertiary canals belongs to SMIP. Although joint decision for irrigation scheduling and maintenance is provided, the WUO's responsibility is generally limited to the maintenance of the watercourses only. SMIP consults the WUCCC on canal operation and regulation of control of structures. The WUCC is responsible for the regulation and distribution of water along secondary canals as well as water management along sub-secondary and tertiary canals. The WUO is also given the responsibility to collect water charges as provided for in the Irrigation Policy. In practice, however, what is written in the agreement and what is provided in Table 3.1.3 seem to be wanting relative to what is called for under joint management.

Table 3.1.3 Matrix of Present Exercises on Joint Management in SMIP

Project Office	WUO or WUA
• Take care completely of Head Reach Portion (Including Intake) • CMC maintenance and supervision by Project Office • Canal operation and control structure regulation by SMIP • Maintenance of secondary canals by SMIP • Maintenance of sub-secondary and tertiary canals by SMIP • Technical help to WUO by SMIP	• WUCCC to be consulted • Regulation and distribution by WUCC with the help of SMIP • Water Management by WUCC • To maintain Watercourses • Feedback by WUO to SMIP • Collect water charges
▪ Joint decision for irrigation scheduling and maintenance	

For instance, in the review of the operations of the Inaruwa sub-division, it was found out that the farmer had to ask from the office the key to a gate in the tertiary because he needed water. This shows that the WUCC do not or can not regulate, distribute or manage water along the sub-secondary and tertiary canals because the keys of the gates are not within their control. Also, the WUO, particularly the WUCC, is expected to collect water charges but the actual collection is undertaken by the Association Organizers (AOs) who are assigned to the WUO but are actually paid by the project. It is difficult to let the WUO collect water charges if somebody else is doing what the WUCC is expected to do. Furthermore, in this given arrangement, the responsibility of the WUC is not clear and its role, if this is done, could only be inferred as the management of the O&M of the watercourses through the WUGs.

3.1.4 Institutional Development Performance

The performance of SMIP as an irrigation institution can be seen as whole or relative to its phase-wise stages, generally categorized as SMIP areas with command area development (CAD) and areas without CAD such as phases II and III of Stage III. Its total culturable command area (CCA) is 63,875 hectares, down by about 6 percent of its original area of 68,000 hectares. Relative to its current CCA, SMIP is now irrigating about half of its irrigable area during the winter season (only wheat is provided with water) and about 97 percent during the monsoon season as shown in Table 3.1.4 given specific sources.[32] Comparing the areas with and without CAD, the areas with CAD irrigate 13 percent more than the areas without CAD during the winter season. Among the areas with CAD, it is the Stage I areas that have

Ltd., HMG/N, MOWR, DOI, Sunsari Morang Irrigation Development Board (IDA Credit No. 3009-NEP), March 2002.

[32] January 2002, Progress Report No. 16 and Operation of CMC during monsoon 2001 (May 16 – October 25, 2001 as well as Operation of CMC during Winter 2001 (Dec. 4, 2001 – March 4, 2002-07-09. The figures presented here are way up higher than the monitoring figures used by the Irrigation Management Division of DOI as discussed earlier.

the higher areas under irrigation during the winter season because these are the upstream areas. Furthermore, these areas, particularly in Stages I and II, the rotation method of water distribution is being practiced.

Table 3.1.4. SMIP Monsoon & Winter Irrigated Areas, 2001/02

SMIP Stages	Irrigable Area or CCA (net) ha	Irrigated Area Monsoon (ha)	Irrigated Area Winter (ha)	Cropping Intensity (%)
Stage I	9,093	9,028	5,960	165
Stage II	16,585	16,015	8,285	146
Stage III (Phase I)	17,678	17,325	8,430	146
Stage III (Phases II	20,499	19,681	9,405	142

The cropping intensity of SMIP is 147 percent. The cropping intensity of the areas with CAD and WUO organization with an aggregate area of 43,356 ha is 150 percent. This is 6 percent higher that the areas without CAD where cropping intensity is 142 percent. However, within the CAD areas, the areas in Stages I and II have a cropping intensity of 153 percent, which is 5 percent higher than that of Stage III (Phase I) areas and 8 percent higher than that of the areas without CAD (Stage III, Phases II and III). In Jhamanpur – S19 (2,075 ha) and Bariyati – S16 (3,679 ha), in two of the branch canals without CAD in the downstream portion of CMC, the cropping intensity for the same period is 161 percent and 159 percent respectively. This goes to show that the CAD, the WUO or the upstream locations of areas with CAD do not have a big impact relative to the availability of water along CMC even during the winter season vis-à-vis areas without CAD.

The second institutional development performance area of SMIP is on the area of Water Users organization. As mentioned earlier, SMIP started organizing farmers into Water Users Groups (WUGs) during the middle of the Stage II implementation. This was obviously SMIP's response to the call of DOI for farmers' organization because of the Irrigation Policy of 1991 and the Water Resources Act of 1992. As the implementation of SMIP is stage-wise due to its big command area, the orientation and approach relative to Water Users' Organization varied from stage II to Stage III. In Stage II and partly in Stage I, the farmers' were organized into WUGs for O&M at the watercourse levels in line with simple structured irrigation design. Consultants were utilized together with the project AOs in the formation, registration and training of the WUGS for O&M turnover. This effort escalated into the formation of WUCs and higher level coordination Committees. Obviously, there was minimal, if any at all, participation of the farmers in the development of the sub-secondary or tertiary physical infrastructures. To date, however, 9 WUCCs have "handing over agreements" with SMIP: 5 in Stage I and 4 in Stage II.

On the other hand, the Stage III (Phase I) implementation has put heavy emphasis on farmers' participation in the development of the watercourses. Also, the AOs have been recruited and oriented, together with the assistance of consultants, in the participatory organization of water users for WC design, alignment and cost contribution as well as construction of the watercourse, field outlets and collector drains. Meetings were conducted and agreements were reached. Initially, the approach was favored by the farmers but this was not sustained due to a lot of problems during the implementation process.[33] Some of these problems are as follows:

[33] HMG/N, MOWR, DOI; Sunsari Morang Irrigation Development Board; IDA Credit No. 3009-NEP, Project

- attendance of farmers during walk-through was quiet low
- performance of the AOs to motivate the farmers in their respective duties was found far from satisfactory
- huge amount of construction works ahead put extra pressure to complete the survey work prior to the start of construction
- implementation was driven toward "target oriented" rather than "farmer friendly" and "process based" work
- only few farmers are affected by the policy of voluntary contributions while those who did not contribute land also enjoyed the irrigation facility equally.
- the WUO-contracted box cutting work resulted into the poor construction of the watercourses as the WUO has no technical manpower to supervise the work spreading over the large area, and
- no clear agreement between the WUG and the WUCC for the construction (box cutting) of the watercourse.

The Stage III (Phase I) project is expected to be completed in June 2003 but no WUO has a "handing over agreement" with SMIP yet. As the project's participatory approach has been concentrated in watercourse development and without farmers' participation in the development of sub-secondary and the tertiary canals, the "handing over agreement" to cover the concerned WUCC command area will face difficulties not only because of the problems in watercourse development but also, most importantly, because of the non participation of farmers in higher level canals of a given secondary or branch canals. A demand-driven situation may arise, which will make the project unable to respond resulting in farmers' dissatisfaction and eventual non-acceptance of the "handing over agreement."

The third institutional development performance of SMIP implementation concerns the collection of water charges. In Stage III (Phase I), the ISF collection during the last season [Winter - Dec. 4, 2001 - March 4, 2002] was only 3 percent of the assessed collectibles. According to what the Project Benefit Monitoring and Evaluation Study noted earlier, the reasons behind the low recovery include the following: systems are not fully operational, similar behaviour of the WUO to fee payers and non payer farmers, systems which are just recently completed are yet to be handed over to concerned WUO and practices of ISF is not yet fully established as the contractors have not yet handed over the systems to SMIP.

Benefit Monitoring and Evaluation Study (Final Draft), Consultancy Services For Sunsari Morang Irrigation Project, Stage III (Phase I), NEDECO Netherlands Engineering Consultants, DHV Consultants BV, SILT Consultants (P) Ltd., Consolidated Management Services Nepal (P) Ltd., and Masina Consulting Engineers (P)

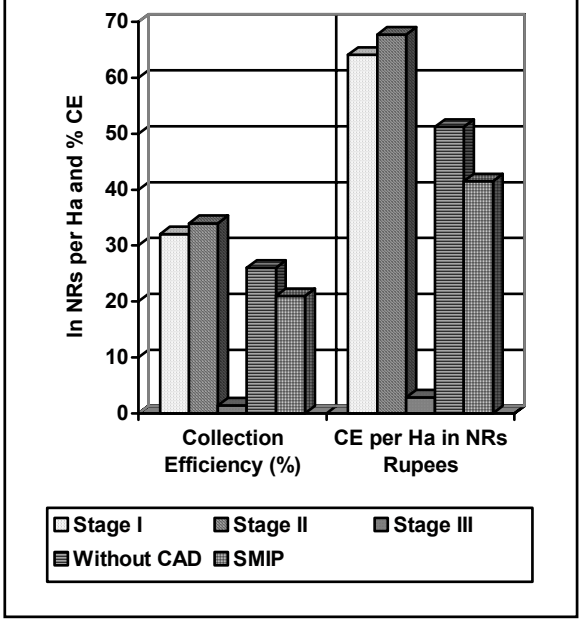
On the whole, SMIP has a current command area of 63,875 hectares. Its actual collection is only in 42,815 or 67 percent of the command area as shown in Table 3.1.5. At NRs 200 per ha, the ISF collection in 2000/01 was NRs 1,775,068 or only 14 percent of what is to be collected at 100 percent in the command area but 21 percent in the area where ISF collection has been made. Thus, the ISF collection of SMIP in 2000/01 was only in 11 secondary and minor canals along CMC. This can be presented in terms of the SMIP stages such as Stages I, II and III as well as the areas without CAD as shown in Figure 3.1.3. These 11 secondary or minor canals comprise an aggregate area of 42,815 hectares of which there has been no collection in 33% of SMIP's command area. The actual ISF collection in the other 67 percent of the commanded areas is NRs 1,775,068.

Table 3.1.5 Actual ISF Collection and Efficiency in SMIP Command Area With ISF Collection as of 2000/01

SMIP Stages	No. of Branches	Command Area (Ha)	Total Collectibles (NRs)	Actual ISF Collection (NRs)	Collection Efficiency (%)
Stage I	4	9,093	1,818,600	582,917	32
Stage II	4	16,179	3,235,800	1,095,892	34
Stage III	2	16,583	3,316,600	47,080	1.4
Without CAD	1	960	192,000	49,179	26
SMIP	11	42,815	8,563,000	1,775,068	21

Figure 3.1.3 shows the collection efficiency and the ISF collection per ha of the SMIP stages. SMIP Stages I and II registered the highest collection efficiency and the highest collection per ha of NRs 64.11 and 67.74 respectively of the commanded area. In the area without CAD and presumably without WUO, ISF was collected. The collection efficiency is 26 percent and the collection efficiency (CE) of per-hectare is NRs 51.23 per ha of the command area. In the Stage III (Phase I) area, the collection efficiency is the lowest and the CE per ha of the command area is NRs 2.84 only. However, as earlier stated, the collection efficiency of SMIP viewed against the total current commanded area (63,875 ha) is only 14 percent in the year 2000/01.

Fig. 3.1.3 Collection Efficiency and NRs Per Ha of SMIP Stages

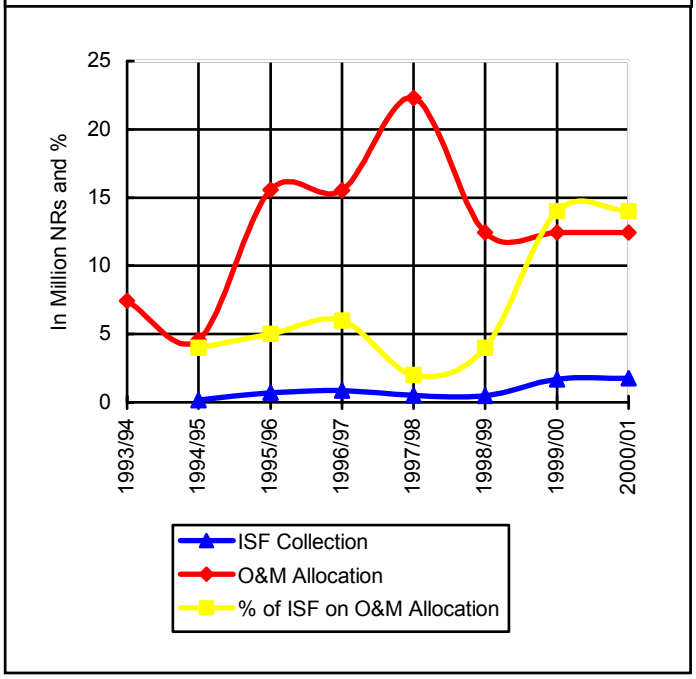


The record of ISF collection and O&M allocation in Million NRs as well as the percent of ISF on O&M allocation in SMIP for the period of 7 years, from 1994/1995 to 2000/01, is shown in Figure 3.1.4. The ISF collection in SMIP started in 1994 in Jhumka (SSJ), the pilot area of Stage II implementation.[34] In 1994/95, the ISF collection was NRs .173 million and went down in 1997 to 1999 but moved up to NRs

[34] Ibid, Project Completion Report, Sunsari Morang Irrigation Project Stage II (Credit No. 1814 – NEP), December 1994.

1.775 million in 2000/01. The increase of ISF between 1994/95 and 2000/01 can be attributed to the fact that ISF was sourced from only three branch canals or WUCCs in 1994/95 and this source increased to 11 secondary/minor canals in 2000/01.

Fig. 3.1.4 SMIP's Records of ISF Collection, O&M Allocation in Million NRs and % of ISF on O&M Allocation from 1994/95 to 2000/01



Thus, over the sever-year period there has been a tremendous increase in ISF and even the non-CAD areas were also contributing to ISF. However, the annual O&M cost was very high in comparison to the ISF collected. The ratio of ISF collected to the annual O&M costs was tremendously low. The annual O&M cost in 1994/95 was NRs 4.565 million, moved up to its highest of NRs 22.305 million in 1997/98 and recorded at NRs 12.455 million in 2000/01. The data on annual O&M cost is difficult to obtain but a report has been made that the annual O&M cost averages at NRs 12.980 million.[35] The ratio of actual ISF collected (ISF cost recovery) to the annual O&M cost in 2000/01 is only 14 percent. Thus, the subsidy of the Government to the O&M costs of SMIP for the same period is 86 percent. The low ISF collection and the low cost recovery has long been an issue that has continually threatened the O&M sustainability of SMIP.

Several studies and reports have been made and cited the reasons for the low ISF collection and the low cost recovery in SMIP.[36] Some of the reasons given in Table 3.1.7 are so numerous that it is difficult to really pinpoint the key reasons or problems.

[35] Ministry of Agriculture and Cooperatives, Nepal and Asian Development Bank, Final Report: NEPAL AGRICULTURE SECTOR PERFORMANCE REVIEW (ADB TA No. 3536-NEP) Volume 1: Main Report, ANZDEC Limited, New Zealand in association with Consolidated Management Services Nepal (P) Limited, March 2002

[36] Aide-Memoire (Draft), IDA Review Mission, Nepal Irrigation Sector Project (CR. 3009-NEP), March 04 – March 20, 2002; Ministry of Agriculture and Cooperatives, Nepal and Asian Development Bank, Final Report: Nepal Agriculture Sector Performance Review (ADB TA No. 3536-NEP) Volume 1: Main Report, ANZDEC Limited, New Zealand in association with Consolidated Management Services Nepal (P) Limited, March 2002; HMG/N, MOWR, DOI; Phase II, Main Report, Nepal Irrigation Sector Project, Irrigation Operation And Maintenance (O&M) Cost And Water Charge Recovery, Under THE Main Component Implementation (IDA Credit – 3009-NEP), Royds Consulting in Association with ARD, Inc./CMS Nepal (P) Ltd/MULTI Disciplinary Consultants, February 2001; HMG/N, MOWR, DOI; End of Phase III, Volume I, Subsidy Action Plan: Main Report, Nepal Irrigation Sector Project, Irrigation Subsidy Study, Under The Main Component Implementation (IDA Credit – 3009-NEP), Royds Consulting in Association with ARD, Inc./CMS Nepal (P) Ltd/MULTI Disciplinary Consultants, September 2001; and HMG/N, MOWR, DOI; End of Phase II, Volume III, Case Study Details: Sunsari- Morang Surface Irrigation, Nepal Irrigation Sector Project, Irrigation Subsidy Study, Under THE Main Component Implementation (IDA Credit – 3009-NEP), Royds Consulting in Association with ARD, Inc./CMS Nepal (P) Ltd/MULTI Disciplinary Consultants, December 2000

Table 3.1.7 Reasons For Low ISF Collection And Low Recovery in SMIP

Nepal Agriculture Sector Performance Review	Irrigation Operation And Maintenance (O&M) Cost And Water Charge Recovery Study
• There is excessive financial leakage from the system due to under-assessment or under-reporting of water charges • WUCs in many instances are inactive and they are not fully aware of their roles and responsibilities • WUCs are highly politicized with instances of the large farmers defaulting in the payment of the water fees • There is absentee landlordism in the Terai regions of Nepal • Fixing the rates of local contribution is unscientific in some cases where levies on ISF are imposed on technically unirrigable land just because it lies within the command area • Existing water distribution is poor	• Lack of sense of ownership • No willingness to pay ISF • WUA's capacity is less than required • Low level of irrigation impact • Water as a free good • Poor post-construction project management • Lack of reliable information on irrigated land • Inefficient legal regulatory measures • Shirking problems • Equity issues • Free riders • Land tenure system • Absentee landlords, and • Demonstration effects

These reasons most often cited for the low ISF collection and low cost recovery in SMIP generally point to the farmers, their behaviours and their WUCs or WUAs. Less is talked about the institutions promoting WUOs or WUAs, either from the side of the recipient institution or agency or from the consultants of the financing institutions. The WUOs or WUAs are always mentioned as being inactive or lacking in terms of the required capacities. But these crucial issues basically belong to the WUA-promoting institutions. If the WUOs are inactive, then the WUO-promoting institutions have not made them active. If the WUOs lack the required capacity, then the WUO-promoting institutions have not made them capable for what these WUOs are supposed to do or perform. This is just like the old saying that, if the students failed to learn, then the teachers have failed to teach or if the students do not know how to learn, then the teachers do not know how to teach.

Finally, the fourth institutional development performance of SMIP lies on the orientation of the project as whole vis-à-vis SMIP. The approach of the project is stage-wise. Such approach is only a matter of division of the whole SMIP of 63,875 ha (formerly 68,000 ha) into manageable stages. The division deals with Stages I, II and III (Phase I) covering the 42,815 ha as well as the Stage III (Phases II and III) being programmed for the remaining 21,060 hectares. Stage I was implemented without farmers' participation. Stage II was pursued with farmers' organization at the WUG levels and included Stage I. Stage III (Phase I) deals primarily with farmers' participation in the development of watercourses. The orientation of the first three stages has varied as the sets of projects' consultants and implementors differ from one to the other within the time span of 25 years. Stages III (phases I and II) are yet to be implemented. To date, the stage-wise approach has put the whole command area into two sets of scenarios: the ISF-paying areas with WUCCs and the free-from-ISF areas without WUCC of the envisioned Stage III (Phases I and II). Indeed, the stage-wise division of the whole area has truly divided the area.

Several reasons have been cited earlier why there is low ISF collection and poor cost recovery in SMIP. However, the various studies and reports have missed the points that this division and its effects have become the central cause and causes respectively of the problems of the WUOs. It is difficult for the WUOs to collect high ISF because many farmers see their neighbors are getting free water for which the WUOs are asking them to pay. The WUOs are not doing their job in maintenance, water distribution and ISF collection because the free-from-ISF farmers are getting the benefits of water without doing these jobs. Besides, they

see that these jobs, except of the watercourses' levels (if the jobs are done at all), are being done by SMIP's sub-divisional offices. The gatekeepers and the dalphas of the sub-division offices are doing the water distribution and maintenance for the WUCCs from the tertiary canals up to the secondary canals' headgates. Even if the project has made contracts with the WUCCs on ISF collection as provided in the Irrigation Policy and recent irrigation regulations, the project-paid AOs are doing the ISF collection for them. SMIP is doing these jobs because they are doing the same jobs in the free-from-ISF areas.

The division has made a contradiction in itself. The WUOs are reportedly inactive and are not able to deliver the required capacities for O&M because to make them active and become able for O&M after the appropriate exposure to training and direct experiences would make the jobs of people employed in SMIP, particularly in the sub-division offices, redundant. It is as if the situation is like the joke that, if I live, you should die and if you live I should die. The situation has to be transcended that, if the WUOs live, everybody will live. This contradiction is reinforced by the fact that SMIP through the WUOs has no real incentive to collect because its annual O&M cost is subsidized by the Government. The level of ISF collection does not really matter because, whatever the level is, the Government subsidy for O&M has been always there.

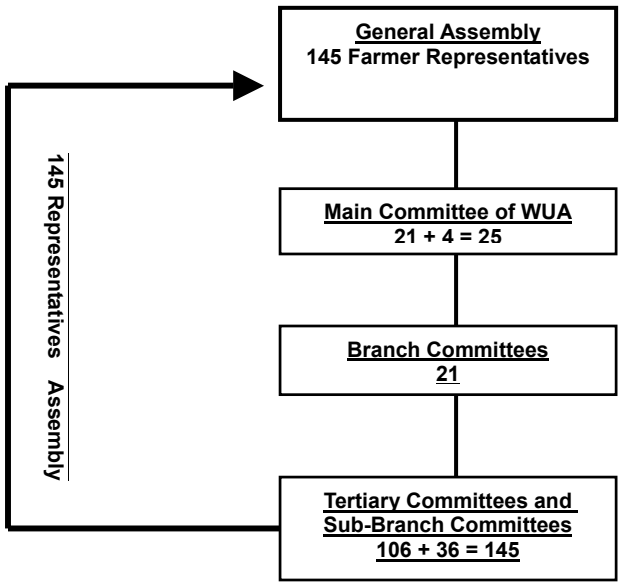
Thus, the institutional development area of SMIP is envisioned to emerge from the inherent contradictions within the stage-wise approach and orientation.

3.2 Institutional Development in Other Projects

3.2.1 Experiences of Kankai Irrigation System37

Kankai Irrigation System is located in Jhapa District of eastern Terai. It was constructed in two phases with financial assistance from the Asian Development Bank. The first phase was constructed between the period 1971 and 1981 for a command area of 5,000 hectares. The second phase was carried out from 1981 to 1991 to irrigate another 3,000 hectares. The source of the system is Kankai river which is fed by the Churia hills. Its main canal has a total length of 34 kilometers and the total length of the 21 branch canals is about 74 kilometers. These canals served a total of 36 direct sub-branch canals' areas and 106 tertiary areas. As of August 2002, the system has only 32 personnel

Figure 3.2.1 Organizational Structure of WUA Kankai Irrigation System



[37] The information in this section were gathered during group interviews of Kankai staff and some WUA officers conducted last August 16, 2002 in the DIO of Jhapa District. The key informants were the DIO Engineer Uttam krishna Raghubansi, Overseer Muneswar Yadav, AO Nar bdr. Marsang,i Acting WUA Chairman Trichandra Dulal and Main WUA Committee members Laxmi Dahal, Phanindra pd. Dhungel and Gopal Pokhrel.

composed of 1 Engineer (III class), 1 light vehicle driver, 1 Overseer, 2 Amins and 27 Chaukidars. These Chaukidars are responsible for operating the gates of the branch canals and taking care not only of the headworks but also the desilting basin in the head.

