Review of Joint Management of Marchwar Lift Irrigation Project

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INTRODUCTION

The Project is located in Rupandehi District and it is southwest of Bhairahawa in Lumbini Zone of the western development region. The project area is surrounded by the Tinau (Kunhra) river to the West, the Danda River to the East and the Indian border to the South. The northern part of the project area is defined by the location of the pump station, Dano and Tinau rivers.

The project area is linked with district headquarters Siddharthanagar by a 20 Km. gravel feeder road joining Bhairahawa Lumbini road.

The estimated population of the project area, covering 14 village development committees of project (before it was 16 VDC), is 44,000 corresponding to about 6,300 families. Of this total, about 95% constitute the farming population. Some 71% of the people are illiterate and the majority is extremely poor living at the margin between subsistence and starvation.

The climate of the project area is sub-humid and sub-tropical with following three distinct seasons:

- A humid rainy season from mid June through September,
- A cool dry season from October through February, and
- A hot per-monsoon season from March to mid June.

The average rainfall is about 800 mm. The Marchwar project area receives less rainfall and measured values vary from 1000 mm to 1400 mm. 91% of rainfall occurs between June to September. Monthly temperatures range from 14° Celsius in January to 40°

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Celsius in May. Annual evapotranspiration totals 1,730 mm with the maximum rate of 6.3 mm/day during April and May.

CHRONOLOGY OF MAJOR INTERVENTIONS

A scheme to command the Terai area to the South of Butwal was originally developed with Indian assistance in mid 1960s, but failed shortly after construction due to outflanking of the river headwork structure. Although the main canal systems remained functional, the headwork was never reconstructed. The command area has, however, continued to develop slowly through private initiatives based largely on temporary gravity diversions from the river. The area south of the Bhairahawa - Lumbini road around Marchwar remained underdeveloped because of its higher elevation with respect to the river.

During late 1970s, HMG/N, with World Bank assistance, initiated a major ground water development in the area north of Bhairahawa - Lumbini highway. It appeared that ground water resources were not available to the South of this area (Marchwar) and HMG/N therefore requested UNCDF's assistance to undertake irrigation developments by pumping available surface water sources of Dano and Tinau rivers.

The resultant Marchwar Lift Irrigation Project was initiated in 1980 on the basis of a pre-investment identification report, which concluded that the project was feasible.

The project was to be implemented by DOI using local contractors and engineering services were to be provided for the design of the pump station. Total cost was estimated at US $ 2.9 million and the project was financed by UNCDF, HMG/N and UNDP (UNCDF grant contribution of US$ 2 million).

MLIP phase - I activities initiated in 1980 and were essentially restricted to the construction of a pump station, partial completion of the main irrigation distribution system, and access road into the area.

MLIP phase - II was felt required to complete the full development of the command area and other related institutional services and therefore, on 4 November 1991, an agreement between the donor agency UNCDF/UNDP and HMG/N was signed for the second phase of this project with a project period of five years.

MLIP Phase - II activities completed in June 1997 which covered irrigation facility for 2800 ha by a lower level canal and 1000 ha by the upper level canal (MLIP Phase - I).

INFRASTRUCTURE DEVELOPMENT

A pump station with its other essential components has been constructed. In the pump station, there are 10 pumps. Six pumps, each of 765 l/s capacity, are mainly for the lower level canal and four pumps, each of 575 l/s capacity, are for the upper as well as for the lower level canals.

Recently, a new transmission line of about 3 km, which connects the National Grid from Bhairahawa - Lumbini sub station to pump station, has been constructed in order to avoid dependency on Indian power supply which is erratic in nature because of high power fluctuations. It has also ensured better safety of the pumps. A brief overview of the achievements is tabulated below:

Table 1: Project Achievement

S.N.	Physical Output	Unit	Total Qty.	Completed	Remarks
1	Canal Construction	Km	58.95	55.86	Rest in dispute
2	Drainage canal construction	Km	3	3 (100%)	
3	Hydraulic structures	No	337	391 (100%)	
4	Buildings	No	5	6 (100%)	
5	Gravel road	Km	25	25.86 (100%)	
6	Land Acquisition	ha	88	78	