The system was included as a pilot area of the USAID-financed Irrigation Management Project (IMP) which was implemented from 1985 to 1994. In order to facilitate farmers' participation, the WUA organization in the system was undertaken by a DOI-based staff and started in 1993. In the same year, the WUA was formed. The result of this effort is reflected in the organizational structure of the WUA in the system as shown in Figure 3.2.1.

The lowest level of the WUA is the 109 Prasakha Samitis (tertiary committees) and 36 Upsakha Samitis (sub-secondary committees) or a total of 145 committees. All the farmer members who paid a membership fee of NRs 10 of a Prasakha Samitis and Upsakha Samitis elect three officials as chairman, vice chairman and secretary. In addition, two farmer representatives are elected: one to represent in system level general assembly (as indicated by the arrow) and the other member to represent in executive committee of upper level Sakha Samiti (branch committee).

The entire branch members representing the subordinate tertiary committees comprise the branch level executive committee. They elect three main officials and one member to represent in the executive committee of main WUA committee. The Branch committee organized in branch canal level also involved some tertiary committees directly drawing water from main canal and located nearby the given branch canal.

Finally, the main WUA executive committee is formed through the General Assembly of all 145 representative farmers from the tertiary or sub-branch committees. The general assembly is constituted for maintaining balance, which primarily works for the formulation of policy and annual programmes and approval of the expenditure. The general assembly elects four officials: the Chairman, Vice-Chairman, Secretary and Treasurer. The four elected officials together with the representative members in the 21 Branch Committees constitute the Executive Committee of the Main WUA Committee of the system with the responsibility of executing the decisions of the general assembly.

To illustrate the organizational structure, Table 3.2.1 is presented below:

Table 3.2.1 Illustration of the Organizational Structure of Kankai WUA

Canals	Tertiary	Sub-Branch (Direct tertiary)	Secondary	Main Canal
No.	109 Tertiary Committees	36 Branch Committees	21 branch committee	1 main Committee
Officials	Five : chairman, vice, secretary, member of the general assembly and the other representative to the Branch Committee	It is also organized just like the tertiary committees but only in the sub-secondary canals drawing water directly from the from the main canal	One representative each from each tertiary Committees comprise Branch Committee. They elect three officials and one main committee representative from among themselves	The 145 general assembly members elect 4 main officials from 21 representatives of the Branch Committees and the 4 elected officials form the Main Executive Committee

1) Canal Operation And Maintenance

All the gates and other structures up to the main canal are operated by the WUA. Because of the scarcity of water supply, the system has practiced rotational irrigation since 1999 particularly for the winter season. At the system level, the yearly spring season rotation is such that the first half of the system gets the water this year and the other lower half gets the water on the next year and so on. Due to the frequent inadequacy of water supply, water rotation has been a big problem here. However, there is also a rotation even between tertiary of a single branch during spring paddy. This system is mainly of gated type.

2) ISF Collection

The ISF is charged to the irrigator at the rate of NRs 68 per crop per hectares. This ISF is charged only for paddy and not for other crops The ISF total collection for the three consecutive years was approximately around NRS 419,000 in 1998, 85000 in 2000 and 75000 in 2001. The temporary staff of Kankai irrigation office, mainly the two surveyors, collect ISF in the systems that are yet to be transferred to the WUA. The WUA collects ISF in the system already transferred. No AO is mobilized here for ISF collection since there is only one AO in the entire system. The ISF collection is becoming very problematic both to the WUA and the Jhapa DIO.

3) WUA Coverage and Operation

The Kankai Irrigation System was designed for 5,000 hectares during the 1st phase and 3,000 hectares for the 2nd phase. The pilot WUA was launched in 8 upstream branches of the 1st phase. The total area covered was 1,600.5 hectares, only 20 percent of the total designed area of the system. All the 8 branch canals were transferred to the WUA with written agreement between 1995 and 1997 as the WUA has its own constitution and is registered according to the Water Resources Act 1993. Both the Prasakha Samitis and Upsakha Samitis perform water distribution and maintenance functions. The Branch Committee takes charge of the ISF collection function. The secretary is given the responsibility of ISF collection.

The irrigated areas and the ISF collection records for both monsoon and spring seasons from 1999 to 2001 in Branch 9, one of the 8 transferred branch canals, is shown in Table 3.2.2. This branch canal has a total of 676 hectares but its cropping intensity for 1999 and 2000 was only 133 percent. It did not have water during the spring of 2001. The collection efficiency in 1999 was a high of 80 percent, reduced to 53 percent in 2000 and further decreased to 27 percent in 2001 as there was no water during the spring of the same period. Just like the ISF collection of the whole system, the ISF collection of this branch canal has shown a decreasing trend. This is reflective of the declining water availability in the system due the system's inability to undertake regular maintenance.

Table 3.2.2. Irrigated Areas and ISF Collection of WUA, Branch No. 9 (676 Ha)

Particulars	1999	2000	2001
Monsoon irrigated (ha)	550	550	550
Spring irrigated (ha)	350	350	0
Collected ISF (NRs)	30,000	20,000	10,000

The Joint Management or transfer to the WUA of the responsibility for the O&M of the transferred areas started only in 1993. In other words, 20 percent of the designed command

area has already been transferred but the WUA or the farmers have assumed water distribution and maintenance below the secondary canals throughout the system. The Chaukidars of the Jhapa DIO are only operating the gates of the areas not transferred but maintenance of the main canal has not been undertaken due to lack of funding. In the transferred canals, the users are responsible for ISF collection, canal operation and maintenance. Even in the canals that are yet to be transferred to the WUA, water distribution and canal operation are mainly done by the users in the branch and tertiary canal levels. Both the DIO and the WUA are of the same opinion that transfer can only proceed if the main canal and the rest of the system is rehabilitated.

3.2.2 Experiences of Chandra Canal Irrigation System[38]

The Chandra Canal in the Saptari District of eastern Terai was the first modern canal irrigation system in the country. It was constructed in the years 1922-28 with the assistance of British engineers. Its source of water is the Triyuga river which is fed by Churia hill of Nepal Terai. This canal was designed to provide irrigation services to 10,500 hectares. The actual areas that receive irrigation water is currently estimated at 8,500 hectares. The main canal has a total length of 29 kilometers that feed water to 10 branch canals with a total length of 49.7 km serving an aggregate area of 7,449 hectares and to 19 minors directly drawing water from the main canal. The system covers 29 VDCs of Saptari District and serves a total of 11,332 households within the command area of 8,500 hectares. Its river flows with high discharge during summer and very low discharge in winter. Since its water source originates from the Churia range, the system has a big problem of canal siltation.

Currently, the system is one of the 11 irrigation projects of the Irrigation Management Transfer Project (IMTP) jointly financed by the USAID and ADB. IMTP has two basic objectives: (1) To refine and institutionalize the processes and strategies for transferring O&M and/or ownership of public irrigation schemes to farmers and (2) To transfer the O&M and/or ownership of 11 irrigation schemes to farmer-beneficiaries, in accordance with their capacity to mobilize local resources. Its two components include: (1) establishment of sustainable and effective Water Users Associations (WUAs) through formal and informal training courses and (2) rehabilitation and improvement of irrigation and drainage facilities.[39] Through IMTP, the WUA in Chandra Canal Irrigation System was organized.

1) Organizational Structure

The lowest level of organization in the WUA of Chandra Canal Irrigation System is a village canal committee. A village canal service area covers an average of 33 hectares with an average of 45 households. The average landholding per household is .75 hectares.

[38] The information from this section was gathered during a meeting with the staff of Chandra Canal Irrigation System last August 21, 2002 in the system's office at Saptari District. The key informants were the System In-Charge and Overseer Japhir Alam, DIO Saptari Engineer Sitaran Yadav, and Benu Poudel, the Sociologist of Saptari DIO. Also, interviewed were the Main Committee Chairman Badri Narayan Yadav, Vice-Chairman Ram Dev Shah and the Barmajhiya Branch Chairman Bechan Pandit (Kumhale).

[39] Project Administration Memorandum, Kingdom of Nepal, Irrigation Management Transfer Project, Loan No. 1311-NEP (SF), Agriculture and Rural Development (West), Agriculture and Social Sectors Department, Asian Development Bank, june 1995.

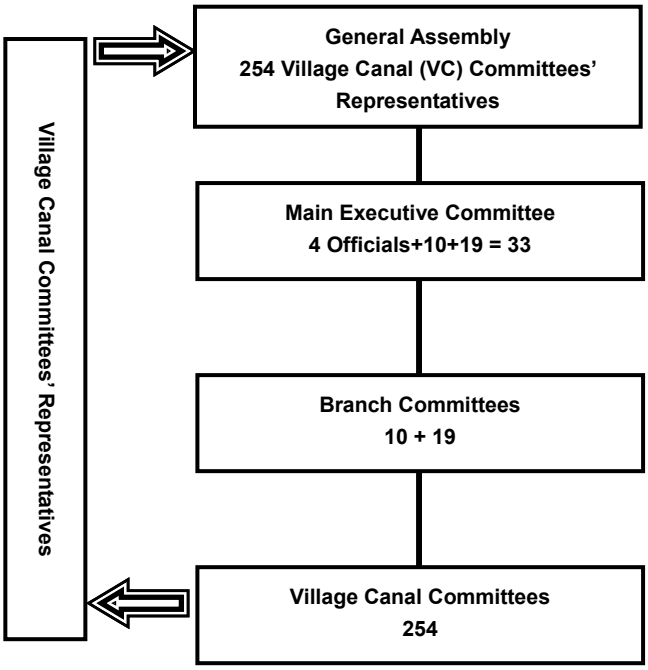
In the formation stage, the farmers served by a village canal elect 7-10 members to form the village canal committee. The farmers elect a Chairman, Vice-Chairman, Secretary, branch committee member, general assembly representative and the rest are members. This elected officials and representatives constitute the Village Canal Committee. All the 254 village canals have a village canal committee each. Each village canal committee is responsible for water distribution and maintenance within the service area of the village canal.

Each village canal committee sends its representative to be a member of the Branch. The Branch members elect three main officials for the Branch and one branch representative to the WUA Main committee. The 19 minors are also organized like the nearby branch committees. The Branch Committee is responsible for water distribution and maintenance along the branch canal and minors.

The 254 farmer representatives of the village canal committees convene into a general assembly. These representatives elect 4 main officials for the main committee: Chairman, Vice-Chairman, Secretary and Treasurer. These four officials together with the representatives from the 10 Branch Committees comprise the main committee of the WUA. Currently, an additional of 67 women members is also appointed as the members of general assembly representing all the branch committees. Number varies according to the size of command area. The DIO chief is also the ex-officio member of main committee. The general assembly approves programs; policies on water distribution, maintenance and ISF collection as well as plans on expenditures. These are executed by the WUA main committee.

2) Canal Operations

Figure 3.2.2 Organizational Structure of the WUA of Chandra Canal Irrigation System



Water is distributed in rotation between different branch canals during water-scarce season such as early monsoon, autumn and in irrigating wheat in winter. Due to the proportionate distribution design of the distributary and on-farm structure, rotational water distribution is difficult within and down to the branch canals. So, there is no rotational practices within the branch canals and minors. It is because the structure down to the main canal is designed to distribute water on proportionate basis. As the water flows increase or decrease, the proportionate share of water is also increased or decreased accordingly throughout the entire outlets of subordinate canals. The entire Chandra canal is said to be constructed in this technical modality. Taking into consideration the difficulties of delivering controlled water at the appropriate time and place, the IMTP's rehabilitation project installed check gates in most of the outlets of these canals. Farmers of

Maleth said that it is essential in controlling water because the upstream farmers used to get water even when they did not require it.

The project people and the main committee decide about the rotational schedule of water distribution for water scarce season. Mainly, the entire main canal is grouped into three different parts for these purposes.

3) ISF Collection

The Chandra Canal Irrigation System charges 40 Rs per hectare per crop. In this system, the WUA undertakes all the O&M of canals and structures below the main canal. Under the joint system management arrangement, the ISF sharing is 75 percent to the WUA and 25 percent to the Government of the total ISF collected.

Initially, all the 33 members of main committee take charge of collecting ISF in his or her respective branch. Later on, the authority is given to the branch committees. Nowadays, six female motivator paid by IMTP collected ISF for the branch committees. Each motivator covers 4 or 5 branch canals and minors. Of the 75 percent share of the WUA collected, 40 percent is allocated for the main committee and the rest of the 60 percent has been retained in the branch committees for the O&M of the branches and minors as well as the village canals.

The reported collection during 2001/02 was 43 percent. Of the 5,782 bighas within the command area of the system, a total of NRs 231,280 should be collected. As of 2001/02, the reported ISF collection was 43 percent or NRs 99,450.40 of which NRs 39,780.16 goes to the main committee and the balance of NRs 59,670.24 remains in the respective minor or branch committees. The amount is not that much relative to the O&M requirements of the areas under the WUA.

3.3 Lessons Learned

Earlier in this report, “institutional development” has been defined as the processes, strategies and methodologies being used by national participants (Department of Irrigation and its units) or outside intervenors to help organizations or people to be organized (Water Users Association) acquire abilities for adopting formal and informal rules or norms and behaviours to collectively serve their valued purposes over time.

Two lines of institutional development have been reviewed in this sector report. One line is being applied in the IDA/World Bank-supported SMIP. The other line started with the USAID-financed Irrigation Management Project (IMP) where Kankai Irrigation System was one of the pilot areas and is being pursued further in the USAID/ADB-financed Irrigation Management Transfer Project (IMTP) where Chandra Canal Irrigation System is one of the 11 projects supported by the Project. The former has been implemented from 1978 to 2003 and the latter from 1985 to 2002. A lot of lessons can be generated from the review of these two lines of institutional development implementation.

1. The differences in the implementation of WUO/WUA organization in SMIP as well as in Kankai and Chandra reflect the lack or absence of institutional development program where standardized procedures, strategies and methodologies are to be applied by the

various implementing units. In SMIP, it was the stage-wise approach and in Kankai it was a pilot approach. Both approaches have not achieved collectivity of the farmer beneficiaries in the systems. Instead, the approaches created divisions making it difficult for the systems' beneficiaries to work together to achieve the common purposes of irrigation; that is, equity, water adequacy and timeliness of water delivery to support production. In Chandra, institutional development has been addressed to the system as a whole. The results in terms of water distribution and ISF collection are far better than those of SMIP and Kankai. Hence, institutional development should be pursued from the point of view of the systems' beneficiaries as a whole with concrete guiding programs emanating from DOI.

2. The organizational structures of Kankai and Chandra are basically the same as both systems followed the IMP/IMTP line of institutional development. The WUA structure in both systems reflect the effort to promote grass-roots democracy and to allow the WUA to penetrate to the lowest reaches of large irrigation systems. The structure is an overlay of different leaders at the levels of the main, branch and village canal committees. There is, indeed, too much democracy. The different leaders at all levels can easily fall into communication problems as a subordinate in one level is the leader in a higher level. Discipline is difficult to promote under this structure because the basic organizational principle; that is, unity of command is violated. On the other hand, the organizational structure of the WUOs in SMIP is tall and highly centralized. As the leadership structure moves up, the leaders become unreachable by the farmers at the levels of the WUGs. There is too much concentration of power among the leaders and none is left among the ordinary farmers. The two kinds of WUO/WUA organizational structures in SMIP as well as in Kankai and Chandra are extremely opposite. One concentrates too much power on the leaders and the other promotes too much democracy. A middle ground WUA organizational structure that facilitates democracy and power concentration to discipline members on democratic agreements has to be designed and applied.

3. In both lines of institutional development, cost-sharing arrangement for rehabilitation has become the precondition for transfer or joint system management. As there are funding constraints in rehabilitation just like in Kankai, then transfer or joint management can no longer be pursued. Reversing this procedure, to transfer or joint management first before rehabilitation will produce a demand-driven rehabilitation by the farmers as opposed to the current rehabilitation-then-transfer modality.

4. Institutional development means empowering people for irrigation. It does not, therefore, mean helping WUOs organize and afterwards not allowing them to do what they are supposed to do.

CHAPTER 4 INSTITUTIONAL DEVELOPMENT IN SRIP

4.1 Rationale and Approach

Some of the existing agency-managed irrigation systems (AMIS) in Nepal have been pursuing the organization of WUOs or WUAs for irrigation management transfer or joint irrigation management for more than two decades already. The organization effort has been undertaken within the context of command area development in SMIP or rehabilitation in IMTP. In the former, the approach to institutional development is stage-wise following the overall approach of the project while, in the latter, the approach is directed to the irrigation systems as a whole.

However, the whole picture reveals that these irrigation systems had been constructed, operated and maintained by the agency or DOI without farmers' participation. Now, the farmers herein are organized into WUOs or WUAs as the systems are being improved or rehabilitated in order to share with the Government or participate in the administration or management of the systems. As the annual Government subsidies continue to flow to support the O&M of the AMIS, the existing joint irrigation management with the WUOs or WUAs can hardly be said to have delivered a significant impact in the sustainable O&M of the systems.

HMGN requested the feasibility study of the proposed Sunsari River Irrigation Project. The Government's policy on irrigation development and its orientation for joint O&M management with the WUAs as stipulated in the Irrigation Policy, Water Resources Act and Irrigation Rules will be the guiding overall framework for SRIP. However, SRIP will not be designed to be constructed by the Government alone for the farmers and, later on, be shared with the WUAs in terms of the system's O&M. It will be designed and constructed for joint irrigation management with and by the farmers and the Government. In this context, the rationale of SRIP puts heavy emphasis on the interconnectedness of the tool (irrigation system) and its users (WUA and farmers) through a viable interface (bounded partnership) for joint irrigation management.

As SRIP is to be designed and constructed for joint management, its basic approach will deal correspondingly with the essential elements of joint irrigation development; that is, joint planning, design and construction. The successful partnership over the tool is dependent on the essential elements in the development of the tool. The basic elements that precondition the development of functional irrigation projects involve from the very start clarity on the system's water rights, infrastructure capable of delivering the service implied in the water right, and assigned operational responsibilities.[40]

The general arrangement of responsibilities for the governance of jointly managed irrigation system will be that of a supplier of irrigation water (DOI) and distributor of irrigation water (WUA). The DOI and WUA irrigation governance include four major institutional principles characterizing successful self-governing systems as follows: (1) a supportive policy, regulatory and legal environment, that recognizes the irrigation community's water rights; (2) capacity to mobilize resources adequate to meet the costs of operations and maintenance

[40] Perry, C. J. 1995. Determinants Of Function And Dysfunction In Irrigation Performance, And Implications For Performance Improvement. *Water Resources Development* 11 (1):11–24.

including emergency repairs and modernization; (3) benefits exceed costs of participation, with proportional equivalence between benefits and costs for each irrigator— that is, those with larger benefits pay a larger share of the costs; and (4) effective collective choice arrangements or "organizational control of water" by users.[41]

Thus, the rationale of the institutional development of SRIP is directed on joint irrigation management. It is anchored on the approach of partnership in the development of a functional SRIP towards the Supplier-Distributor interface of irrigation governance in the management of irrigation water.

4.2 Project Area Description and Design of Institutional Layout

4.2.1 Project Area Description

The proposed project area falls in the eastern part of the Terai. It is located in the southern most part of Sunsari District and occupies the south-western part of SMIP. The project takes on the downstream reaches of Shankarpur and Suksena branch canals and will build headworks 600 meters downstream of E-W highway to provide irrigation through the Suksena and Shankarpur canals and serve the area of 10,147 hectares with more than 10,000 farmers in the 13 Village Development Committees (VDCs) of Sunsari District. Even with the presence of Suksena and Shankarpur branch canals, the farmers who responded to a survey (N=254) reported that their lands have not been irrigated during the last monsoon and winter seasons (84 percent) and that they have either owned or rented pumps as an alternative use to support their production during both seasons (66 percent).

About 80 percent of the farmers in the proposed project area derived their income from agriculture. Nine out of 10 farmers in the area who were consulted about the project expressed their belief that the project would improve their agricultural production. Because of this, they were willing to provide free and voluntary labor in the construction of watercourses (75 percent) and free access to their lands that will be traversed by the canal networks of the project (59 percent). After the project completion, the farmers were also willing to join the WUA (96 percent), assume leadership positions (88 percent), participate in O&M activities (88 percent) and pay water charges (88 percent).

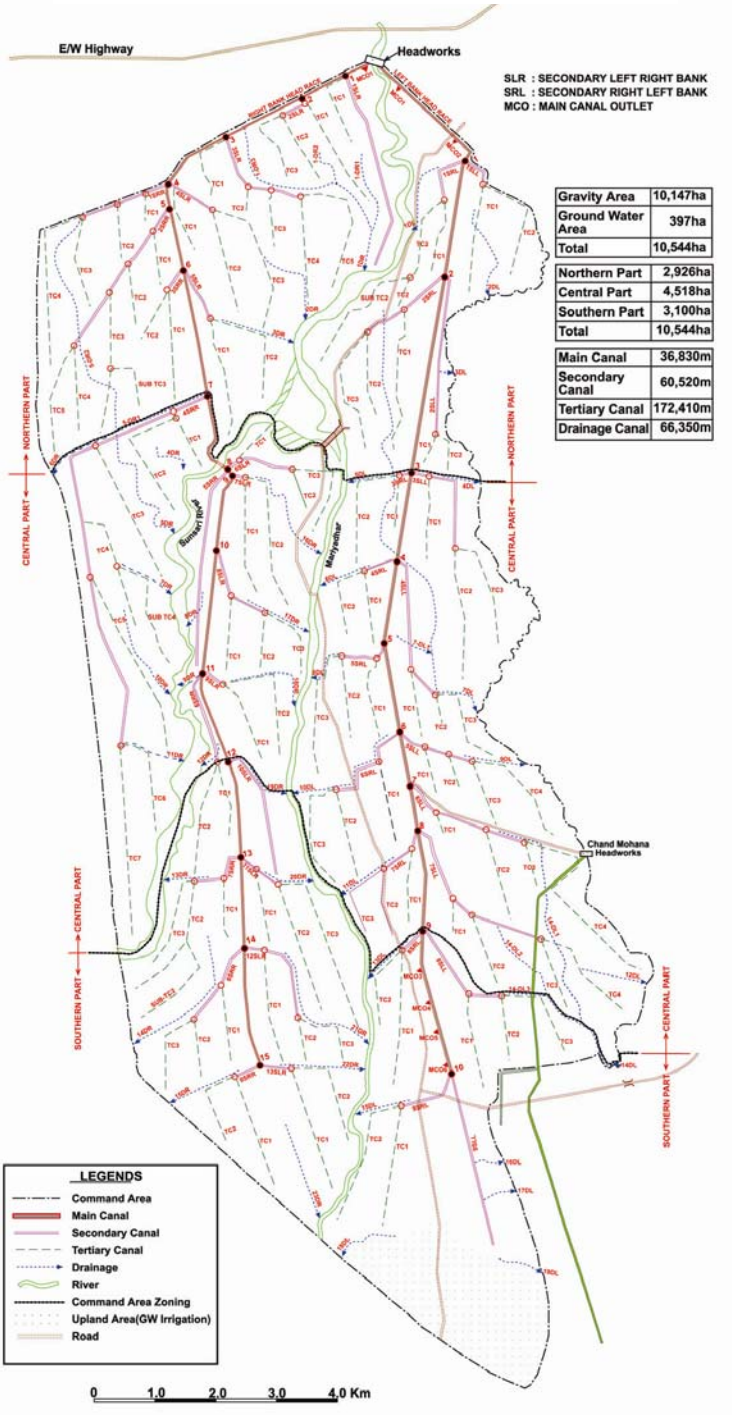
4.2.2 Design of Institutional Development Layout

The design of a Water Users Association (WUA), as a matter of logic relative to the irrigation tool and the WUA's basic task of water distribution, has to be aligned with the configuration

[41] Merrey, D. J. 1996. *Institutional Design Principles For Accountability In Large Irrigation Systems.* Research Report 8. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI). This effective organizational control of water by users, as Merry, D.J. 1996 pointed out, will normally have the following characteristics: (a) organizational autonomy, with clearly defined boundaries (area and membership), in which the users control the allocation of water and officials derive their legitimacy and authority from users and are accountable to users, (b) financial autonomy, i.e., an institutional arrangement in which the irrigation management organization relies on direct methods to raise most or all of the resources needed for operation and maintenance, (c) single organizational entity manages a single infrastructural system, (d) maintenance and conflict resolution which are tightly connected to the allocation and distribution of water and the organization can enforce rules among its members, (e) transparent arrangements for monitoring performance (including financial) and (f) nested or federated organizational structure.

of the proposed irrigation project. The water distribution networks from the watercourses to the tertiary canals and up to the secondary canals define the social infrastructure of the WUA. In the case of the proposed SRIP, there are two main canals, as shown in Figure 4.1.1, that will divert irrigation water from the Sunsari headworks. This water will flow from the main canals to the secondary canals and down to the tertiary canals for the watercourses. The Shankarpur and Suksena main canals have been designed to have 18 and 26 secondary canals respectively. The headgates of these main canals become the physical boundaries for the water delivery functions (supplier role) of DOI from the system's headworks and the water distribution task (distributor role) of the WUAs to the watercourses through the tertiary and secondary canals.

Figure 4.1.1 Irrigation and Drainage Network



It is, therefore, at the level of the headgates that 44 Water Users Committees (WUCs) will have to be organized and registered: 18 and 26 WUCs for Shankarpur and Suksena respectively. In this project, a total of 507 Water Users Groups (WUGs) will be established; 231 in Shankarpur and 276 in Suksena. As intermediary tertiary canals will also be constructed to feed water the various watercourses, intermediary groups or Sub-Water Users Committees (SWUCs) will be organized to manage water and maintenance along these tertiary canals. As designed, there will be watercourses that will be directly drawing water from the main canals. The WUGs here will be integrated into the nearest WUCs.

4.3 Goal, Objectives and Strategy

4.3.1 Goal of the Institutional Development Component

The goal of the institutional development component or program of the proposed project is sustainable O&M of the system through the joint irrigation management of the DOI and the WUAs in the equitable,

adequate and timely delivery and distribution of irrigation water to increase farmers' production, and thereby achieve higher levels of productivity per unit of land and water.

4.3.2 Objectives

Towards this goal, the specific objectives of the institutional development program of the project are as follows:

1. To organize and register WUAs for joint irrigation development in terms of planning and construction;
2. To organize functional Water Users Groups on the watercourses that will be federated at secondary canal levels as registered Water Users Committees for the effective water distribution and maintenance along these canals and ISF collection among the farmer members;
3. To organize Sub-Water Users Committees for the effective water distribution and maintenance along the tertiary canals;
4. To strengthen the capacity of the organized WUA: WUCs, SWUCs and WUGs in the management of the operation, maintainance and ISF collection at their respective levels;
5. To assist DOI through its Irrigation Management Division at the central level, IMD at the Directorate and Sunsari DIO in the recruitment, training and mobilization of WUA Development Officers (or AOs) in the organization, training and assistance for the WUA at different levels to perform their basic tasks;
6. To enhance the capacity of the Irrigation Management Division and Sunsari DIO to support the WUA in carrying out responsibilities for system's operation, maintenance, ISF collection and agricultural support tasks in line with joint management; and
7. To facilitate the joint irrigation management agreement between the DOI as supplier and the WUA as distributor of irrigation water.

4.3.3 Strategic Elements

In order to achieve the SRIP Institutional Development Program (IDP) objectives towards sustainable O&M of the system, the strategic elements include: (1) Socio-Technical Coordination, (2) Federated Organization of the Autonomous WUCs and (3) ISF Collection Improvement.

1) Socio-Technical Coordination

The design and construction/rehabilitation of irrigation projects intended for joint irrigation management require a close coordination between the Project Management Office, responsible for design and construction, and the WUA. This coordination is necessary because the distribution canal networks and the watercourses which are intended to be the areas of the WUA under a joint management in the future are not yet in place. The coordination will ensure active participation of the farmers in the irrigation development stage of the future WUA areas. As the watercourses are not yet constructed, the WUA has to be established as an

ad-hoc but registered one. The WUA needs to promote the generation of farmers' cash and labor contribution to the construction of the project. Furthermore, the socio-technical coordination will ensure farmers' participation in the planning and construction of the irrigation facilities and structures of the WUA area in the future.

The results of IIWI studies[42] on irrigation management transfer (WUA area intended for joint irrigation management with DOI) have pointed out lessons for development agencies. One of these states that: "Rehabilitation is often done just before the turnover of management. Where this is implemented without meaningful participation and investment by the farmers, it can reinforce the perception among farmers that the irrigation system belongs to the Government. By contrast, having farmers take the lead in setting priorities for construction, while investing a significant amount of their own labor and materials, can be an effective means of changing farmer perceptions about who is and who will be primarily responsible for the system after turnover."

In this context, socio-technical coordination means that the technical design and construction plans of the canals for rehabilitation or improvement prepared by the Project are understood, and accepted by the farmers. That is, the social aspects are coordinated with the technical aspects. This is to be operationalized as follows:

- Farmers are consulted about the plans for canal alignment and structures' locations in the secondary ant tertiary canals, and if re-location needed, this will be forwarded in the final design.
- Farmers propose their priorities and plans on the water courses.
- The Project Management Office of the subproject reviews farmers' proposals.
- Both parties, the Project Management Office and the farmers (through their WUA), agree in a meeting on the design and construction/rehabilitation plans for the secondary canal networks and watercourses and formalize these agreements in a Memorandum of Agreement specifying the farmers' contribution. This project is proposing 100 percent farmers' contribution on the development of the 20-hectare watercourses and to a certain extent, say 10 – 25 %, in the construction costs of the tertiary canals.
- Farmers, through their WUA, will be mobilized for construction with the guidance from the Project Management Office.

When this socio-technical coordination process will be done and the construction will be completed, the maintenance has already been transferred to the farmers of the watercourses and tertiary canals through the WUGs and the SWUCs. Considering that the canals belong to the farmers, the WUGS and the SWUCs will readily assume the subsequent routine maintenance and canal protection in the future for sustainable operation.

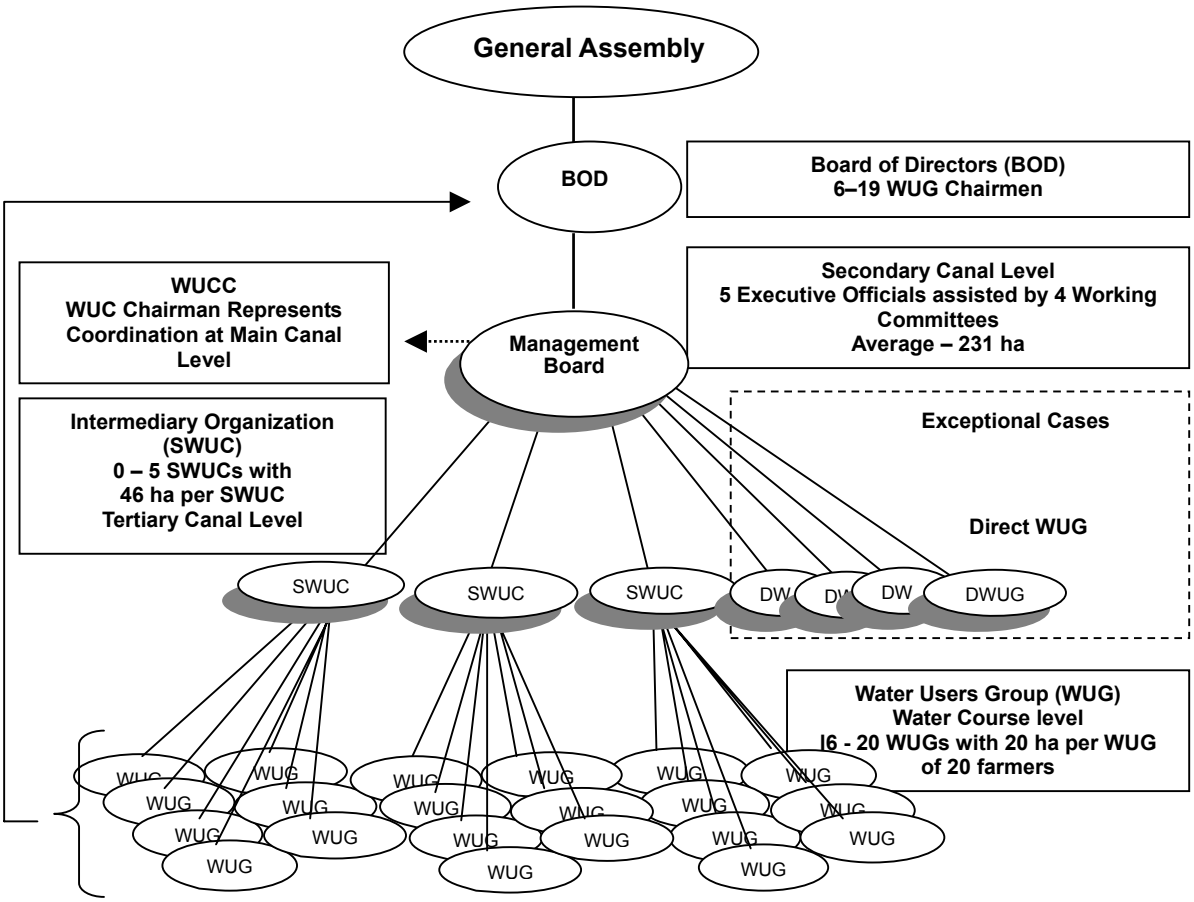
[42] Vermillion, D. L., and C. Garcés-Restrepo. "Results of management turnover in two irrigation districts in Colombia". IIMI, 1996; WimH. Kloezen, Carlos Garcés-Restrepo And SamH. Johnson III. "Impact Assessment of Irrigation Management Transfer in the Alto Rio Lerma Irrigation District, Mexico". IIMI, 1997; and Sam H. Johnson III. "Irrigation Management Transfer in Mexico: A Strategy to Achieve Irrigation District Sustainability". IIMI, 1997

2) Federated Organization of the Autonomous WUCs

The organization of autonomous WUCs means clearly defined boundaries (area and membership) where the users control the allocation of water and the officials derive their legitimacy and authority from users and therefore, are accountable to them. With their autonomy rather than dependence on external sources, the WUCs can also have financial autonomy, an institutional arrangement where the WUCs rely on direct methods to raise most or all of the resources (ISF and labor) needed for operation and maintenance in managing its single infrastructural system, the sub-system of secondary canal irrigation networks.

The proposed organizational structure of an autonomous WUC in SRIP is a federated setup as shown in Figure 4.3.1. This organizational structure, called generally as WUA or WUO, looks complex but it is really a flat type federation of farmers through their WUGs and very simple in operations. The details as to the structure in terms of functions of groups and officials at all levels, membership, meetings, etc., will be detailed and defined in the Constitution of the WUC. The levels and the principles of a WUC operation will be discussed briefly.

Figure 4.3.1 Organizational Structure of a WUC in SRIP



The WUC in SRIP has the farmers in the watercourses organized into WUGs as the foundations of the organization. In SRIP, there will be a total of 507 WUGs . As designed, each watercourse has an average of 20 ha with an average of about 20 – 30 farmers. From the

institutional point of view, the smaller the group, the more cohesive is the relationship and the operations become simpler and more effective. It is through the WUG that the basic work takes place. It is here where the farmers get their water through the field channels and correspondingly pay ISF. For sustaining the benefit of getting adequate and reliable water supply, the farmers here have to perform the required maintenance work. It is because of the basic task in the WUG that its leadership becomes extremely important. Out of the 20 –30 farmers, five WUG leaders will be democratically elected. They are the Chairman (tasks coordination), Vice-Chairman (water distribution and maintenance), Secretary (membership list, relationship and education), Treasurer (irrigation service fee) and Auditor (review of financial operations and facilities protection). Because these tasks are crucial to the operations of the WUG, the elected Chairman must truly represent the farmers' interests to higher levels of the WUC organization and can enforce agreements and decisions of the General Assembly or Board of Directors.

When all the WUG Chairmen have been already democratically elected, these Chairmen have the right to represent all the farmers in the Board of Directors of the WUC. Structurally, the organization is a two-tier flat type federation of WUG Chairman in a General Assembly. The WUG represents particular groups of farmers and the BOD represents all the farmers in the WUC command area. The BOD elects 5 Executive Officers of the WUC. The five Executive Officers are the Chairman (tasks coordination), Vice-Chairman (water distribution and maintenance), Secretary (membership list, relationship and education), Treasurer (irrigation service fee) and Auditor (review of financial operations and facilities protection) for whole WUC command area. The General Assembly approves plans and programs relative to the operations of the WUC as recommended by the Committees of the Executive Officers and rules and procedures to govern smooth operations of the WUC as recommended by the WUG Chairmen in general.

In short, the BOD approves decisions and the WUC officers execute and impose the implementation of these decisions together with the rest of the WUG Chairmen. Should problems arise in the BOD on matters the representatives cannot decide, the matter is brought to the General Assembly. This is the WUGs' meeting on certain issues that may be conducted in the different places of the WUGs at different time. The farmers' general voice as voted upon by the representative WUG Chairmen in the BOD will prevail. This is real grassroots democracy (farmers' voice) from the ground and discipline in the implementation of decisions of the farmers as a whole. Simply, the WUC operations is from-the-farmers-to-the-farmers mode. The farmers are also represented by the WUC Chairmen in the WUCC to coordinate water delivery and schedules along the main canal with concerned officials of the DIO. For coordination purposes, the WUCC is not registered. Only the WUCs are registered because they enter Joint Irrigation Management Agreement with DOI for the O&M of their respective command areas.

The SWUCs are basically intermediary service groups along tertiary canals. Their main function is to distribute equitable and adequate water to the WUGs under their charge. They also coordinate maintenance work along the tertiary canals. No responsibility of collecting ISF is given to the intermediary organization since this job is already done by the WUGs under their charge. The officials of the SWUCs are composed of: 1) chairperson, 2) vice

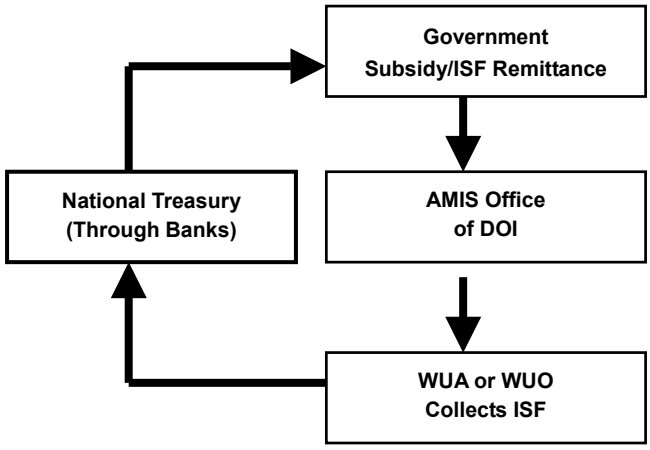
chairperson and 3) secretary. The chairperson will be responsible for overall coordination among the WUGs under him/her, the vice chairperson being responsible for equitable service delivery; and the secretary will be responsible for all the records keeping and monitoring of the ISF payment from the farmers to the WUGs.

3) ISF Collection Improvement

Studies cited earlier compare ISF collection against the O&M costs' subsidy. Very seldom is the emphasis made on ISF collection against the actual irrigated areas for both monsoon and winter seasons. Against the O&M costs' subsidy, the ISF collection recovery in various AMIS ranges from 0.1% to 15% with an overall recovery of 1.3%. Other studies point out that the cost recovery is only two percent of the total O&M costs. Thus, the O&M of the AMIS is, therefore, highly subsidized by the Government. The rates of ISF vary from place to place. In SMIP, the rate of ISF is NRs 200 per ha, NRs 68 per crop per hectare in Kankai and NRs 40 per bigha per crop in Chandra canal. The ISF rates are very low compared to those in other Asian countries. Even with these low ISF rates, the collection efficiency ranges from nothing in Kankai for the last three seasons because of problems of low water availability, 14 percent in SMIP and 20% in Chandra canal for the year 2000/01. There are plenty of problems ranging from the overall ISF collection mechanism, institutional arrangement, variable ISF rates collected either per year per ha or per bigha/ha per season to the unappreciated conditions of service, if there is any, from the concerned DOI office; there is no water when the farmers need it and it comes when it is not needed.

The proposals for ISF improvement in SRIP will address the above-cited problems. As shown in Figure 4.3.2, the Government has been trapped in the subsidy-ISF remittance cycle. The subsidy is high because the DOI office does O&M up and down the system, leaving the WUO without their contract stipulated water distribution function, but only to collect water charges. Worse, even in ISF collection, it is the project-paid AOs who do the collection under a 50:50 ISF sharing arrangement just like in SMIP. In Chanda Canal irrigation systems, the WUA is responsible for the O&M of the secondary canals down and the ISF collected is higher at 25:75 ISF sharing scheme in favor of the WUA. But on the whole, the ISF remitted to the Government is very low in comparison with the subsidy. It is only a matter of time that the Government will recognize its self-defeating position and will eventually decide to end the vicious cycle of dependency.

Figure 4.3.2. Flow of Subsidy and ISF Remittance



In SRIP, the objective of ISF collection improvement is to get out of the cycle. Specifically, it will address O&M costs relative to two governing systems: the Supplier and the Distributor. Initially, the realistic total requirements to do the Supplier's job will be 100 percent subsidized plus costs requirements for institutionalizing the joint irrigation system management strategy

for both the Supplier and Distributor. If the work is set up and done well during the project implementation process, then no more subsidy is required from the Government because all the total O&M costs for both the Supplier and the Distributor in effectively managing their respective parts of the system will be sourced 100% from ISF. These O&M costs will establish the true basis of the ISF rate per hectare per season.

The farmers will be willing to pay ISF if they see the connection between water service and payment. This is only possible at the WUGs' level and, therefore, can not be done by the bureaucracy. The ISF will answer 100 percent of both O&M costs of the Supplier and Distributors. The rate will be established and collected per season as the irrigated and benefited areas per season vary. There is scarcity of water during the dry season and a lot of waterlogging during the rainy season. The farmers will pay on the actual benefit they get out of water minus the waterlogged areas. Again, this can only be monitored at the WUGs' levels!

4.4 IDP Components

4.4.1 WUC Organizing Process

The process of organizing the WUCs in the SRIP area encompasses three interlinked phases.

First: the Pre-Organization Phase deals with the commissioning and internal preparations of the Project PMO and the forging of understanding on the project development framework, methods and expected results among the relevant levels of the DOI organization together with the Project Consultant. On the side of the farmers, the organization of ad-hoc WUCs will be carried out at the start of the detailed engineering stage in order to forge a project agreement with the DOI/PMO where farmers' role and contribution are made specific relevant to the project: its planning and construction.

Second: the WUCs' Organization and Development Proper Phase covers the bottom-up participatory approach in the WUC organizing process and the conduct of various facilitating training packages.

Third: the Post-WUC/WUCC Organization and Development Phase facilitates, among others, the reorganization of the WUCs according to hydraulic boundaries and the firming up of the joint irrigation system management agreement of each WUC with DIO.

1) Pre-WUC Organization Phase

Here, two activities need to be carried out: the project orientation seminar and the training of the WUA Development Officers (WUADOs) or AOs. For a pioneering project to prosper on the ground, the Project should facilitate the conduct of the project orientation seminar among selected DOI officials, PMO management officers, and among the representatives of 44 ad-huc WUCs together with the key officials of Sunsari District and the project area VDCs. This seminar will be a venue for participants to discuss, agree and commit on the Project's IDP, objectives, methods, resources required and anticipated results of the Project.

Immediately after a common understanding has been forged within the orientation seminar, the WUADOs of the Project will have to be trained as WUC organizers to facilitate the joint

project development and irrigation system management. The key personnel from IMD must also be involved in this training to give inputs to the participants on the basis of their advanced experiences in IMTP and other AMIS institutional development work. The organizers training program will equip the WUADOs with the basic knowledge of their role, and the needed skills for them to carry out their duties in the organization and post-organization phases. The pro-forma design of the WUADOs' Training program will be developed and finalized by the training core group for this program who will be correspondingly constituted for the purpose during the detailed engineering stage of the project.

2) WUCs' Organization and Development Proper

This phase makes use of bottom-up participatory organizing and training approaches mainly facilitated by the trained WUADOs. Immediately after their training as WUC organizers, they will be deployed to their assigned areas according to the sequence of the infrastructure development of the Project in both Suksena and Shankarpur canals and according to the yearly phased-program of institutional development in the area. As designed, there are 237 WUGs in the Suksena area and 277 WUGs in Shankarpur area. To facilitate the organization of 514 WUGs, about 22 WUADOs are required within the project implementation period. After all the WUGs are organized and the WUCs are established, the number of WUADOs will be reduced to 15; 6 in Suksena and 9 in Shankarpur.

The WUADOs integrate with the farming households and their families through house-to-house visits, get to know their concrete problems and aspirations for their resolutions, discuss the WUC organization, solicit their willingness to join the organization of the WUGs, and maintains field notes and diaries of their daily activities in the watercourses' areas. They then firm up the list of farming households in said WUGs' areas, identify from the list names of five to eight household heads, and invite them to become members of the WUG organizing core group.

Afterwards, they arrange for the first meeting of the core group to deepen their understanding of the irrigation situation and the WUG/WUC organization option, help them on the basics of planning the WUG organization meeting, and plan with them the pre-, during-, and post-requirement of the organizational meeting. Once one WUG is organized, each WUADO will move on to the next until he/she completes all the WUG organization assignment. The WUG organization work of the WUADOs will be closely monitored by their Supervisors, who will conduct weekly supervisory meeting to review their activities and plan further under the guidance of the Consultant.

After all the WUGs have been organized, all the elected Chairmen of the WUGs will be convened to act as Ad Hoc Council Potential Leaders (ACPL) for the future WUCs. The ACPLs have to be mobilized for collective work to maximize their individual contributions through committee work and expedite needed preparations for the organization of the WUC. Once all the preliminary Constitution of the WUC has been drafted, the ACPLs will conduct a series of consultative meetings with the WUGs and farmers to review with them the draft Constitution, hear and incorporate their suggestions, and solicit their general agreement to the revised WUC constitution.

After the completion of all WUGs' consultation meetings, the ACPLs are convened once more to review all the suggestions and comments of the farmers, finalize the Constitution and plan for its ratification by the all WUG members. With ratified Constitution of the WUC, the Council members prepare for the organization of the WUC through their attendance to the WUC Leadership Installation Conference/Seminar. This seminar will facilitate the participants' election of the WUC leaders, and the organization of the required standing or special committees. It aims to equip the leaders with knowledge on WUC leadership, develop their attitudes and organizational skills, and for a functional and viable O&M organization to assume O&M responsibilities (water distribution, ISF collection, maintenance and facilities protection) under the WUC's command area.

With the assistance of the WUADOs, the WUC leaders will pursue for the registration of the WUC at the District Irrigation Office of Sunsari to obtain its legal and business status. All the registration requirements will have to be prepared and submitted to appropriate agencies with the assistance of the WUADOs. This needs to be done to enable the WUC to enter into a joint irrigation system management agreement with the DOI and legally qualify it to negotiate for a loan or assistance from any lending institution.

3) Post WUC Organization and Development

When the WUC is registered and has completed the required training programs, it is said to be ready to start establishing relations with other organizations. This condition will give them the initial readiness and confidence to propose O&M, and negotiate a joint irrigation system management agreement with the DOI. When this becomes possible, then the management will have taken the pioneering step in the implementation of the Project's joint irrigation system management under the arrangement of a Supplier-Distributor relationship.

The joint irrigation system management agreement will revise existing formats and procedures of the concerned DIO office as the scope of responsibilities of the WUC is to be substantially scaled up. Thus, the process of joint irrigation system management agreement drafting, negotiations and subsequent signing will have to be undertaken by both parties. The ISF sharing scheme will have to be arranged and agreed as required under the Supplier-Distributor institutional arrangement.

To establish uniformity in the area in terms of relations with the concerned DOI irrigation office (Supplier) with the WUCs as Distributors, the WUCC has to be organized and made functional. This is essential because both parties will discuss and negotiate on the terms of the Agreement. Above, all the operational details of the headworks and the main canal vis-à-vis the scheduling of water deliveries and other plans have to be discussed by both parties to the level of mutual understanding, acceptance and agreement.

4.4.2 Training Programs/Workshops (DOI, WUC Officers, Farmers)

The training programs, workshops and consultation meetings are essentially woven into the total process of implementing the Join Irrigation System Management strategy. These are basically of two sets of training inputs timed according to the need within the implementation process. One set is for the agency and the other set for the WUC and farmers.

The 1st set is directed at the various levels of DOI: the central and field-level IMDs, the Regional Directorate, the DIO, the irrigation system operators as well as the O&M personnel for them to understand and support the work called for under joint irrigation system management. The training programs for the concerned DIO personnel and the PMO include: (1) WUA Development Officers (AOs) training program, (2) Trainers Training for Farmers' Training Programmes, (3) Training of the DIO personnel and the PMO on Participatory Design and Construction of the secondary and tertiary canals, and (4) Socio-Technical Coordination Training among the design and construction staff of the DIO personnel, and the PMO, and the WUADOs. The second set of Training Programs for the WUCs mainly consists of: (1) WUC Establishment and Leadership Installation Seminar, (2) System O&M Management Training, and (3) Financial Management Training.

All these training programs, workshops, conferences and meetings, which are essential parts of the joint irrigation system management strategy are to be carried out to achieve the following objectives: (1) To enable the DIO management and the PMO to support the organisation and development of WUCs as the institutional medium for joint irrigation management; (2) To facilitate the WUA Development Officers in acquiring the required knowledge and skills for organizing the WUCs, and conducting the training programs for the farmers; (3) To ensure that the leaders and members of the organised WUCs will acquire the skills to manage, maintain, and operate secondary and tertiary canals and watercourses under the WUCs' management responsibility including a simple recording of their O&M financial transactions; and (4) To facilitate the organization of the WUCC for coordination purposes between the WUCs and the concerned DOI office.

The training programs and consultations meetings pointed out above are minimum essentials. More can be recommended in the process. The designs of the programs will start during the detailed engineering stage of the Project and will be implemented within the project implementation process.

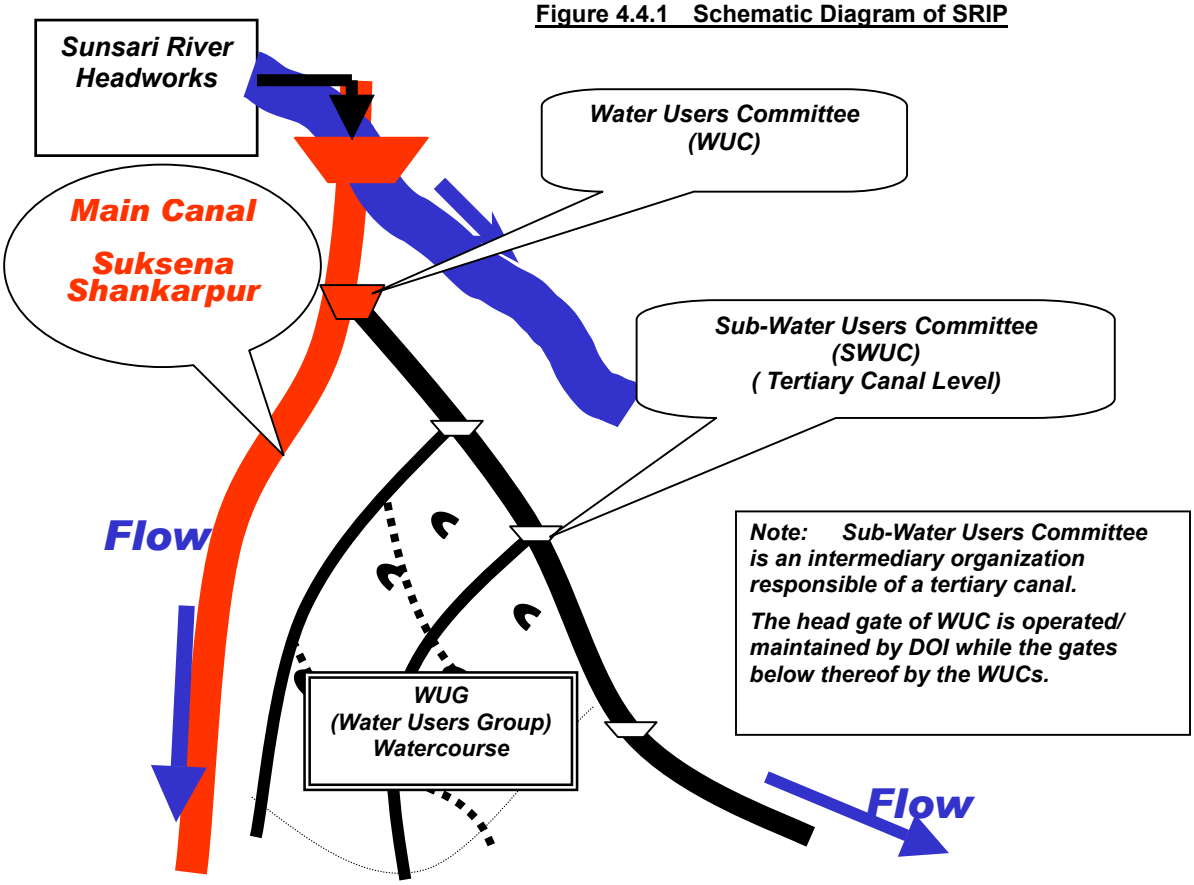
4.4.3 Joint Irrigation System Management and Agreement

Only less than 10 years ago, the Irrigation Regulation (2056) based on the Water Resources Act of 1992 was issued. The Irrigation Regulation provides that …"big projects, which cannot be fully transferred to the WUA, may be operated jointly by concluding an agreement between the two parties including collection of service charge, share percentage of Users' Association, and arrangement for maintenance." There is no clear definition or parameters as to what this joint operation is all about. It is left to the concerned DOI office to have its joint operation agreement with the WUA. As referred to by SMIP, this joint operation agreement is called "handing over agreement" but this joint operation agreement in SRIP means joint irrigation system management agreement. The object of the joint operation is the irrigation system and the operation of the system needs to be managed.

Irrigation management means getting the job done of diverting water from the source to a farmer's fields. In a simple case, the farmer can do this by himself. But in a system of more than ten thousand farmers in 10,147 hectares like SRIP as indicated in Figure 4.4.1, the water diversion gets complex as this is mediated by big regulation structures and big canals from the main to the secondary, sub-secondary, tertiary, watercourses, field channels and down to the

farms. The management job becomes cumbersome and most likely is not done well. Farmers complain and will hardly pay water even if they get it. The job is not well managed because it can not be managed well. Now, the Government wants to share the job with the WUO through joint management. To some, this joint management means that the concerned DOI personnel work with farmers up and down the system - below the headgates or any other points. Any central authority (mobile personnel, responsible to higher bureaucratic authority, with little site specific knowledge) cannot afford to have its scarce resources drained by countless energy absorbing local matters. Besides there is little that DOI personnel can effectively do down in the system that farmers cannot do better. This is not what is joint irrigation system management in SRIP.

Figure 4.4.1 Schematic Diagram of SRIP



In SRIP, irrigation system management means, in the first place, a division of roles vis-à-vis the system as a whole. As illustrated in Figure 4.4.1 above, the Sunsari river headworks, the diversion and delivery of water along the two main canals as well as the control of the cross regulators and the 44 secondary headgates are jobs that belong to the Supplier of water, the concerned DOI office. The jobs of distributing the supplied water down to the secondary canals, controlling the gates of the tertiary, allocating water to the watercourses and collecting the corresponding ISF belong to the Distributor of water which is in this case the WUA: WUCs, SWUCs and WUGs. The management of the water diversion and delivery (Supplier) and the management of water distribution down to the farmers' fields (Distributor) are connected in the mode of Supplier-Distributor arrangement. Therefore, the management of the

irrigation system is joint. This joint management means a commitment on DOI's part to deliver water to the delivery points of the secondary headgates at which the local WUC agrees to pick up that water supply and organize around it. DOI then becomes accountable for delivering this supply and the WUA is also accountable for water distribution and ISF collection. Since delivering a set quantity of water is generally impossible, the commitment would be to deliver agreed upon proportions of available river or canal flows at WUCC level. As such, there are particularities in the Supplier-Distributor relationship, these have to be well defined in a mutually understood and accepted joint irrigation system management agreement.

4.4.4 Post Joint-Irrigation-System-Management Assistance and Support Services

The Supplier-Distributors' institutional arrangement can improve the operations and management of the irrigation system and the watercourse farmers can really avail of the water as scheduled or when they need it. But water is only one input to production and an effort to increase production is a corollary effort to enhance the capacity of the farmers to pay ISF. In this context, the concerned DOI office, the WUADOs initially and IMD in the long term, needs to link the WUCs to services beyond water. The management of water is not enough. The management of complimentary support services like credit, fertilizer, marketing, etc. by the WUCs themselves is what makes production increase and what puts more money to the farmers' pockets to pay for ISF.

But for proper implementation that substantially increases production, capability should be built in the WUCs in the proper integration of the management of water and the management of complementary support services in accordance with the WUCs' cropping calendar. This will definitely require improvement of water distribution management at the WUCs and SWUCs levels and water management at the WUGs' levels. When the farmers are able to pay for the ISF, then the system's operational sustainability for the continuing benefits of the farmers becomes a natural consequence. An irrigation system becomes sustainable when its production reaches a level whereby the income derived by the water users from such production enables them to contribute and bear fully the financial and other resources necessary for sustained O&M of the system. This is on the condition that there are no adverse developments in government policies, no adverse changes in the environment and provided further that there is timely government assistance, as needed, during natural calamities.

4.5 Activities and Timetable of SRIP Institutional Development Program (IDP)

4.5.1 Key Activities

The key activities of the SRIP's IDP are within the irrigation development phases such as pre-construction, construction and post-construction as well as the O&M. The activities are sequential from the training of the WUADOs as organizers, to the organization of the ad-hoc WUCs and their participation during construction and reorganization that leads to eventual joint irrigation system management with the concerned DOI office. Table 4.5.1 specifies these key activities.

Table 4.5.1. SRIP IDP Phases and Key Activities

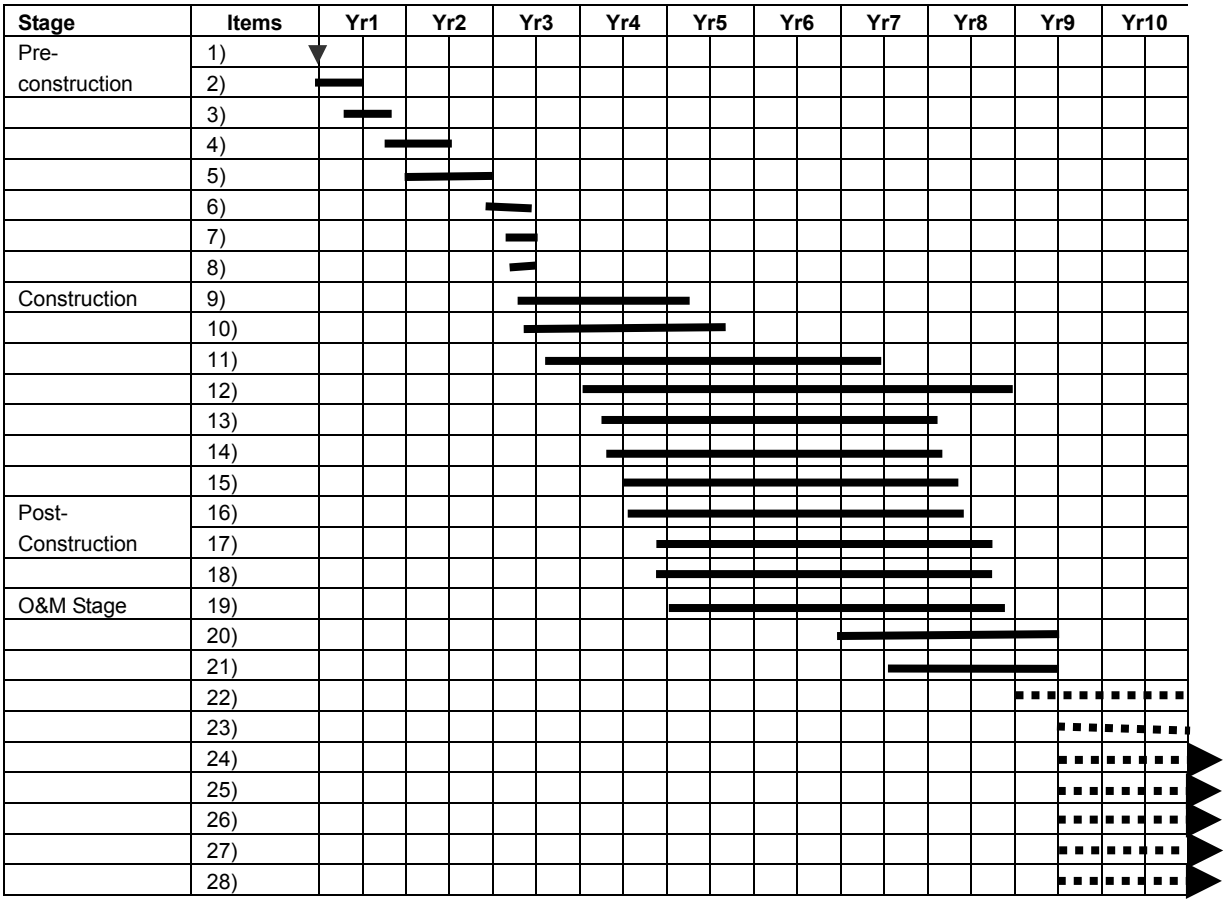
Phases	Key Activities
Pre-construction	1) Organization Of Project Management Office (PMO)
	2) Recruitment And Training Of Staff (Technical And Institutional)
	3) Training of WUADOs as Organizers; Planning And Deployment
	4) Social Mapping of the Secondary Area
	5) WUC Organization For Project Development Agreement With DOI
	6) Attends Leadership Installation Conference
	7) WUC Prepares Needed Documents and Registers WUC With DIO
	8) Signing of Project Development Agreement
Construction	9) WUC-PMO Consultation Workshop And Establishment Of WUC-PMO Project Management Committee
	10) WUC Meeting with PMO on Construction Plans And Schedules
	11) Attends WUC Training On Financial Management
	12) WUC Participates As Labor Contract For Construction Of Secondary And Tertiary Canals And Assists In Land Acquisition
	13) WUC Attends Pre-Construction Conference
	14) WUC Receives and Reviews Designs For Watercourse Development
	15) WUC Firms Up List Of Farmers, Organizes WUGs, and Mobilizes Farmers For Watercourse Construction
Post-Construction	16) WUC Reorganizes as per organizational Structure through Leadership Training
	17) Attends WUC Training On System O&M And Water Management
	18) Prepares For Joint Management Agreement with DOI
O&M Stage	19) WUC-IMD/DIO Discuss and Agree On Contract For Joint Management
	20) Formal Signing Of Joint Management Contract
	21) IMD Provides WUC Training On ISF Collection And Record Keeping
	22) Attends WUCC meeting
	23) Provides WUC Training On Maintenance And Water Distribution
	24) Implement Water Distribution Plan According To Cropping Pattern
	25) Regularly Manages Its Work On Water Distribution, ISF Collection And Maintenance
	26) Conducts Review And Planning To Improve It O&M Work
	27) Regularly Conducts With WUCC Coordination Meeting To Review And Plan System-Level Water Distribution
	28) Monitors WUC in implementation and provides access to agri-support services
IDP Management Functions	29) Staff Reporting
	30) IDP Supervisory Meetings
	31) IDP Staff Development
	32) IDP Monitoring

4.5.2 IDP Phases, Activities and Timetable

Table 4.5.2 shows the IDP phases, key activities and timetable. Right after the establishment of the project's PMO, the IDP starts with the recruitment of the WUADOs. On the 2nd quarter of year 1, their training as the WUAs' organizers will be conducted. They will facilitate organization of the ad-hoc WUCs following the organizing process discussed earlier up to the WUCs' registration. This work will culminate in the forging of project development agreement of each WUC with DOI concerned office. During construction the WUCs' and farmers' participation will be made possible through the WUC-PMO project management committee. The WUCs will participate in the construction of secondary and tertiary canals as labor contractors but will construct their 20 ha watercourses by themselves with the design from the PMO. The mobilizations for the construction of the watercourses will be the venue for the WUGs' organization following the process cited earlier. Once the WUGs are all organized, the WUC will be reorganized through the existing WUGs' chairnmen or changes in the leaders of the WUGs. The forging of joint irrigation system management agreement between the WUCs (Distributors) and the PMO/DOI (Supplier) will

be facilitated towards the end of the construction period and just before the system becomes operational. The Distributors' role of the WUCs will be performed with the guidance of the IMD/DIO and the WUCC. All relevant training programs will be provided to the WUCs at specific points in the implementation period.

Table 4.5.2 IDP Phases, Key Activities and Timetable



These training programs will be designed by the DOI/PMO and Consultants in preparation for the conduct of each training program as a participatory training course during the various phases of project implementation. It will be provided to WUADOs and their Supervisors either formally or on the job. These programs will cascade down to the WUCC/WUCs and be undertaken at the field level by the WUGs. All training programs attended by the WUC BOD or WUG Chairmen will have to be presented by them to all officers and members of the WUGs. The application of these training programs are seen as concrete actions by the leaders and members as they participate during each phase of the project implementation. As such, these training programs are woven to each phase from the pre-construction up to the O&M phase where the WUCs play the Distributors' role in the O&M of the secondary areas.

4.6 Inputs and Budget Required

The inputs required for the institutional development program of SRIP basically covers personal services, training programs, equipment and office supplies and local transportation costs. The total budget required for a 5-year implementation amounts to 51 MRs. The

personnel and training programs which is 70% of the total costs as proposed, involves putting into a reality what HMGN promotes in AMIS in terms of joint irrigation management which

Table 4.6.1. Summary Costs of a 5-Year IDP in SRIP

	Cost Areas	Total Costs in '000Rs	Percent
1.	Consultants/Personnel/Staff	23,100	46
2.	Trips and Per diem	6,000	12
3.	Training Programs	13,400	27
4.	Equipment and Supplies	5,600	11
5.	Office Supplies	700	1
6.	Local Transportation Costs	1,800	4
•	Total	50,600	100

may not be operational yet in Nepal. To achieve the main objective of this kind of an effort in SRIP requires the needed on-the-job and formal training programs both for the bureaucracy and the farmer through their WUCs.

4.7 IDP Management and Institutional Arrangements

The management of SRIP is centered on the Project Management Office (PMO) which will have 4 basic Divisions as shown in Figure 4.7.1. Without undermining the roles of other 3 Divisions, what will be emphasized here is the institutional development division (IDD). This Division is charged with promoting the change from the current practices of irrigation administration to the desired joint irrigation system management as proposed for the Project.

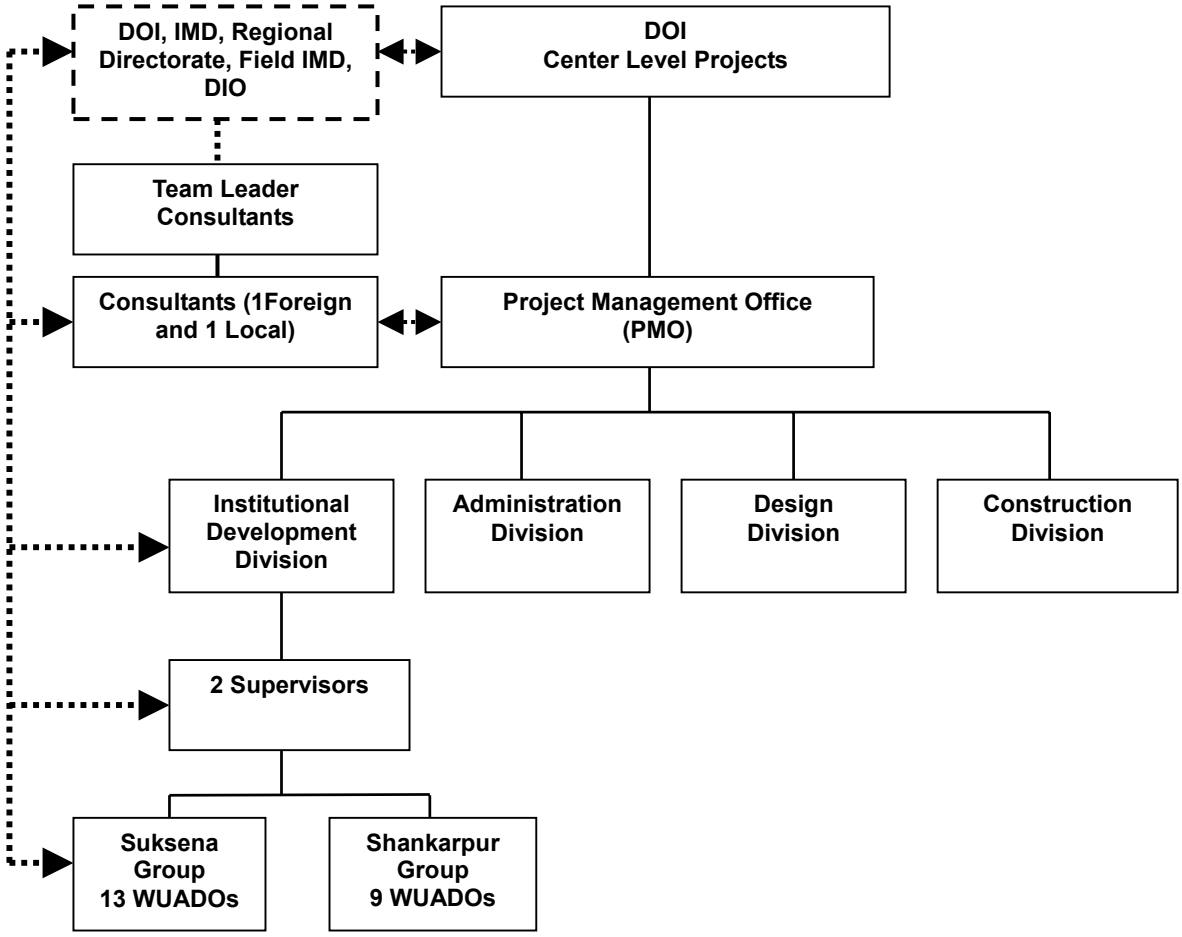
The declaration of joint management as an alternative mode of irrigation management was made in 1992 through the Irrigation Policy and reiterated in 2000 by the Irrigation Rule. This mode is introduced in SMIP and in the IMTP projects. As SRIP will learn from the experiences of these projects, the proposed joint irrigation system management will be practically new in terms of processes, approaches and methodologies.

As such experienced, domestic and foreign Consultants in this field with the capabilities to interface with DOI, vertically or horizontally, in various levels is required. As the Irrigation policy provides, national or foreign consultants shall be used only in the most essential areas for the purpose of irrigation development and management. Such engagement of the Consultants shall help improve the organizational structure and management to increase the effectiveness and reliability of the irrigation service. This can be done by strengthening the working capability of governmental and non-governmental agencies involved in irrigation development.

It is in this context that the IDP of SRIP be contracted out to an international Consultant who can tap and work with local consultant or NGO to operationalize in details the institutional development component called for under the proposed SRIP. The external support can strengthen better the DOI as a whole rather than the DOI itself who will do the institutional development component. It is better for DOI to do the physical infrastructure as this is main expertise in close coordination with those responsible for the social infrastructure in order to

arrive at the objective of joint irrigation system management.

Figure 4.7.1 Program Management Structure With Emphasis on SRIP's IDP



4.8 Potential Constraints and Countermeasures

Assuming the Government of Nepal and the GOJ agreed on the financing scheme of and both Governments will approve the Project and assuming further that the Project Manager has already been commissioned for the Project, the proposed IDP of SRIP will have the following potential constraints.

Table 4.7.1 Potential Constraints and Countermeasures

Potential Constraints	Countermeasures
1. The proposed IDP of SRIP is something new as the institutional development work in Nepal has been undertaken on existing systems with rehabilitation (IMTP) or CAD of the existing SMIP. With the new proposed headworks, SRIP is a new project and IDP in a new project is rather a rare, if any at all, case in Nepal. In this context, people can easily misunderstand the intent of the proposed IDP.	1. In this case, informal and formal education through workshops and seminars are needed with the bureaucracy. Deliberate attempts should be made to keep management informed from time to time on the progress of the implementation through brief understandable reports and meeting.
2. The proposed SRIP comprise the unserved portions of the downstream reaches of Suksena and Shankarpur canals within SMIP. The potential constraints in this situation deal with the negative perceptions of the farmers about Government projects in general. In particular, many of them (about 84 percent) have expressed about how badly they have experienced the performance of these canals. No water during dry season and flooding in their areas during the wet season. They may have difficulty in cooperating with SRIP in matters of project contributions (.2 percent) of the total project costs.	In this situation, the role of the WUADOs is extremely important. They will be the persons who will do face to face contact with the farmers. A good presentation and explanation on their side about how different this project is can change farmers' negative perceptions. Their early deployment to the area (start of the detailed engineering period or even before if possible) can facilitate their explanation about the project and the value of making a direct cost contribution to the project. Eventually, they will play the Distributors' role when the project is completed with their active participation.
3. The farmers think that this SRIP is just like the SMIP and they may have second thought about the proposed IDP.	Again, this lies on how the WUADOs can convince them about SRIP and depends much on the training of the WUADOs. The organizing approach and process will help the situation.
4. SRIP is a proposal to move towards higher farmers' contribution in project development (100% for the watercourse and 10 to 25 percent in the tertiary and secondary canals) and higher ISF collection based on the actual O&M costs of the Supplier and the Distributors. SRIP may suffer the problem of comparison with the lower contributions and ISF in SMIP which may make the farmers resistant to the project.	The consultation programs with and training programs for the farmers must really be made effective to be able to transcend the comparison of lower contributions and ISF than those proposed in SRIP. This problem can be addressed to by the frequent contacts of the PMO and the WUADOs. Thus, the consultation meetings and the pre-construction conferences with the farmers must be designed and conducted effectively.
5. SRIP 's IDP is dependent on the project or system to be truly functional in the future where the proposed institutional arrangement for the O&M of the system is joint irrigation system management.	As IDP will depend on the project, then SRIP must be so constructed that it can serve the requirements of the proposed Supplier-Distributor institutional arrangement under joint management.

CHAPTER 5 REVIEW AND REFORM OF RULES AND REGULATIONS

5.1 Project Development

The Irrigation Policy of 1992 (2049) section 3.24 provides that "His Majesty's Government shall invest in the project only after having formal agreement with the Water Users' Association by clearly defining the functions, duties and rights of the concerned Irrigation Office and Water Users' Association by adopting a transparent method in relation to the construction, implementation, operation and management of the project." Further, section 3.25 stipulates that the agreement concluded with the Water Users' Association shall be regarded as the basis of resource mobilization.

This pre-project investment agreement includes areas that have something to do with the project such as land for the watercourses, cost sharing according to the levels of canals and upfront deposit of the WUA. Despite such agreement, (IP) Article 2.2.3 made farmers' contribution mandatory to provide land free of cost for the small canal that is to irrigate up to 30 ha block. Along with this provision, the IP clearly says that farmers must construct the small field channels bringing water to their individual plots on their own. Furthemore, despite such agreement, the IP provides definitive cost contribution for both WUA and HMGN as specified in its attached table as shown below:

Users	WUA's Contribution	HMGN
Water Course up to 10 ha	100	0
Tertiary from 10 to 30 ha	25	75
Sub-secondary from 30 to 500 ha	0	100
Headworks, Main, Secondary Canals	0	100

Note: In case of rehabilitation. 12 % on the WUAs and the remaining 88% on the HMGN.

In addition to the farmers' donation of land for a 30 ha block, the WUA shall have to deposit an amount of 0.5 percent of estimated cost of any project which is to be operated and maintained finally by itself, in the joint Bank account of the concerned Irrigation Office and Water Users' Association as a security. The amount thus collected and its interest may be utilized by the Water Users' Association for the purpose of operation, maintenance or rehabilitation of such irrigation system after the completion of the construction of the irrigation system.

Basically, there are contradictions within the IP itself and issues in terms of how to proceed given the provisions of the IP. The tabled cost contributions of both parties is so contradicts the provision on the farmers' donation of a 30 ha block for irrigation and construction of field channels thereat. The contradiction confuses the meaning as to the size of the watercourse particularly in the field. The contradiction makes the setting of the area and cost contribution impractical. As to the WUA's upfront deposit of 0.5 percent of the estimated cost of the project, it is not clear who is going to do this and how. If this scheme has already been done, it will be very helpful to learn from the experience.

In the proposed SRIP, the watercourses have been designed for an average of 20 hectares. This will be done to make things simpler for the farmers as they are going to donate the land and construct the watercourse by themselves 100% with the design to be provided by the PMO of the project. Also, the project plans to agree with the farmers contributions for the

tertiary and secondary canals regardless of what has been provided in the IP table. The reform of the IP is not needed on this matter because, in the final analysis, the pre-investment agreement of the project between the farmers through their WUA and HMGN what the parties will be doing and contributing in terms of land, voluntary labor on construction and upfront cash deposit for the project.

In SRIP, this agreement will have to be facilitated by the WUADOs early in the detailed engineering stage. In this stage, consultations meeting with the farmers about the project will be undertaken. All the project's expectations and contributions from the farmers will be laid out. This will be done initially by the PMO and the WUADOs. As the WUCs are organized in an ad-hoc manner but registered with the DIO, the end-results of this process will be the pre-investment agreement for the project. As the catch-all term, therefore, is no-agreement-no-project situation as a matter of fact, the primary objective of IDP in the pre-construction stage to see to it that both parties reach into said pre-investment agreement.

5.2 Operation and Maintenance

The Irrigation Policy of 1992 (2049) states that projects larger than 2000 hectares in the Terai, which cannot be turned over to the Water Users Association for their operation, maintenance and management, shall be jointly managed by the concerned Irrigation Office and Water Users Association. The Irrigation Rule of 2000 (2056) reiterated this provision with the specification that the joint operation shall have an agreement between His Majesty's Government and the Users' Association. In accordance with Rule 10, the secondary canal, sub-secondary canal, tertiary or water course of such Project must be transferred to Users' Association. Such transfer will be under the agreement between His Majesty's Government and Users' Association pursuant to sub-rule (1). The obligation and responsibility of the activities to be carried out in accordance with the Water Resources Act and this Regulation including collection of Service Charge, share percentage of Users' Association, arrangement for maintenance shall be specified in such Agreement.

This is the basis of the SRIP proposal to have the WUCs manage the secondary canals up to the watercourses as a partner of the concerned Irrigation Office which will manage the headworks and the main canals. This is operationalized in the proposed WUCs-DIO Supplier and Distributors' institutional arrangement, the true expression of joint management. There is no reform needed here. What is envisioned is the operationalization of the joint management on the ground.

Rules 7 and 8 of the Irrigation Rule of 2000 provides for the organization of the Users Coordination Association and the establishment of deposit for maintenance fund. Furthermore, it provides that the Coordination Association will be registered. In the proposed SRIP, however, the Water Users Committees (WUCs) at the secondary level are planned to be the Associations that will be registered. All levels from the watercourses to the headworks require coordination where higher level coordinates the works of the lower levels. Without specifying which level this coordination will be confuses which level should be registered. In SRIP, this level is pinpointed. However, all WUCs will have to organized as WUCC to coordinate the DOI office concerning water delivery schedules or arrangements. This coordination does not require that the WUCC will have to be registered because this will confuse the

Distributors'-Supplier arrangement in SRIP.

On the maintenance fund, the Rule stipulates that the Users' Association shall establish a separate fund for the maintenance of the irrigation system and the structures and deposit at least ninety percent of the Service Charge and other income. It further provides that at least ninety percent should be allocated for the maintenance of canal, secondary canal and sub-secondary canal. This provision is basically redundant as the Water Users Associations are expected to do water distribution, maintenance and collection of water charges. In SRIP, the maintenance fund will have to be concretely established not only in the distributors' areas but also in the Supplier's area. The WUCs will determine how much will go to maintenance and other works of the Association and fixing maintenance to be 90 percent just for does not have meaning. So, in SRIP it is up to the WUCs to decide this purely internal and very specific matter like maintenance fund allocation.

If the Irrigation Policy, Water Resources Act and the Irrigation Rule have to be reformed, these will be stated as general guidelines and not as specifics. The specifics limit flexibility and innovations on the ground while the general guidelines serve as the framework of the specifics. The specifics are the expressions of the guidelines best formulated according to the requirements of the actual local situations. Thus, in SRIP the general guidelines will be followed but the specifics will be left to the agreements of the WUCs and the concerned DOI office relative to the agreed work of both parties, the Supplier and the Distributors.

Attachment 1

List of Projects/Systems (AMIS) Under The Operation and Maintenance Program
(As of 2000/01)

S.N.	Project /System	District	Location	Irrigated Area (ha)	Cropped Area Summer	Cropped Area Winter	Total Cropped Area (ha)	Cropping Intensity
1.	Chatara(Sunsari Morang) Irrigation System	Morang, Sunsari	Biratnagar	66,000	26,500	25,000	51,500	78
2.	Narayani Irrigation Project	Parsa	Birgunj	28,700	20,000	14,000	34,000	118
3.	Koshi Pump Canal Irrigation System and West Koshi Canal Irrigation System	Saptari	Rajbiraj	25,000	14,000	5,000	19,000	76
4.	Kamala Irrigation System	Dhanusha	Portaha	25,000	25,000	16,000	41,000	164
5.	Chandra Nahar Irrigation System	Saptari	Barmajhia	10,500	8,500	4,000	12,500	119
6.	Nepal Gandak West Canal System	Nawalparasi	Semari	10,300	7,850	5,000	12,850	125
7	Kankai Irrigation System	Jhapa	Gainde	8,000	5,000	1,200	6,200	78
8.	Banganga Irrigation System	Kapilvastu	Taulihawa	6,200	5,000	3,000	8,000	129
9.	East Rapti Irriagtion Project	Chitwan	Chitwan	6,060				
10.	Manushmara Irrigation System	Sarlahi	Basbaria	5,200	5,200	5,200	10,400	200
11.	Narayani Lift Irrigation System	Chitwan	Bharatpur	4,700	3,700	1,200	4,900	104
12.	Khageri Irrigation System	Chitwan	Bharatpur	3,900	3,900	2,000	5,900	151
13.	Mohana Irrigation System	Kailali	Dhangadi	3,500	2,000	1,200	3,200	91
14.	Narayani Tubewell Project	Bara	Kalaiya	2,800	2,800	1,000	3,800	136
15.	Jhanj Irrigation Project	Rautahat	Gaur	2,000	2,000	1,500	3,500	175
16.	Patharaiya Irrigation System	Kailali	Dhangadi	2,133	2,000	500	2,500	117
17.	Bijaypur Irrigation System	Kaski	Bijaypur	1,280	1,280	650	1,930	150
18.	Dunduwa Irrigation System	Banke	Nepalgunj	1,250	500	200	700	56
19.	Hardinath Irrigation System	Dhanusha	Hardinath	1,200	900		900	75
20.	Pokhara Water Utilization Project	Kaski	Pokhara	1,030	290	290	580	56
21.	Groundwater Tubewell Project	Mahottari	Jaleswor	1,000	1,000	800	1,800	180
22.	Rampurphnat Irrigation Project	Palpa	Rampur	755	755	400	1,155	153
23.	Sagarmatha Tubewell Conservation Project	Siraha	Lahan	700	700	100	800	114
24.	Panchakanya Irrigation System	Chitwan	Bharatpur	600	600	420	1,020	170
25.	Chaurjahari Irrigation System	Rukum	Chaurjahari	600	600	600	1,200	200
26.	Begnas Irrigation System	Kaski	Begnas	580	580		580	100
27.	Kailali Kanchanpur Tubeweel Project	Kailali, Kanchanpr	Dhangadi	556	556	100	656	118
28.	Phalebas Irrigation System	Parbat	Phalebas	340	300	100	400	118
29.	Phewa Irrigation Project	Kaski	Pokhara	330	330	330	660	200
30.	Hyangja Irrigation System	Kaski	Hyangja	320	320	320	640	200
31.	Bulingtar Irrigation System	Nawalparasi	Bulingtar	240	240	200	440	183
32.	Kapilvastu Tubewell Project	Kapilvastu, Rupandehi, Nawalparasi	Butwal	200	200	200	400	200
33.	Gadkhar Irrigation Project	Nuwakot	Gadkhar	140	140	140	280	200
34.	Gyandi Irrigation System	Parbat	Gyandi	100	80	40	120	120
35.	Aapchaur Coffe Kheti Irrigation System	Gulmi	Aapchaur	50		50	50	100
	TOTAL			**221,264**	**142,821**	**90,740**	233,561	106

Attachment 2

Agreement
between SMIP and the WUCC
on the
Operational Handing Over
of the
the .....(name).....Canal[1]

Having Considered

His Majesty's Government of Nepal objectives as elaborated in the Irrigation Policy 1992 and as amended in 1997 and the Irrigation Regulation 2056 with the aim to:

(a) optimally develop irrigation services through cost effective investment in the irrigation development and extension programmes while ensuring they are sustainable, and;
(b) to bring uniformity in the implementation process of all institutions and organisations, and;
(c) to decrease the government's involvement in the construction, maintenance and operation of irrigation schemes by gradually increasing the participation of organised users,

This Agreement

Entered on the date mentioned hereinafter between .....(name)..... Project Manager of Sunsari Morang Irrigation Project with its principal office at .....(address)..... hereinafter referred to as SMIP, as duly authorised representative acting for and on the behalf of the Ministry of Water Resources, Department of Irrigation of His Majesty's Government of Nepal on the one part and .....(name).....Chairperson of the .....(name).....Water Users Coordination Committee of the.....(name canal)..... with its principal office at .....(address)..... hereinafter referred to as WUCC, as duly authorised representative acting for and on behalf of the Water Users' Groups within the command area of ..... (name canal).....,

Now Witness as Follows:

(1) Whereas said SMIP has prepared an inventory and status report regarding the condition of the irrigation and drainage system, inclusive of all infrastructure and appurtenant structures within said WUCC's command area, hereinafter referred to as *the irrigation and drainage system*, including an Irrigation Area Boundary Map (Appendix 1);

(2) Whereas said SMIP on the basis of aforementioned status report has prepared a list and schedule of works to be completed and financed by the SMIP (Appendix 2);

(3) Whereas said SMIP and said WUCC both agree that additional repairs on the irrigation and drainage system other than mentioned under (2) may have to be carried out;

(4) Whereas said SMIP has prepared an Operation and Maintenance manual for the irrigation and drainage system for the use by said WUCC (Appendix 3);

(5) Whereas said SMIP has provided said WUCCwith training to take over the management including Operation and Maintenance of the irrigation and drainage system;

[1] HMGN, MOWR, DOI, Sunsari Morang Irrigation Development Board (IDA Credit No. 3009-NEP), MISSION REPORT, Institutional Development and Water Management Specialist, CONSULTANCY SERVICES For Sunsari Morang Irrigation Project, Stage III (Phase-I), NEDECO Netherlands Engineering Consultants, DHV Consultants BV, SILT Consultants (P) Ltd., Consolidated Management Services Nepal (P) Ltd., Masina Consulting Engineers (P) Ltd.

(6) Whereas said SMIP and said WUCC have tested the water supply system and observed that all WC outlets within the irrigation and drainage system can be properly served;

(7) Whereas said WUCC has inspected and accepted the condition of the irrigation and drainage system, the Irrigation Area Boundary Map as well as the list and schedule of planned works (Appendices 1, 2, 3),

Both Parties Now Agree:

(1) The said WUCC agrees to take over and said SMIP agrees to handover the full responsibility of maintenance and operation of the irrigation and drainage system with effect from the date of both parties signing this operational handing over agreement;

(2) The said WUCC, as authorised by its by-laws, agrees to accept all rights and fulfill all responsibilities associated with operating and maintaining the irrigation and drainage system within the .....(name).....canal command area, comprising:

(a) to operate and maintain the irrigation and drainage system in accordance with the instructions of the Water Users' Central Coordination Committee (WUCCC) and the guidelines provided by SMIP (Annex 3) in order to sustain and improve agriculture production;
(b) to provide the WUCCC on the request but at least one month before the start of each cropping season with information pertaining to the area intended to be cropped, the crops to be grown and the planting schedules;
(c) to identify and submit to said SMIP within six (6) months after signing of this agreement a request for funding of additional repairs; the request should be accompanied by a specified list of identified repairs, a plan of implementation and cost estimates;
(d) following review of the request by said SMIP and said WUCC and after reaching mutual agreement on the additional repairs to be carried out and release of funds by said SMIP, to carry out the additional repairs according to the list and schedule prepared by said SMIP and said WUCC, and to contribute in the associated costs sharing of said repairs through the provision of management and labour, free of charge;
(e) to complete the additional repairs within one (1) year after signing of this agreement;
(f) to solicit and obtain free of charge any such information or advice of the SMIP for the furthering of the WUCC, and the Water Users' Committee (WUCs) and Water Users' Groups (WUGs) within its irrigation and drainage system;
(g) to consult and seek approval of said SMIP in the event of making changes to irrigation and drainage system;
(h) to collect from the water users within its command area the Irrigation Service Fee (ISF) as specified from time to time by HMGN;
(i) to deposit 50% of the collected ISF in the Government Revenue Account not later than the second week of April of each calendar year;
(j) to divide and deposit the remaining 50% ISF in the accounts of the WUGs and WUCs within its irrigation and drainage system, and in the account of WUCCC in accordance with HMGN's regulations and as specified in the constitution;
(k) to submit at the end of each fiscal year audited statements of accounts of their monthly income and expenditures to the Chief District Officer for renewal of their registration, and to the WUCCC and said SMIP for monitoring purposes;
(l) to provide if and when required land for the establishment of an WUCC office.

(3) The said SMIP agrees to accept all rights and fulfill all responsibilities of this operational handing over agreement associated with providing services to said WUCC, which would include:

(a) responsibility for the operation of the intake gate of .....(name).....canal;

(b) completing construction works according to the list and schedule prepared by the SMIP (Appendix 2) within one year after signing of this agreement;
(c) the review and possible adjustment of the duly specified request by the WUCC for funding of additional repairs of the irrigation and drainage system;
(d) within one (1) month after reception of the request reaching agreement with said WUCC on the additional repairs to be carried out, the schedule of implementation, the associated costs and mode of payment;
(e) the provision of funds not exceeding NRs .....(amount)..... to said WUCC within one (1) month after reaching agreement on the additional repairs of the irrigation and drainage system;
(f) supervising and respectively approving the implementation and completion of additional repairs carried out by said WUCC;
(g) informing the WUCC through the sub-division in charge on the assignment or replacement of gate operators of the SMIP operating the intake gate of the .....(name)..... canal;
(h) informing the WUCC through the sub-division in charge on the start and end of water supply;
(i) the provision of the WUCC command area with the timely supply of the amount of water as per operational plan, with the exception of cases of *force majeur* including:
    - default payment of the WUCC with respect to the ISF;
    - natural calamities
(j) informing the WUCC through the sub-division in charge on changes in the amount and timing of delivery of the water as decided by the WUCCC;
(k) the provision of the WUCC with advice and training on matters pertaining to operation and maintenance of the irrigation and drainage system;
(l) the maintenance and upkeep to standards of all those irrigation and drainage infrastructure within the WUCC command area which will not be handed over and as such is not described in the status report;
(m) the provision of necessary physical resources to establish a WUCC office.

(4) Both parties agree that the implementation of all rights and obligations described in this operational handing over agreement will be exercised for a period of one (1) year only, where after a final handing over agreement will come into force;

(5) Both parties agree that implementation of all rights and obligations described in this operational handing over agreement are legally binding and are subject to the provisions of HMGN's Irrigation Regulations, as these provisions may be changed from time to time.

(6) Any conflict regarding the implementation of this operational handing over agreement will be resolved mutually, through consensus and/or in consultation with the WUCCC. Failing to reach a mutual acceptable solution, the matter will be brought to the Chief District Officer and its decision will be final.

(7) Any modification to this operational handing over agreement shall be in writing and made by mutual consent between both parties.

In Witness Whereof

The said parties have signed and stamped in duplicate on .....(date).....in.....(location).....

On behalf of His Majesty's Government of Nepal
Ministry of Water Resources
Department f Irrigation
Sunsari Morang Irrigation Project.

On the behalf of WUCC
of .....(name).....

----------(signature)----------
Mr. .....(name).....

Project manager

----------(signature)----------
Mr. .....(name).....

Chairperson

In the presence of

----------*(signature)*----------
Mr. .....*(name)*.....

Senior Divisional Engineer
SMIP

----------*(signature)*----------
Mr. .....*(name)*.....

Chairperson of WUCCC

Authentified and approved by

----------(signature)----------
Mr. .....(name).....

Chief District Office

Appendix 1

1. Inventory and status of canals and structures to be handed over
2. Status report signed by both SMIP and the WUCC
3. Irrigation Area Boundary Map

Appendix 2

List and Schedule of works to be completed by the SMIP

Works to be done by SMIP in the fiscal year _____
Wokrs to be done by SMIP in the fiscal year _____

Appendix 3
Operation and Maintenance Manual (to be prepared)

Title Page
- Title of Document
- Name of WUCC Territory
- Date Prepared

Introduction
- Purpose of the Manual
- Location of irrigation and drainage system covered by the Manual
- Brief History (When contructed, designed by who, managed by whom prior to turnover

Description of the I&D system
- Components of the system (secondary, sub-secondary, tertiary, quartenary, and drainage system

Layout Map

Operation Procedures

Operation procedure for Intake Gates

Detailed procedures of how the intake gates of secondary and sub-secondary canals are operated. This will include Q – H graphs, gauge reading and recording, on-off operational procedures, joint management, etc.

Operation procedures for irrigation system

Detailed procedures for operating the tertiary, quartenary and drainage canal system, division of flows and rotational supply among field outlets, preparation of a cultivation plan (cropping plan and irrigation plan)

Maintenance Procedures

Maintenance Procedures For Irrigation Infrastructure

Detailed procedures for regular and periodic maintenance of irrigation infrastructures. This will include procedures for weeding, desilting, etc.

Maintenance of Drainange Infrastructure

Detailed procedures for regular and periodic maintenance of drainage

Attachment 3

Status of Irrigated Areas in SMIP as of 2001/02

Canal Name	Design Irrigable Area or CCA[1] (Net) ha	Irrigated Area Moonsoon[2] (Net) ha	Irrigated Area Winter[3] (Net) ha
Sunder Gunder	385	385	0
CMC 2/T1	203	203	95
CMC 1-9	338	338	0
Ramdhuni	371	368	170
Manikchauri	1,295	1,290	665
Singhiya	740	740	385
Jhumka (SSJ)	946	946	450
Vishampur (S8)	403	403	200
Suksena (S1)	8,146	7,700	3,050
Shankarpur	6,687	6,630	4,740
Sitagunj (S9)	7,985	7,860	4,500
Ramgunj (S10)	6,845	6,380	3,000
Duhabi (S12)	426	426	135
Biratnagar (S13)	5,184	5,030	1,650
Hattimuda (SS13A)	650	650	400
S14-T1	197	197	120
S14-T2	248	248	150
Harinagara (S14)	11,399	11,200	6,110
Hurhuriya	960	930	120
CMC10/13-18	330	330	0
Bariyati (S16)	3,697	3,530	2,350
CMC11/19-21	165	165	0
Nayapati (S17)	2,000	1,950	1,230
CMC12/22, 23	110	110	0
Amjora (S18)	960	930	470
Ranjani	960	930	660
Chisang	170	170	100
Jhamanpur (S19)	2,075	2,010	1,330
Total	**63,925**	**62,099**	**32,680**

[1] January 2002, Progress Report No. 16 and Operation of CMC Moonsoon 2001
[2] Operation of CMC during monsoon 2001 (May 16 – October 25, 2001
[3] Operation of CMC during Winter 2001 (Dec. 4, 2001 – March 4, 2002-07-09

Attachment 4

SMIP ISF Collection in Stages I, II and III[1] From 1994/95 – 2000/01

Canal Name	Design Irrigable Area[2]	Stages	ISF Collections							Year of Handover
			2000/01	1999/00	1998/99	1997/98	1996/97	1995/96	1194/95	
Sunder Gunder	385									
CMC 2/T1	203									
CMC 1-9	338									
Ramdhuni	371	I	88,182	24,459						2000
Manikchauri	1,295	I	62,225	61,940						2000
Singhiya	740	I	105,818	41,561	11,115	27,642	13,499			1997
Jhumka (SSJ)	946	II	30,718	9,189	7,383	96	8,409	42,447	139,286	1993
Vishampur (S8)	403	II	25,812	23,189	23,045	21,945	37,891	31,872	25,356	1994
Suksena (S1)	8,146									
Shankarpur	**6,687**	**I**	**326,692**	371,888	106,760	75,328	55,978			1997
Sitagunj (S9)	7,985	II	576,386	616,304	197,128	276,863	444,664	280,312		1995
Ramgunj (S10)	6,845	II	462,976	551,839	141,579	101,338	291,960	314,193		1995
Duhabi (S12)	426	II		-	-	-	6,792	45,636	8,679	1996

[1] WUO and SMIP – Joint Management Workshop, RAD, Biratnagar, CONSULTANCY SERVICES FOR SUNSARI MORANG IRRIGATION PROJECT, STAGE III (Phase I), NEDECO Netherlands Engineering Consultants, DHV Consultants BV, SILT Consultants (P) Ltd., Consolidated Managemnt Services Nepal (P) Ltd.,Masina Consulting Services (P) Ltd., HMG/N, MOWR, DOI, Sunsari Morang Irrigation Development Board (IDA Credit No. 3009-NEP), March 2002

[2] January 2002, Progress Report No. 16 and Operation of CMC Moonsoon 2001

Biratnagar (S13)	5,184	III	34,435							
Hattimuda (SS13A)	650									
S14-T1	197									
S14-T2	248									
Harinagara (S14)	11,399	III	12,645							
Hurhuriya	960		49,179							
CMC10/13-18	330									
Bariyati (S16)	3,697									
CMC11/19-21	165									
Nayapati (S17)	2,000									
CMC12/22, 23	110									
Amjora (S18)	960									
Ranjani	960									
Chisang	170									
Jhamanpur (S19)	2,075									
Total	63,925									

Attachment 5

Results of Questionnaire During Farmers' Consultation Meetings on SRIP

I. Data Processing Methodology

After the data gathering stage, the accomplished interview questionnaires were encoded and analyzed using the Statistical Package for Social Sciences (SPSS) computer software.

The interview questionnaire was designed as a structured instrument. After encoding the data of the 254 questionnaires, preliminary statistical runs were done to validate the data distribution and to spot check for bouncing or error codes.

The Study generated 44 variables. These variables were basically information areas required in each item of the interview questionnaire. There were two sets of data in the database. One set was the numeric data types which are of interval/continuous nature. These are area size and amounts in NRs. In this study, there were 7 variables of this type. The other set was the nominal or discreet type. These are the more numerous variables and were coded as string values in the interview questionnaire. There were 37 nominal variables generated in this Study.

Statistical analyses used for the first set of data were descriptive such as the mean and frequencies.

The second set of data was analyzed using frequency counts and percentages. Further, significant differences and interrelationships were determined using non-parametric statistics.

Appropriate tables were generated to facilitate ease of interpretation in the discussion of Study findings.

In the draft report, preliminary findings yielded data that were seemingly clustered around farm location and source of income variables. The farm locations are upstream (Babiya, Narsimha and Jalpapur VDCs), midstream (Ramnagar Bhutaha, Gautampur, Basantpur, Harinagara, Madharsahi and Rajgunj VDCs) and downstream (Devangunj, Kaptangunj, Sahebgunj and Ghuski VDCs). Source of income variable was classified as agricultural production, employment, business, and farm labor. Cross-tabulations were done for the nominal and discreet variables. Difference of values were tested for significance at .05 level using Chi-square statistic.

II. Discussion of Findings

The 254 respondents come from the three farm locations, namely, upstream (20%), midstream (50%), and downstream (30%). Their age range distribution are as follows:

Age Range	N	%
17-29 years old	25	10
30-40 years old	89	35
41-50 years old	78	31
51-60 years old	50	19

61-74 years old	12	5
Total N	254	100

Majority of the respondents come from Muslim (16%), Koeri (27%), and Yadav (13%) castes. About 34% of them did not state their castes during the survey, while the remaining 10% come from the Sahu, Tharu, Newar, Bengali, Dhanuk, Sonar/Lohar, Brahmin, and the to be scheduled castes. About 87% were married, 66% had between 2 to 6 offsprings, 18% were childless, and about 4% had more than 10 offsprings.

Their total landholdings were 661.8 ha. Of these, 55%predominantly held from 1 to 3 hectares. About 21% had less than 1 has, 22% had between 3.1 to 6 has, 4% had between 6.1 to 9 has, and 2% had 10 to 14 has. The profile of their tenurial status are as follows:

Tenurial Status	% of N	Area in hectares
Owned	35 31 25 4 5	Less than 1 ha. 1.0-2.0 2.1-4.0 4.1-6.0 above 6 (15 maximum)
Leased	5	7.40
Tenanted	3	6.50
Sharecropped	3	3.83

About 80% derived income from agricultural production, 8% from employment, 6% from business, and 4% from farm labor.

When asked about the current status of irrigation in their farms, the respondents reported 84% of their katha were not irrigated during the monsoon and winter seasons. About 65 and 67% of them said water supply is very inadequate during the monsoon and winter seasons respectively. During these seasons, they obtained water from the following alternative sources.

Using Alternative Water Source		%
Alternative Water Source	Monsoon	Winter
Owned pump	24	23
Rented pump	41	43
Group owned pump	2	1

Majority (71%) reported they were not aware of SMIP's effort to organize farmers into WUG in their areas. Thus, they were not members of WUG as they were unaware of any WUG activities. Those who chose not to join WUG said they did not see any benefits in joining, were too busy or not interested to join.

About 91% of the respondents believed the proposed SRIP would improve agricultural production in their area by way of introduction of a new barrage along Sunsari River, the rehabilitation of Suksena and Shankarpura canals, and the construction of canal networks in the area. In short, they believed that SRIP is needed to provide new irrigation facilities and

improve existing facilities in their area. They expressed willingness (96%) to join WUA when this HMGN project requires them to do so. About 88% of the respondents were willing to assume officership positions in the WUA.

About 71% were willing to contribute counterparts to the project capital cost by way of the following:

Form of contribution	% expressing willingness
100% of project construction cost of 20-ha watercourse	16
NRs per bigha	
5-35	9
50-75	7
100-150	21
151-250	9
260-500	3
1,000-5,000	2

About 75% expressed willingness to provide free and voluntary labor in the construction of watercourse, and 59% were willing to provide free access to their lands traversed by canal networks of the Project.

After project completion, 87% expressed willingness to get involved in WUA activities, and 86% were willing to pay water charges. These are in the following amounts:

Amount (NRs) per bigha	% expressing willingness to pay	
	Monsoon	Winter
1-50	26	24
51-100	24	26
101-150	18	17
151-200	11	6
250-300	4	3
500-702		2

About 88% of the respondents were willing to participate in O&M activities. The O&M activities reported are the following:

O&M activities	% willing to participate
Canal maintenance	39
Water charges collection	26
Preparation of cropping calendar	34
Preparation of water delivery schedule	35
Attendance in meetings	38
Attendance in training programs	52

Majority (59%) of the respondents intended to participate in only one of these activities, 12%

in all of the activities, 11% in 2 activities, 8% in 3 activities, 7% in 5 activities, and 4% in 4 activities.

Significant Differences of Findings Based on Farm Location and Source of Income

Findings show significant differences of responses from the three farm locations and the six sources of income classification at 95% confidence.

a. Farm Location

Those who specified their caste affiliations were significantly distributed in the three farm locations. The upstream respondents were mostly from the Muslim caste. The midstream respondents were mostly of the Keori and Muslim castes, while the downstream respondents were mostly of the keori and Yadav castes. Most midstream farmer respondents had significantly bigger landholdings. A significantly higher number of farmer respondents from the midstream and downstream (N= 97, 61 respectively) derived their income from agriculture. As of study period, the same farm locations were also reported to lack irrigation water during monsoon and winter seasons.

The farmer respondents from the midstream and downstream locations showed significantly higher willingness to provide voluntary or free labor during project construction than those in the upstream.

b. Source of Income

Findings earlier mentioned in this paper showed 80% of the respondents derived income from agricultural production. Of this, 96% expressed willingness to join WUA, take WUA officership positions (88%), pay water charges (88%), and participate in O&M activities (90%).

Attachment 6

Documentation of Farmers' Consultation Workshops on Sunsari River Irrigation Project

I. General Information

Dates	Time	No of Parti-cipants	Village Development Committees	Venues
August 5, 2002	9:00 - 17:00 hrs	56	Babiya, Narsingh, and Jalpapur	Training Centre for Primary Teachers, Inaruwa
August 7, 2002	9:00 - 16:40 hrs	71	Bhutaha, Basantpur and Ramnagar Gautampur	Balkrishna Higher Secondary School, Ramnagar, Bhutaha
August 9, 2002	10:20 - 17:30 hrs	78	Harinagara, Rajgung Sinuwari, and Madhaharsahi	Harinagara Secondary High School, Harinagara
August 11, 2002	9:00 - 17:30 hrs	85	Kaptangaj, Sahebganj, Dewanganj, Ghuski	Krishna High School, Shankarpur, Kaptangarj
The facilitators for these consultation workshops were the DOI counterparts Tanka Kafle (Aug. 5), R. P. Koirala (Aug. 7), Manju Sharma (Aug. 9) and R. K. Mishra (Aug. 11)				

II. Objectives

1. to present and discuss the preliminary development plan of SRIP;
2. to solicit opinions, suggestions from the beneficiary participants and
3. to discuss the institutional, social, environmental and agricultural aspects of the Project as well as collect relevant data and information.

The Facilitator (Lok Prasad Bhattarai) presented the overall scenario of subject matter of workshop. At first, participants and team members introduced themselves. After introduction session Team leader Kosei Hashiguchi welcomed the participants and presented the introductory speech focusing on:

1. Brief introduction about the SRIP: In this connection he said that due to long lengths of Suksena and Shankarpur canals and sandy soil having very high percolation rate, as high as ten times the value considered for calculating water requirement in SMIP, the SMIP was unable to provide irrigation facility in the present study area. Due to this HMGN requested, 3 years back, the Govt. of Japan for feasibility study of SRIP. The study started 15 months ago (April 2000) with discharge measurements of Sunsari River to ascertain potential command area, and is ongoing to date. The Study Team has also been continuously conducting research on the other aspects like agriculture, social, environmental, etc.

Picture 1 . Team Leader Presented Background of the Study

Based on the study so far a preliminary development plan of the Project has been prepared that will be discussed during the workshop and requested the participants for their suggestions and opinions. He said that the outcome of the workshop would be reflected in the final development plan (FDP).

Another aspect is the implementation of the Project. He also narrated that the irrigation facility will increase the agriculture production, in the case of SRIP, for example, the paddy production may go

up to 80 mounds per bigha (from 40 mounds at present) i.e. an increase in yields by two times.
Finally, the Team Leader informed that the Study Team is responsible for the design and planning and not responsible for the implementation. Upon the completion of the study work, HMG/N is responsible for implementation of the project. Some part of the fund that is needed for the project implementation should be borne by HMG/N from its national treasury and the remaining part may be managed by other agencies. One of such agency may be the Government of Japan. But, a concrete and detailed plan is necessary before seeking for ask assistance from such agency. He also hoped that this discussion may play a good role in making a concrete and detailed plan of the project.

He stressed that other issues to be considered for the success of the project are ISF, fund required for O,M &M and the beneficiaries commitment for contribution during construction. He requested the participants to discuss these issues and provide their valuable suggestions.

Condition of SMIP: On the one hand Suksena and Shankerpur canal are very long and other hand the lower part of it is sandy which needs more water. SMIP can not irrigate the southern part of the SMIP area. **About the ISF of SMIP**: The present SMIP Rate of Rs 135/bigha/year is not sufficient for canal operation and On the maintenance, the ISF rate (Rupees per bigha per year) should be decided in such a way that the collected amount could well cover the operation and maintenance cost of the project. Per preliminary calculation, for good operation and maintenance, it takes Rs 550-600/bigha/year. The Government of Nepal has been continuously giving the large amount of subsidy for SMIP. But it is not good financially for the Government. HMG/N will face bankruptcy in the future. It is better to collect the ISF from the farmers themselves for operation and maintenance of the water course. **About the share of the construction part**: The main part of the canal construction can be borne by HMG/N or donor agency. He asked to discuss about the last part which covers the around 20 ha of land can be constructed by farmer or not.

2. Technical Aspect of the Project. Next, the facilitator requested Mr. R. Koirala to present the technical aspects of the Project. He started by explaining about the river morphology along different reaches and the history of change in the course of the river in the past and river discharge in the peak and lean season. He also explained about the status and supply from SMIPand the reasons for taking up the project. He described the proposed facility/structures of the project in detail. The presentation is as follows:

Picture 2. R. Koirala Presenting Technical Aspect of SRIP

Source of the river originates at hilly area near Dharan
U/s catchment, high erosion because of deforestation, weathering and agriculture practices. Total catchment area 294 km^2 at E/W Highway Bridge. Up stream reach, agradation (bed rising) problem, while at down stream reach, meandering problem. Inundation problem in Study area (particularly, Narsimha, Basantpur, Ghuski and Kaptangunj VDCs). Maria Dhar remained active during 1962 – 78. Average monthly discharge at E/W highway crossing, minimum 2.746 cumecs, maximum 40.21 cumec, and Total annual volume is 420 million cu m. During lean period, a significant contribution from SMIP join this river as seepage water.

Sunsari Morang Irrigation Project (SMIP), (with Map). Total command area in Sunsari and Morang districts is about 73,000 ha. SMIP is being implemented under different phases of different stages.

Suksena and Sankarpur were developed under first stage. Suksena and Sankarpur canals are long canals. The type of command area under these canals is sandy soils. Average percolation loss considered for entire SMIP command area was 2 to 3 mm per day, while, the average percolation loss in SRIP command area was observed as much as 15 to 20 mm/day. Therefore, a shortage of water is felt in this area.

Sunsari River is flowing without being harvested, and the area nearby (SRIP) is thirsty. Therefore, it may be a good decision to consider the use of Sunsari River water for irrigation purpose.

Some of Technical Features of SRIP

Total Area	16818.8 ha
Gross Command Area	11338 ha
Net Command Area	10147 ha

		Sukasena	Sankarpur
Net Command Area	(ha)	5529	4618.8
Main Canal Length	(km)	21.20	20.80
Design Discharge	(m3/s)	10.50	8.80
Long slope		1/5000 to 1/2600	1/5000 to 1/2500
Bed Width	(m)	5.80 to 1.60	5.50 to 1.50
Secondary Canal Length	(km)	70.00	68.00
Tertiary Canal Length	(km)	93.100	
Total Nr of Structures		778	

Some rearrangement of secondary canal layout could be done (or adjusted) whenever felt necessary from the viewpoint of manageability.

Cropping Pattern. Several alternatives of cropping patterns were critically reviewed. If we consider 80% system reliability (i.e. one out of every five year is supposed to be drought) then a suitable cropping pattern for summer may be 60% land covered by paddy and 40 % others crop like vegetables, jutes etc. Similarly, if we consider 50% system reliability, in such case, 80% land can be covered by paddy and remaining 20% with other crops like vegetables or jutes.

The appropriate cropping pattern during winter season depends very much upon the quantity of assured water that we can divert from the head work. A minimum amount of water should be released downstream from the viewpoint of environment and other biological needs. But this quantity is not decided yet. If we consider this quantity as 10% of available flow minimum, the 90% area can be brought under irrigation with 50% wheat and 50 % vegetables. But, if the minimum discharge be 50% of available flow, then the coverage may be approximately 50% of the total land. In such cases, we have to introduce rotation supply system. And conjunctive use of STW may be a reasonable solution.

Road Network. When assured irrigation is available, the production starts increasing. That requires good road network. Project facilitates canal service roads along main canal, selected secondary canals. Other agencies like DDC and DOR are also involved in making roads in that area. So, a good coordination among all agencies is felt necessary to decide additional service road network.

WUA. Establishment of WUA for project implementation phase as well as for operation and maintenance. A joint management between Government and Water Users will be established to operate and maintain the project. Government will take care of Barrage and main canals. Remaining parts will be taken cared of by the WUAs.

Raised questions during discussion

- Flood problem is more pronounced than irrigation
- Some extra water should be diverted to Maria dhar (particularly, during flash flood)
- SMIP canal network is obstructing the natural drainage of the area, this project may still worsening the problem (12 rivers)
- Is it possible to use (and reuse) of local small rivers for irrigation purpose?
- River courses are being encroached, whether there is any plan to take action or not?
- Is 10,000 ha of land irrigate at once or in rotation basis?
- Are the V.Cs of the SMIP being replaced or not?
- Do the both water sources (Sunsari River and Chatara of SMIP) use in same canal.
- Do the Suksena as well as Shankerpur canals carry out the water (capacity of the canal)
- Is this irrigation project irrigating the western part of the Mariya Dhar which is little bit high?
- What type of gates will be there?

Other technical issues discussed were:
- reasons behind the selection of headwork site
- planning of canal networks, with due consideration to utilizing the existing canal networks of SMIP to the extent possible
- SMIP's inability to deliver water to the present study area with emphasis on high percolation rate than adopted in project design
- different stages of command area development in SMIP
- SRIP can provide irrigation water to 60% of the proposed command for paddy at 80% system reliability
- approximately a highland area of about 500 ha. in Kaptanganj VDC will not be irrigated by SRIP
- main canals and major SCs will be graveled
- project to be managed under joint management

Issues raised by the participants:
- part of Narsingh VDC north of western main canal of SRIP deprived of irrigation
- area on the other side of Geruwa Khola irrigated neither by SMIP nor by SRIP. Study team agreed to make field inspection.
- location where the eastern conveyance canal will meet Shankarpur distributary?
- provision of flood control and drainage improvement in the scope of the project, if not, even the irrigation infrastructures might get damaged.
- what about having covered conveyance system? that might save land.

Is there any plan to use Maria dhar for irrigation?
- *The study team is looking after the possibility of constructing any structure around Madhya Harshai VDC so that around 500 ha. of land can be irrigated.*

How will be the area between feeder canal of the proposed project and EW highway irrigated?
- *We will recommend that this area should be irrigated by SMIP*
- **Around 500 bigha of cultivable land on the south western side of Kaptanganj VDC is inundated every year for 4 months in monsoon and farmers are unable to grow paddy in that area. After construction of canal network this problem will be more severe. Excess water should be drained in consultation with the Govt. of India.**
- Right now we don't have any big scale drainage development program.
- **Meandering nature of sunsari river is destroying cultivable land every year and it may also damage the canal network so proper embankment along sunsari river should be made.**
- If the river poses threat to the canal at some places some river training work may be considered and we will also put sufficient cross drainage structures to protect our canal and maintain natural drainage. Talks with Indian Govt. is on for construction of embankment along the sunsari river.

Clarifications from Study team:
- areas not irrigated by SRIP are expected to be irrigated from SMIP.

- flood control and drainage improvements not considered so far in the scope of works.
- covered canal will lead to high cost and O & M difficulties.

3. Institutional Development. There after, the discussions about institutional plans were started by Mr. Ehera mentioning that a good start would mean continued discussions which would lead to many agreements and what is most needed is the participation of all. Mr. Ehera started his session with explanation about the need of organization for a project that covers 10,000 ha. and around 16000 households. He said, "As a farmer we have three basic concerns and these concerns the objectives of this project. They are:

- Supply of adequate water
- Timely availability of water
- Fare share of water(Equity)

When problems arise in achieving those objectives we think of organization, rules, procedures, agreements etc." He also discussed the following issues:

Ted Ehera described the importance of water users group. As the project increases in size, difficulty also increases in running various canals like main, secondary, tertiary, water courses and field channels. He also mentioned that the main task is to supply smooth water to the fields of nearly 16000 farmers. There is barrage, two main canals (suksena and shankerpur). Suksena covers the 5000 ha of land and Shankarpur canal irrigates around 4500 ha of land which is far from farmer's farm. So there is need of many tertiary canals. A watercourse is proposed to cover 20 ha of field. So the group of nearly 30 farmers within this 20 ha land is called WUG. Government will construct main canal, barrage, sub canal, tertiary canal which is estimated to amount to about 15 million US dollars. At the same time, the Government expects WUGs to make water courses and field channels within the 20 ha land. The presentation also emphasized the following points:

- large irrigated area means great number of beneficiaries → many problems requiring strong institution to solve them.
- institution also needed for making rules governing water distribution.
- no religious, no political but irrigators' organization.
- the organization to be bottom up.
- a watercourse for a block of 20 ha.(about 30 farmers).
- the proposed WUA structure starting from watercourse and higher up to system level was discussed.
- different stages and aspects of decision-making and execution were explained using flip charts.
- the role of board of directors and formation of various committees was discussed.
- 100% contribution in construction of watercourses.....no compensation for land

Mr Ehera also presented the proposed WUA structures from WUGs to WUCC and highlighted the nature of work to be executed under each level. He also mentioned the role of discipline in democracy as well as in WUA.

Mr Ehera asked to the participants whether they are ready to participate or not? With some reluctance, farmers nodded their head in the favor of YES. The Team Leader cited some examples of Egypt and Philippines. With some reluctance, farmers nodded their head in the favor of YES. Some raised issues (by participants) were:

- make firm law and enforce effectively

Picture 3. T. Ehera
Discussed the Proposed IDP of the Project

- what is the demarcation (to what level, the agency can go) limit
- contribution made by farmers may develop some sentimental attachment with the project

Some raised issues (by participants) were:

- make wardwise WUA

Clarification: It is built according to hydrological figure. WUA member should be that person who irrigates the water.
Proposal by Ehera: Govt contributes 15 million US dollor, how much rupees is from your side?
Reaction: we pay land tax, ISF. Another gentle man from back side said that that as 15 million US dollor is loan so all Nepali people are responsible to pay.
Proposal: Is it possible to construct the water course by farmer or not (which irrigates 20 ha. of land)
Reaction: Yes, we can. We must do by ourselves. We even construct the water course of Ground water irrigation.
Another guy: we agree by mouth but not in action.
Queries from farmer: For small farmer it is very difficult to contribute the land without compensation. Can he expect compensation from Govt or not?
Answer by Ehera: WUA can manage and decide it. Tertiary, secondary, main canal which is not paid by SMIP will be paid the compensation.
Response by farmer: we agree. We share the water course.

Mr Ehera added that to make the project successful, four basic points (objectives) are important:

- Water distribution
- Operation and protection of facilities
- Maintenance
- ISF

To fulfill these points what we need are

- An effective WUA
- Handing over all facilities after completion
- Joint Management (Irrigation Office and WUA)

Participants' reaction:

- the farmers' agreed to the need of an organization and also to the proposed model of WUA
- They were somewhat reluctant about the construction of water course and some of them raised the point that it will be difficult to get land from the concerned farmers
- After repeated explanations and justifications , in principal they agreed to go for the contribution.
- One of the participant raised the question that if there is a single or few farmers in a watercourse, how to organize WUG in that case. Mr. Ehera said that in that case a single farmer will represent the WUG.
- One of the participants raised the point that one watercourse can not irrigate 28 ha.(A case of SMIP)
- Mr. Ehera replied that it may be a technical problem but a strong organization can do something in this regard. They can distribute water equitably. "Self" and "I" is a problem for good organization. "WE" should prevail.

Afterwards, a one-page institutional development scoping questionnaire was distributed to the participants. The study team helped in filling it. After the participants finished filling the format, Mr. Ehera resumed the session again. He explained about three important aspects relating to implementation and post construction phase vis-a-vis;

- Government takes on the headworks and main canals ant the secondary canals down will be managed by the WUCs and farmers. The participants agreed to this arrangement.
- construction contribution, especially construction of watercourses and partial contribution in the cost of tertiary canal.
- Rate and payment of ISF. Ideally, the basis of ISF amount should be O&M cost.

Participants' response:
Mostly participants were of the opinion that the project is needed but, owing to the poor condition of the farmers they are not in a position to contribute to construction cost, but can give labour contribution only for a day or two. If constructed they can operate and maintain the lower level canals. Finally, Ted Ehera raised the issue of ISF. He tried to solicit the opinion of farmers regarding this matter. There was distinct division in respect of the amount. Few farmers said that we should follow the SMIP practice. But most of them have realized that it is too low. They offered higher ISF. Someone even suggested that considering the operating cost of STW, they can pay up to Rs 600 per year per bigha.
So at last the consensus among the farmers was made that 1) it will be increasing gradually not at once, or 2) - ISF @ Rs. 200 per bigha o.k. but should be supported by AESS, so that we can be benefited by irrigation., or 3) about 270 to 300 Rs per annum per bigha at the beginning, later as per the reliability, the WUA can review the ISF, or 4) pay as per the prevailing SMIP rate or even higher than that provided that the irrigation service would be reliable. Team Leader suggested that the decision on ISF is still open and can be again discussed later on.

Other issues raised by participants:
- what if someone does not give land for watercourse?
- study team should try to further lower down the command of one watercourse.
- Watercourses should be planned in consultation with farmers.

After the group discussion the facilitator summarized the findings of the daylong proceedings in brief which are mentioned above under different sections. The issue of contribution and ISF as said to be understood by the project was conveyed to the participants for reconfirmation as follows:
- O & M below main canal by beneficiaries.
- beneficiaries agree to contribute as much as they can.

After this, the participants were divided in three groups VDCwise i.e Narsingha, Babiya and Jalpapur and discussions about agricultural, social and environmental aspects were made separately with different teams in a merry go round style. The aim was to collect information, solicit their opinions and discuss about possible impacts of the project from the participants point of view. The main findings were as follows:

4. Social aspect (facilitated by Ms. Okata and Ms. Sharma): some informations regarding the following were gathered.
- wardwise cast distribution distribution
- land holdings
- problem ranking
- village roads
- existing organizations in the villages e.g. NGOs etc.
-

A brief introduction of Social Aspects was given in each VDC group. Ward wise information regarding social structures (caste wise), land holding size were collected in a tabular format. Apart from these information, some other problems, the farmers are suffering, were also collected with ranking

Picture 4. Okata-san & Sharmaji interviewed Women During Farmers' Consultation Meeting No. 2

(importance). Also information regarding active NGOs working within VDCs was also sought with their rank. A brief summery is presented below.

The problems identified were irrigation, sanitation, School, cattle stealing, security etc. The rank of the problems, as they have mentioned, are

1. Irrigation 2. Cattle stealing
3. Road network 4. Education
5. Sanitation etc

In August 9 meeting, the Team took the VDC mapping of all three VDCs. The wardwise information of caste distribution and land holding size were collected from each wards of every VDC. There were three different topics for each VDC for the discussion.
For Madhaharsahi: Leadership and decision Making process
For Rajgung Sinuwari: Identifying problems and ranking them
For Harinagaara: Existing community based organization, purposes, their activities etc

Findings:
Madhaharsahi: Leadership and decision Making process. Decisions of village level problems are done by the Panchayet (informal meeting of related persons). There is not formal leader. People of two party seat in one place and try to solve the problems. The meeting decides the punishment for wrong doing.

Rajgung Sinuwari: Identifying problems and ranking them. More than 15 problems were picked up and asked them to rank them. Lack of irrigation facilities, problem of security and problem of road seemed main problems of the VDC.

Harinagara: Existing community based organization, purposes, their activities etc.More than 12 local as well as I/GO organization are there. Except them co-operative organization which was organized by local farmer seemed very active.

Among 5 NGOs active in this VDCs, "Eillet millet community" stood first based on the activities. Rural Development Bank's activities also lauded.

Basantpur VDCs. The problems identified were irrigation, sanitation, School, cattle stealing, security etc. The rank of the problems, as they have mentioned, are

2. Irrigation 2. Cattle stealing 3. Road network 4. Education
5. Sanitation etc

Ramnagar Bhutaha. Among 5 NGOs active in this VDCs, " Eillet millet community" stood first based on the activities. Rural Development Bank's activities also lauded.

Basantpur. Farmers of this VDC seemed united to run commercial resources (a commercial land of 250 bigha). Some of the land has been given to the landless farmers under lease. The management without the farm is not found encouraging.

5. Agricultural aspect (facilitated by Mr. Miki and Mr. Mishra):

- the participants agreed to the cropping pattern proposed by the study team.
- at present in Babiya VDC 90% paddy. 60 – 70% being irrigated by SMIP.

Picture No. 5 . Miki-san & Mishraji Gathered Opinions on the Agricultural Aspect

- Narsingh and Jalpapur VDC- only 15 – 20% are being irrigated by SMIP.
- constraints to irrigated agriculture: timely and reliable irrigation, market, non-availability of inputs and AESS.

6. Environmental Aspects (Hideyo Shimazu, Janak Timalsina, R Koirala)

A discussion regarding the environmental issues were conducted among the farmers of each VDCs. Team tried to disseminate knowledge among farmers about the need of environmental study for large development activities. The team also described the procedure in each step and solicited the opinion from the farmers regarding the positive as well as negative impacts that would arise in the future after the implementation. All participants spoke that they do not identify any negative impacts of the project, however following existing problems were mentioned which the study team must consider to mitigate/ remove during further stage of study in the future.

Picture No. 6. Kafleji Solicited Ideas From the Participants on the Impacts of SRIP

- Effluent from paper mill is directly affected to the cattle and agriculture yield. Farmers are seriously

  angry with the mill
- We can not use Mariadhar to divert flash flood at Sunsari River
- Sediment diverted from river may damage agriculture land

- Paper Mill effluent problem
- We can not use Mariadhar to divert flash flood at Sunsari River
- No significant impact to fishermen community

  There may be some erosion problem
- may affect the health of cattle/ human beings (because of increased dampness)
- No significant impact to fishermen community
- Suggest that the effluent color and river water color should be same (eye judgment)

- EIA process and publication of notice for scoping was explained. Participants were asked to give their opinion about the possible impacts. Their response was as given below:

Positive impacts – silt can act as fertilizer, increase in productivity and production, construction of access roads, increase in cropping intensity etc. and in an overall sense betterment in the living conditions of the people.

Negative impacts – water quality down stream of the headwork needs attention especially in the context of reduced flow in the river during winter and spring season and release of effluents from the paper mills.
- inundation problem though not directly associated with the project.
- existing downstream use (for lift irrigation, cattle watering etc.) may be impaired.

Other comments:
- they were of the opinion that fishing in Sunsari river is not a major problem. One of the participants suggested that the fishermen can fish in the canals.

- the IP Chairman of Jalpapur VDC raised doubts about the possible development of Mariya Dhar as an alternate fishery option. He said that most of the land within the Dhar is private in the sense that people are using it and paying tax to VDC. But few other participants (in low tone) objected to this.
- when asked about the minimum release in the river for environmental considerations, a compromise between irrigation and ecology during lean period, they suggested 25% of the flow.
- Sunsari river is fed by spring source.

III. Closing Remarks

The meeting again assembled in the plenary session. One participant from each VDC was given some time to express the views on behalf of his VDC. After this, some important participants were requested to address the session on behalf of the farmers.

Their opinions are given below.

Immediate Past Chairman, Babiya VDC: "SRIP will be boon to the 13 VDCs that are deprived of irrigation facilities at present. At the same time we have bitter experiences of some very good projects not being implemented in the past. But I hope this will be implemented. Thanks to all."

Immediate Past Chairman, Jlpapur VDC: "People will be greatly benefited by this project.Thanks."

Ex-VDC Chairman, Narsingh VDC: "We are glad that SRIP, for which we were trying for ever is being studied. We will help our best for the successful implementation of this project.Thanks."
Ex vice chairman of Harinagara: He expressed gratitude to JICA team and requested to start this project as soon as possible.

Ex Chairman of Madhaharsahi: He expressed that the people of Madhaharsahi will be benefited by SRIP. He promised that the project will be supported by the people of Madhaharsahi. He gave thanks to JICA Team who are going to carry out the feasibility study of SRIP.

Ex Chairperson of Rajgung Sinuwari: He welcomed everybody. He said that the people of Rajgung Sinuwari are very glad by the SMIP and gave thanks to JICA team on the behalf of Rajgung Sinuwari people.

Momd. Allauddin, Ex chairman of Ramnagar Bhutaha.
Requested to the Study Team to convey their plight up to the central government and thanked to the team

Sikamlal Yadav, Ex Chairman of Basantpur
Welcomed to all of JICA Team and DIO, Irrigation is very important, Road network is also important and thanked to everybody

Duriklal Shah Ex chairman of Gautampur VDC
Welcome to everybody. SMIP did not consult with farmers at early stage that is why it has so many problems. So this is a good practice to solicit farmers' suggestions which may be a key to the success.

Mr. MungaLal Mehata(Ex. VDC chairman,Kaptanganj) : " We appreciate JICA"s effort and we will cooperate to make it a success.We are ready to cooperate whenever needed."
Mr. Ram Charan Mehata(Ex. VDC chairman,Dewanganj) : "We have suffered a lot due to lack of irrigation. we are using STW but it is costlier than surface water. Future will show this project will help us or not."

Mr. Sabud Khan(RPP representative, Ghuski) : "Due to the discussion held today I believe that this project Will be a boon to this area."

Mr.Jawahar Lal Pal(Ex. VDC. Vice chairman) : "If this Project is implemented we will certainly get benefit"

The Facilitator Mr Lok Prasad Bhattarai gave thanks to all and formally closed the Meeting.

Attachment 7

Setting-up of Water Users Committees in Sunsari River Irrigation Project

Canals	WUC	Area, ha	Direct TO	Sub-WUCs	WUGs	Membership
Shankarpur Main	1SRL+MCO1&2	278.0	2	3	14	278
	1SLL	211.7		2	11	212
	2SRL	314.3		3	16	314
	2SLL	131.3		2	7	131
	3SRL	162.5		2	8	163
	3SLL	401.5		3	20	402
	4SRL	150.1		2	8	150
	4SLL	248.2		3	12	248
	5SRL	245.2		3	12	245
	6SRL	277.4		3	14	277
	5SLL	241.8		4	12	242
	6SLL	359.8		4	18	360
	7SRL	162.3		3	8	162
	7SLL	383.1		4	19	383
	8SRL+MCO3-6	233.4	4	2	12	233
	8SLL	332.8		3	17	333
	9SRL	232.5		2	12	233
	9SLL	252.1		0	13	252
Sub-total	**18**	**4,618.0**		**48**	**231**	**4,618**
Min		**131.3**		**0**	**7**	**131**
Max		**401.5**		**4**	**20**	**402**
Average		**256.6**		**3**	**13**	**257**
Suksena Main	1SLR+MCO1	183.1	1	1	9	183
	2SLR	167.7		3	8	168
	3SLR	353.3		5	18	353
	1SRR	292.5		4	15	293
	4SLR	274.2		3	14	274
	2SRR	388.3		5	19	388
	3SRR	126.8		2	6	127
	5SLR	204.1		2	10	204
4SRR	TC1&TC2	139.6		2	7	140
	TC3	210.5	as required	0	11	211
	TC4	190.0		1	10	190
	TC5	267.3		0	13	267
	TC6&TC7	243.2		0	12	243
Suksena Main	5SRR	115.3		0	6	115
	6SLR	136.8		3	7	137
	7SLR	199.5		2	10	200

	8SLR	168.4		3	8	168
	6SRR	174.7		2	9	175
	9SLR	172.0		2	9	172
	10SLR	134.9		0	7	135
	7SRR	256.1		3	13	256
	11SLR	281.4		3	14	281
	8SRR	211.1		3	11	211
	12SLR	199.1		3	10	199
	9SRR	217.7		2	11	218
	13SLR	221.4		2	11	221
Sub-total	**26**	**5,529.0**	**-**	**56**	**276**	**5,529**
Min		**115.3**		**0**	**6**	**115**
Max		**388.3**		**5**	**19**	**388**
Average		**212.7**		**2**	**11**	**213**
Whole SRIP	**44**	**10,147**	**-**	**104**	**507**	**10,147**
Min		**115**		**0**	**6**	**115**
Max		**402**		**5**	**20**	**402**
Average		**231**		**2**	**12**	**231**

Note: Taking into account cases having plural plots, expected membership was estimated on basis of average 1ha land per farmer though statistical average is 1.24ha.

Attachment 8

Breakdown of IDP Budgets Required

A. Personnel Required	No.	Man-months	Rate US$/Mo.	Total
Institutional Development Consultant (Foreign)	1	12	10,000	120,000
Institutional Development Consultant (Local)	1	45	1,500	67,500
WUADO Supervisors	2	45	200	18,000
WUADOs	22	33	100	72,600
	15	12	100	18,000
Total	26	147		296,100
B. Trips				
Foreign	8		2,400	19,200
Local	24		160	3,840
C. Per Diem (Foreign)	360		150	54,000
SUB-TOTAL				669240

D. Training Programs	No. of Batches	No of Parti-cipants	No. of Days	Rate per person per day	Total NR	Total USD
DOI Orientation (Mainly Regional down)	4	30	1	200	24000	307.70
WUADOs' Organizers Training	1	30	7	200	42000	538.46
WUADOs' Trainers Training	1	30	3	200	18000	230.77
PMO-WUADOs Coordination Training	1	40	2	200	16000	205.13
Leadership Installation Conference	15	40	3	200	360000	4615.39
Training On Financial Management	15	40	2	200	240000	3076.92
Leadership Training (Reorganization)	15	40	2	200	240000	3076.92
Training On System O&M And Water Management	15	40	2	200	240000	3076.92
Training On Maintenance And Water Distribution	15	40	2	200	240000	3076.92
Training On ISF Collection and Record-keeping	15	40	2	200	240000	3076.92
WUC-PMO Consultation Workshop	1	44	1	100	4400	56.41
Pre-Construction Conference	15	40	1	100	60000	769.23
IDP Supervisory Meetings						
IDP Staff Development						
WUADOs' Staff Development						
SUB-TOTAL						

E. Equipment and Supplies	Quantity	Unit Cost (in USD)	Total NR	Total USD
1. Equipment				
Pentium III desktop computers	2	1300	202800	2600
Laser high speed printer	1	100	7800	100
Multimedia set	1	700	54600	700
Xerox copier	1	500	39000	500
Computer table	2	30	4680	60

Computer chair	2	18	2808	36
Filing cabinet	4	120	37440	480
Working table	4	20	6240	80
Chair	10	8	6240	80
Motorbikes	22	1800	3088800	39600
Isuzu 4 X 4 pick-up	1	24000	1872000	24000
SUB-TOTAL			5322408	68236
2. Office Supplies				
Floppy diskettes	24	0.30	561.60	7.20
Copy paper	50 reams	7	27300	350
Toner				
Copier Ink				
Printer ink	6 cartridge	90	42120	540
Miscellaneous items			70200	900
SUB-TOTAL				
3. Travel/Transportation				
Fuel for motorbikes	3520 liters	0.25	68640	880
Fuel for pick-up (diesel)	3200 liters	0.32	79872	1024
Oil, coolant, battery			89700	1150
Maintenance cost			234000	3000
SUB-TOTAL			472212	6054

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CONSTITUTION AND BY-LAWS OF THE
WATER USERS COMMITTEES (WUC), INC.

KNOW ALL MEN BY THESE PRESENTS:

That we, the undersigned, all of legal ages, Nepalese citizens and residents of____VDC, Sunsari District, Nepal, together constituting the majority of the entire membership of _____, do hereby promulgate the herein By-Laws:

ARTICLE I
NAME, DOMICILE AND PURPOSE

The name, domicile and purpose of the Association are those set forth in its Articles of Incorporation.

ARTICLE II
MEMBERSHIP

SECTION 1 – **QUALIFICATIONS FOR MEMBERSHIP** – Membership shall be open to any person of legal age, who is an agricultural lessee, amortizing owner, owner-cultivator, and other lawful possessor or tiller of agricultural lands situated within the irrigable services area of the Sunsari River Irrigation Project (SRIP) and is actually engaged in farming.

SECTION 2 – **APPLICATION FOR MEMBERSHIP** – The application for membership shall be made in writing on the prescribed form and shall be submitted to the Board of Directors through the Association's Secretary. Such membership application shall be subject to the provisions of Section 1 of this Article, a majority of the Board of Directors shall admit the applicant to membership. Notice of admission shall be communicated by the Secretary to the applicant within five (5) days after the Board Action.

SECTION 3 – **MEMBERS IN GOOD STANDING** – A member in good standing is one who faithfully complies with the duties set forth in Article III Section 2 of this By-Laws as well as the terms and conditions of the Membership Agreement.

ARTICLE III
RIGHTS AND DUTIES OF MEMBERS

SECTION 1 – **RIGHTS OF MEMBERS** – Each member has the following rights:

1. To exercise the right to vote in all matters affecting and related to the Association;
2. To be eligible to any elective positions of the Association;

3. To participate in all deliberation during membership meetings and to express his/her opinions or ideas on any matter under discussions;
4. To make use of any assistance, services and benefits of the Association upon compliance with the conditions and requirements thereof; and
5. To thoroughly examine the records of the Association.

SECTION 2 – **DUTIES OF MEMBERS** – Each member has the following duties:

1. To faithfully obey and comply with the By-Laws and such other rules and regulations as maybe promulgated by the Board of Directors and/or by competent authority;
2. To regularly attend all meetings, conferences and seminars that may be called by the Board of Directors and/or any government agency engaged in food production;
3. Promptly pay all financial obligations and other duties;
4. To willingly contribute personal services for the welfare of the Association;
5. To willingly participate in the procurement, processing and marketing of farm products that may be initiated by the Association;
6. To work jointly with co-irrigators in proper management, operations, use and maintenance of irrigation facilities and other oppurtenent structures within the Association's jurisdiction;
7. To religiously adopt and apply modern and proven farm techniques as may be suggested, taught and directed by government technician engaged in food production;
8. To comply with the agreed decisions of duly constituted authority and the Board regarding the type/nature of crops to be planted the are to be planted as well as the timing of planting; and
9. To closely coordinate and assist in other related group activities on irrigation matters.

ARTICLE IV
TERMINATION AND SUSPENSION OF MEMBERSHIP

Any member may be suspended or terminated on the following grounds:

1. Loss of ownership or right of possession of the land in respect of which he/she has applied for membership in the Association;
2. Willful failure to pay irrigation service fee and other dues for three (3) times without reasonable cause;
3. Failure to comply with any of the duties of the membership;
4. Failure to comply with the terms and conditions of the Membership Agreement;
5. Acts of omissions injurious or prejudicial to the affairs of the Association, e.g., destruction and unauthorized construction of irrigation canals, farm ditches and other structures preventing the free and smooth conveyance of the water; and

6. Violation of any of the provisions of the By-Laws and other rules and regulations promulgated by the Board. Any member who has resigned, was suspended or terminated shall not obstruct or intervene in any manner in all operation activities of the Association.

ARTICLE V
MEMBERSHIP FEES, DUES/CHARGES AND OTHER CONTRIBUTIONS

SECTION 1 – **MEMBERSHIP FEES** – Every prospective member shall pay a membership fee of _____ (Rs _____).

SECTION 2 – **ANNUAL DUES** – An annual due of _____ (Rs _____) shall be paid by every member in January of each year.

SECTION 3 – **IRRIGATION FEES** – Every member of the Association shall pay such amount per harvest season for area planted to rice or for crops other than rice, in accordance with the prevailing and duly authorized DOI irrigation service fee rates.

SECTION 4 – **CONTRIBUTIONS** – The Association may raise funds through contributions or donations from member-irrigators either in the form of cash, labor or in-kind, and through benefit programs considered appropriate and legal for the purposes.

SECTION 5 – **GENERAL FUND** – All penalties or fines paid by members as well as donations, contributions, income derived from completion of contracts with DOI and other legal entities and monies derived from members shall be part of the general fund of the Association.

ARTICLE VI
THE WUC GENERAL ASSEMBLY

Section 1 – **COMPOSITON** – The General Assembly is an assembly of representatives, composed of all the Water Users Group (WUG) chairmen. Though the general assembly convenes only the WUGs' chairmen, issues specified hereunder shall require WUG chairmen to convey to all the members of his/her WUG. Then, actual general assembly takes place at WUG level in different places and different times or otherwise simultaneously. Once after the issue is agreed among WUG members, the WUG's decision shall be conveyed by the WUG chairman and then consolidated by all the WUGs' chairmen in the General Assembly of the representatives.

Section 2 – **ISSUES TO BE UNDERTAKEN** – Issues that shall be delivered to all the WUG members prior to the decision in the General Assembly are; drastic change in financial policies, conversion of WUC status into others such as cooperative, merging or federating with other similar Associations, liquidation, and others as may be agreed by the General Assembly.

Section 3 – **POWERS OF THE GENERAL ASSEMBLY** – The General Assembly shall have the following powers:

1. To act and exercise final authority in all matters affecting the Council except those delegated to the Board of Directors;
2. To Nominate the members of the Board of Directors and remove its member for cause;
3. To Elect the chairperson and members of the Election Committee who shall serve the WUC in the next election and qualification of WUC Officers;
4. To act as final arbiter of any dispute or disagreement which may arise between and among farmer members and/or the Board of Directors;
5. To ratify amendments in the Article of Incorporation and By-Laws; and
6. To dissolve the Board of Directors for cause and constitute a new one.

ARTICLE VII
GENERAL ASSENBLY MEETING

SECTION 1 – **FISCAL YEAR** – The fiscal year of the Association shall commence on the first day of January and ends on the last day of December.

SECTION 2 – **GENERAL ASSEMBLY MEETING** – The representatives of the General Assembly, all the WUG chairmen, shall meet at least once a year within thirty (30) days after end of the fiscal year.

SECTION 3 – **SPECIAL MEETINGS** – Special meetings of members may be called at any time by the Board of Directors or upon written request of at least five (5) members, or majority of the members, in good standing, as granted by the Board of Directors.

SECTION 4 – **NOTICE OF MEETINGS** – Notice of every annual or regular meeting shall be delivered personally to all members within five (5) days before such meeting. In addition a copy of such notice shall be posted for such period in conspicuous or frequented places within the premises the Association's office. Such notice shall include the purpose, the date and the venue of the meeting.

SECTION 5 – **QUORUM AND VOTING** – Except when otherwise provided by Law, seventy percent (70%) of the entire membership shall constitute a quorum. In every meeting of the entire membership, each member shall be entitled to one vote.

SECTION 6 – **ORDER OF BUSINESS** – The order of business in every meeting shall, as far as practicable, be as follows:

1. Roll call and proof of quorum
2. Proof of the notice
3. Reading of and action on the minutes of the last meeting
4. Report of officers and committees
5. Recommendations and proposals
6. Approval of the Budget for the ensuing year
7. New business
8. Adjournment

ARTICLE VIII
BOARD OF DIRECTORS

SECTION 1 – **NUMBER OF DIRECTORS AND QUALIFICATIONS** – The affairs and business of the Association shall be administered by a Board of Directors, the number of members of which shall correspond to the number of WUGs. The Board of Directors must possess the following qualifications:

1. He must be a member in good standing;
2. He must know how to read and write;
3. He must be of good moral character and reputation in the community;
4. He must be engaged in actual farming within the areas of operation of the association and in legal possession of his farm holding in a period equal or longer than his legal tenure over the landholding be cultivates, and
5. He must be WUG Chairman.

SECTION 2 – **ELECTION AND TERM OF OFFICE** – Members of the Board of Directors (BOD) are those elected chairman at their respective WUG within fifteen (15) days from the end of the Fiscal Year by secret ballot. The Directors shall hold office for a term of two years (2) until the election and qualification of their successors. No Director shall be elected for more than two consecutive terms.

SECTION 3 – **ELECTION OF BOD OFFICERS** – The Members of the BOD immediately after election, shall meet and elect from among themselves the Chairman of the Board and Secretary. The Chairman shall preside over all meetings of the Board of Directors and the Secretary shall be in charge of his/her secretariat.

SECTION 4 – **ELECTION OF WUC OFFICERS** – Upon the election of the BOD officers, the Members of the shall elect from among themselves by secret ballot WUC President, the BOD Vice-President, Secretary, Treasurer, Auditor and Press Relation Officer/s of the Association. The candidacy of the WUC officers shall limited to those other than the BOD officers. Each of them shall hold office immediately after the election. Turn over of accountabilities, responsibilities and the WUC assets shall be done within ten (10) days.

SECTION 5 – **VACANCIES** – Whenever a vacancy occurs in the position of a director through death, resignation or removal, except by removal or termination of terms, such vacancy shall be filled in accordance with section 29 of the corporate code, provided that such vacancy occurs within two months immediately preceding the next regular election of directors, the vacancy shall be filled at such regular election.

SECTION 6 – **REMOVAL OF DIRECTORS** – Any member of Association may bring charges against a director by filling the same in writing the Secretary of the Association together with a petition signed by at least five (5) members in good of the Association. The Board of Directors must call a special meeting of the Association to consider the removal. The affirmative vote of two-thirds (2/3) of the Board of Directors which are entitled to vote shall be necessary to remove the Director in question during the meeting. The person shall bring the charges against the Director at least ten (10) days before the meeting. The Director shall have an opportunity to be heard in person or by counsel and to present witnesses during the meeting called for the purpose, and the person or persons bringing the charges shall have the same opportunity.

SECTION 7 – **REIMBURSEMENT OF EXPENSES** - The Board of Directors shall serve the Association without any compensation. However, as far as practicable, they may reimburse actual and necessary expenses incurred by them for activities directly related with the Association.

SECTION 8 – **REGULAR MEETINGS** – Regular meetings of the Board of Directors shall be held at the principal office of the Association on the option of each member or at such other place as the Board may determine.

SECTION 9 – **SPECIAL MEETING** – Special meeting of the Board of Directors shall be held whenever called by the WUC President or by majority of the Directors on three (3) days written notice to each Director. Such notice shall state the time, place and purpose of the meeting.

SECTION 10 – **QUORUM** – Seventy (70%) percent majority of the Board of Directors shall constitute a quorum at any meeting thereof. A majority vote of the Directors present at any board meeting at which their is a quorum shall be enough to decide on any question other than those undertaken by General Assembly and except the election of officers which shall require the vote of all the members of the Board.

SECTION 11 – **POWERS AND DUTIES OF THE BOARD** – The Board of Directors shall have the following powers and duties.

1. To formulate and implement rules and regulations not inconsistent with law, the Articles of Incorporation and By-Laws for the management of the affairs of the Association's officers and members;
2. To fix uniform rate of irrigation fees per hectare, per harvest season in accordance with agreed rates by DOI through Joint Management contract;
3. To require proper records to be kept of all transactions of the association;
4. To elect officers of the Association;
5. To appoint other employee, who may not be members of the Association and to fix their compensation;
6. To help member-irrigators secure loans from any government and private lending agencies;
7. To decide on the disposition of any surplus funds in case of dissolution and/or liquidation of the Association;
8. To act on the application for an withdrawal from membership; and
9. To create the committees as it seem necessary.

ARTICLE VIII
STANDING COMMITTEES

The Association shall have four (4) Standing Committees aside from Election Committee as a special WUC committee. The Election Committee shall be created at least one (1) month before the next General Assembly where the WUC Boards shall be set up. The four (4) standing committees shall be composed of all the members of Board of Directors, equivalent to WUG chairmen, except the WUC president according to their preferences and the member-number of each committee agreed by the Board of Directors.

SECTION 1 – **SERVICE COMMITTEE** –It shall be chaired by the Vice-President of the WUC, and secretary shall be elected among the members. The Committee shall be in charge of planning, coordination, execution of official distribution of irrigation water and protection of irrigation facilities. It shall be responsible for the joint or group action of farmer-irrigators in the proper operation/maintenance and protection of irrigation fcilities under the WUC jurisdiction. It shall also be charged of investigating and finding solutions to conflicts related to irrigation.

SECTION 2 – **MEMBERSHIP AND EDUCATION COMMITTEE** – This Committee shall be chaired by the WUC Secretary, and secretary shall be elected among the members. The Committee shall be charged with the processing of membership application or any document related to membership status for endorsement to and decisions by the Board of Directors. It shall also be responsible for all education, training and/or information aspects of agricultural production, e.g., improved irrigation procedures and other related activities irrigation matters and shall make an annual program for water-users education in coordination with the WUC President and other

committees. It shall be responsible for the promotion of cooperative work to enhance the promotion of farm activities to benefit the water-users.

SECTION 3 – **FINANCE COMMITTEE** – The WUC Treasurer shall head this Committee and secretary shall be elected among the members. The Committee shall be responsible for the generation and disbursements of funds upon authorization from the Board of Directors. It shall plan irrigation service fee collection, savings scheme and other fund-raising, and shall coordinate with other committees as maybe necessary.

SECTION 4 – **AUDIT AND INVENTORY COMMITTEE** – The WUC Auditor shall be the Chairman of the Committee and secretary shall be elected among the members. The Committee shall be responsible for auditing the amounts of the Association. It shall conduct an inventory of the assets of the Association in a period prescribed by the Board of Directors.

SECTION 5 – **ELECTION COMITTEE** – Chairperson and Vice Chairperson shall be elected from among the Board of Directors. Three (3) election committee members shall also be elected among the Board of Directors. The Election Committee Chairman shall call a committee meeting at least one month before the next election to review and discuss the rules and regulations and the conduct of election, qualifications of candidates and other requirements for election. The committee shall promulgate rules and regulation in the conduct of election, pass upon the qualification of candidate, supervise the conduct of election, canvass and certify in writing the returns to the presiding officer, and proclaim the winning candidates.

ARTICLE IX
DUTIES OF WUC OFFICIALS

SECTION 1 – **DUTIES AND POWER OF THE PRESIDENT** – The President shall have the following powers and duties, and must be member of the Board:

1. To exercise general supervision and direction of the Association's affairs and to oversee the proper implementation of resolutions and instructions of the Board of Directors;
2. To represent the Association in all social and economic activities to which it is a party or participant;
3. To prepare, in consultation with appropriate officers and committees, a yearly program of activities of the Association;
4. To sign the certificate of membership, and
5. To exercise such powers and perform such other duties as Board may from time to time fix or delegate.

SECTION 2 – **DUTIES OF THE VICE-PRESIDENT** – The Vice-President, if qualified, shall exercise all the powers and perform all the duties of the President during the absence or incapacity of the latter and shall concurrently serve as chairman of the Service Committee. The Vice-President must be member of the Board, and shall serve as Chairperson of the Service Committee.

SECTION 3 – **DUTIES OF THE SECRETARY** – The Secretary shall have the following powers and duties, and must be member of the Board:

1. Serve as Chairperson of the Membership, Education and Training Committee;
2. To keep full minutes of all meetings of the members of the committees and of the Board of Directors;
3. To serve as custodian of all records;
4. To keep an up-to-date list of members;
5. To receive and present application for membership to the Board of Directors and to inform the applicant of whatever action is taken by the Board;
6. To fill and countersign all certificates of membership issued, and
7. To give or cause to be given, all notices required by law or by the By-Laws of the Association, as well as notices of meetings of the members and the Board of Directors; and shall concurrently serve as the Chairman of the Membership and Education Committee.

SECTION 4 – **DUTIES OF THE TREASURER** – The Treasurer shall have the following powers and duties, and must be member of the Board:

1. Serve as Chairperson of the Finance Committee;
2. To collect, receive and deposit irrigation service fee and all funds accruing to the Association;
3. To keep book of accounts of the Association disburse funds approved by the Board of Directors and authorized by the auditor and submit an annual report of the financial activities of the Association; and
4. To post a bond of such amount as maybe determined by the Board of Directors for the faithful performance of his duties.

SECTION 5 – **DUTIES OF THE AUDITOR** – The Auditor shall have the following powers and duties, and must be member of the Board:

1. Serve as Chairperson of the Audit and Inventory Committee; and as such conduct the periodic physical inventory of all assets and properties of the WUC and recommend measures to the Board for proper safekeeping;

2. Examine the financial records of the WUC and recommend measures to the Board to improve financial condition of the WUC; and
3. Submit audit reports to the General Assembly.

SECTION 6 – **DUTIES OF THE PRESS RELATION OFFICER** – He shall be charged with the enhancement of information dissemination.

ARTICLE X
ESTABLISHMENT OF HEAD GATE GROUP (SUB-LATERAL GROUP)

SECTION 1 – **COMPOSITION AND DUTIES OF HEAD GATE GROUP (SLG)** – A group, called Head Gate Group (Sub Lateral Group) shall be established by calling all the WUGs along a canal other than main canal for the WUC. The Group shall ensure equal water distribution among the WUGs and protection/restoration of the irrigation facilities with the area covered. Monitoring shall also be conducted in remitting irrigation service fee from the group member WUGs to the WUC treasurer.

SECTION 2 – **OFFICERS** – Three (3) officers shall be elected; the Chairman, Vice Chairman and the Secretary among the group member WUGs' chairmen. The Chairman shall be responsible of exercising general supervision and coordination of the WUGs' water use and facilities protection. The Vice-Chairman, if qualified, shall exercise all the powers and perform all the duties of the Chairman during the absence or incapacity of the latter. The Secretary shall be responsible of keeping full records of all meetings of the member WUGs and shall monitor the irrigation service fee remittance from member WUGs to WUC treasurer.

ARTICLE XI
THE DISSOLUTION AND LIQUIDATION

SECTION 1 – **CAUSES OF DISSOLUTION** – The Association may be dissolved by resolution adopted by two-thirds (2/3) of the affirmative vote of General Assembly at a regular meeting or special meeting called for the purpose or any cause provided by existing laws.

SECTION 2 – **ORDER OF PAYMENT OF LIQUIDATION** – After dissolution, the assets of the Association shall be used to pay liquidation expenses and all debts of the Association. Any surplus assets may be donated to any community project, whether economic, educational, cultural or social or may be prorated among members and officers of the association depending upon the final decision of the General Assembly.

ARTICLE XII
OPERATION AND MAINTENANCE OF IRRIGATION FACILITIES AND STRUCTURES

Section 1 – **MAJOR FACILITIES** – All major facilities, other appurtenant structures, and all the canals within the service area other than DOI's responsible canal/facilities, and drainage canals shall be operated and maintained by the WUC. All member shall ensure that major structures and canals within their areas are in good condition, free from silt deposits and vegetative growth to ensure conveyance of irrigation water in their areas. Members shall remove all illegal checks and unauthorized turnout to ensure equitable water distribution among all water users.

Section 2 – **TERMINAL FACILITIES** – All terminal facilities including turnouts and farm ditches shall be operated and maintained by WUGs. Each WUG through its farmer members shall ensure that structures and/or farm ditches within their areas are in good conditions, free from silt deposits and vegetative growth so as to have free and smooth conveyance of irrigation water in their areas. WUGs shall remove all illegal checks and other unauthorized structures along main farm ditches to ensure equitable water distribution among all WUG members.

ARTICLE XIII
IRRIGATION SERVICE FEF COLLECTION

Section 1 – **ISF BILL DISTRIBUTION AND COLLECTION** – The WUC through the Treasurer shall distributes bills and collect irrigation service fee (ISF) from among its member through the WUG.

Section 2 – **ISF REMITTANCE** – All ISF collection of the WUGs hall be remitted to the WUC through the Treasurer. The same shall be remitted by the Treasurer to the DOI Cashier.

Section 3 – **RECONCILIATION** – The Treasurer and DOI cashier shall reconcile its ISF collection records weekly to ensure accurate recording of ISF remittances and update each party on the attainment of the ISF collection target.

ARTICLE XIV
OTHER RULES AND REGULATIONS

The Board of Directors may seem necessary to promulgate such other rules and regulations governing the relationship of the members among themselves in line with the rendition of personal or joint services, distribution of irrigation water, construction of dikes, ditches and drains and such other matter as may be involved in the operation of irrigation systems within the Association's regulations. Violation of such rules and regulation as well as those of the By-Laws may subject the offender to a penalty as prescribed by the Board.

ARTICLE XV
USE AND DISPOSITION OF ASSOCIATION FUNDS

Funds derived by the Association in the form of required fees, dues and other contributions from other entities considered legal for the purpose, shall be part of the general fund and may be used for:

1. Payment of charges and obligations of the Association;
2. Payment of cost of maintenance and repair of terminal facilities, farm ditches and other irrigation structures within the area of the Association;
3. Payment of such other expenses that may rise in the conduct and operation of its activities.

Above-mentioned accumulated funds shall be deposited with the nearest depository bank in the name of the Association. Deposits/withdrawals of said funds shall only be made with the signatures of the Treasurer and the President and approved resolution of the Board of Trustees.

ARTICLE XVI
BOOKS OF ACCOUNTS

To assist the WUC in safeguarding WUC funds, promoting capital build-up and ensuring the agricultural development objectives/goals, the WUC, by unanimous decision of its Board of Directors, is fully authorized to hire an external, competent, independent auditor to annually review the WUC books of accounts, recommend measures to safeguard the council properties and render audit report to the Board and the General Assembly.

The DOI is empowered to assist the WUC Audit and Inventory committee in auditing WUC funds, recommend measures to remedy defects in income disbursement and expenditures. The DOI upon consultation with the Board of Directors is authorized to inform the membership during assembly meetings of the status of association funds in support to the audit and inventory committee report when the need arises.

ARTICLE XVII
MISCELLANEOUS PROVISIONS

SECTION 1 – **MERGER** – The Association may, upon recommendation of the Board of Directors, affiliate itself with other Association having similar activities as those of the Association.

SECTION 2 – **SEAL** – The WUC President, by delegation of the Board, shall provide a suitable seal for the Association.

SECTION 3 – **PRINTING** – The Articles of Incorporation and By-Laws shall be prepared in pamphlet form and a copy thereof shall be distributed to each member.

ARTICLE XVIII
AMENDMENTS

These By-Laws may be amended, altered or repealed whole or in part, or a new By-Laws may be adopted at any regular or special meeting called for the purpose by a vote of the majority of all the members and majority of members of Board of Directors entitled to vote.

Adopted in the Municipality of Province of , this day of , by the vote of the majority of the members of the Association.

	Names	**Signature**
1.		
2.		
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11.		
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20.		

ATTESTED:

Chairman of the Members Meeting Secretary of the Members Meeting

CERTIFICATION

KNOW ALL MEN BY THESE PRESENTS:

That we, the undersigned, constituting a majority of the member of the Board of Directors of , an association organized and existing under the laws of the Nepals, and the Secretary thereof, do hereby certify that the foregoing document is a true and correct copy of the By-Laws of the said Association duly adopted by the affirmative vote of a majority of the members of the Association.

Done at _____, on _____
(Place) (Date)

1. _____ 2. _____
(Name & Signature) (Name & Signature)

3. _____ 4. _____
(Name & Signature) (Name & Signature)

5. _____
(Name and Signature)

COUNTERSIGNED BY:

_____
(Secretary)

_____ ASSOCIATION, INC.

_____ _____
VDC District Region

LIST OF PRESENT MEMBER-IRRIGATORS

PRINTED NAME	SIGNATURE	ADDRESS
1.		
2.		
3.		
4.		
5.		
6.		
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30.		

_____

Secretary/Treasurer

_____

IRRIGATORS' ASSOCIATION, INC.

_____ _____

ADDRESS IRRIGATION SYSTEM

FOREIGN – FUNDED

MINUTES OF THE ORGATNIZATIONAL MEETING:

_____ IRRIGATORS' ASSOCIATION, INC., held at _____ on _____ _____ _____.

The meeting was called to order at _____ o'clock A.M./P.M. with ____ _____ as presiding officer and _____ _____ as temporary secretary.

The Secretary called the role of the Incorporators.

The following were present:

Majority of the Incorporators were present. The presiding officer declared meeting legally constituted.

After a thorough discussion and on a motion duly seconded, the Articles of Incorporation and By-Laws were unanimously approved together with the following data:

1. The name of the Association shall be _____ _____ Irrigators' Association, Inc.
2. The principal office of the Association shall be located at _____ _____.
3. The area of operation shall be within _____ _____ River Irrigation System.
4. The extend of membership (who may become members) _____ _____.
5. The term for which the Association is to exist is _____ _____.
6. The number of Directors shall be _____ _____.
7. The membership fee shall be _____ _____.
8. The annual general assembly shall be on _____ _____ _____ at _____ _____.

The election of the Board of Directors, Chairman and Members of the different Committee was held. The results of the election were as follows:

BOARD	NO. OF VOTES	REMARKS
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3.		
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15.		

A. SERVICE COMMITTEE:

_____
_____
_____
_____
_____

B. MEMBERSHIP AND EDUCATION COMMITTEE:

_____
_____
_____
_____
_____

C. FINANCE COMMITTEE:

_____
_____
_____
_____
_____

D. AUDIT AND INVENTORY COMMITTEE:

_____
_____
_____
_____
_____

The presiding officer then proclaimed the newly-elected members of the Board of Directors, Chairman and Service Committee, Membership and Education Committee, Finance Committee and Audit and Inventory Committees.

There being no more business to be taken up, the meeting was adjourned at _____ o' clock A.M./P.M.

I hereby certify to the correctness of the above minutes.

_____
Temporary
Secretary

ATTESTED:

_____
Presiding Officer

SECRETARY'S CERTIFICATE

That I, _____, Secretary of _____ _____, as Association in the process of registration hereby certify:

That at the monthly meeting of the Board of Director of the Association held on _____ at the Association office during which a quorum was present, the following resolution was duly approved: Resolution # 2, S. 1997.

"Resolved, that the Association will comply with the SEC requirements for non-stock corporations dated May 24, 1968 in the course of its operation."

In witness whereof I hereby affix my signature this _____ day of _____ _____ at _____.

_____

Secretary

_____

President