Table 2: Command Area Development

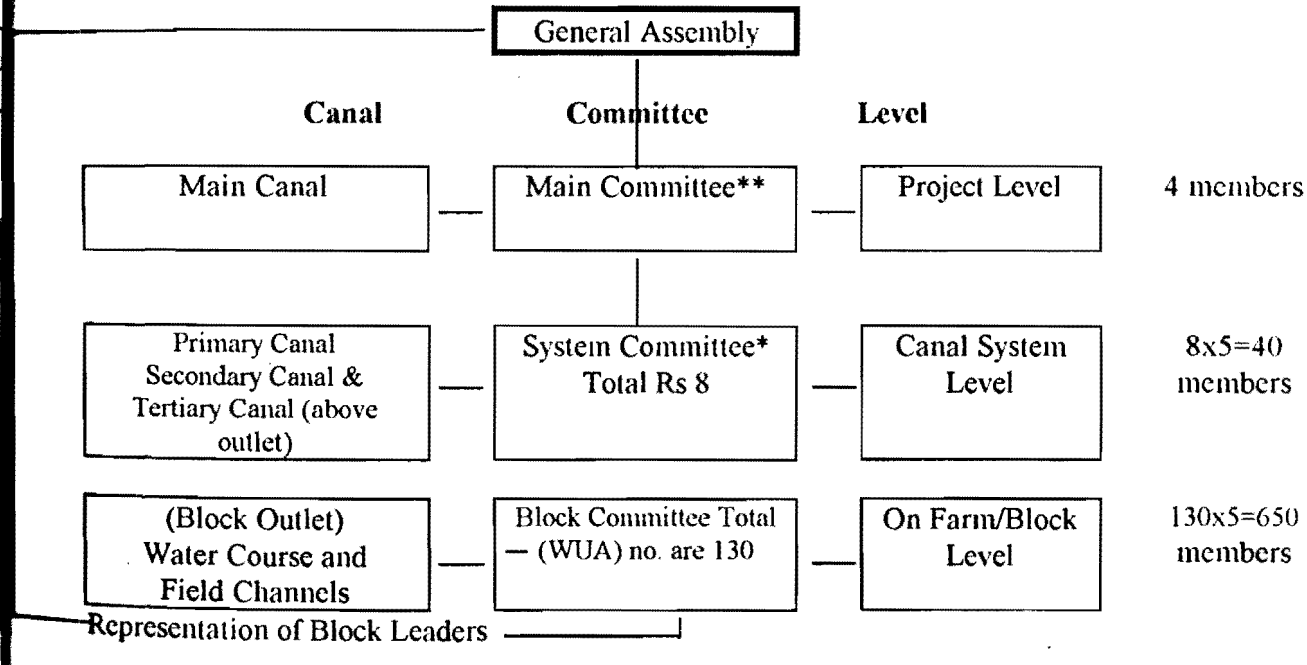
Particulars	1995/96 (Constraints)	1996/97 (Developed)
Irrigable command area	2800 ha	-
Non irrigable because of topography	66 ha (3%)	-
Non irrigable because of fine tuning	170 ha (6%)	170 ha
Non irrigable because of right of way problems	302 ha (7%)	100 ha
Non irrigable because of social problems	73 ha (3%)	73 ha
After fine tuning irrigable (expected)	2432 ha (86%)	2432 ha
Technically irrigable	2737 ha (97%)	-
Presently irrigable	2189 ha (82%)	2532 ha

ROJECT DIRECTION

cr completion of irrigation development activities, a workshop was held in December 96 for setting up the future direction of the system and also, some O&M issues of LIP were agreed upon. The workshop was participated by the members from main mmittee and canal system committees of WUA, representatives from Ministry of Water sources, Ministry of Agriculture, Department of Irrigation and all district level line ncies. Because of the complexity of pump irrigation system and direct cost olvement in operation and maintenance, it became important to look for the future way run the system and to get views of all the concerned agencies. Altogether, twenty points re made in the workshop on the roles and responsibilities of all the concerned agencies g. DOI, UNCDF and WUA).

UA/FORMATION OF GROUPS

e WUA, to exist as a statutory association, has registered its "Marchwar Lift igation, Water Users' Association" constitution 2051 with the District Administrative fice, Rupandehi. Different committees of the WUA and their relationships with canal stems could easily be comprehended by the flow diagrams below.



otal numbers of members: 650 + 40 + 4 = 694.

Canal System Chairman is ex-office member of main committee.

Main committee consists of 12 members.

Block/Block Committees

The developed command area has been divided into 130 Blocks. Each block has a block committee comprising of five members of which one is the block leader. The block committee is responsible for its block. Operation and maintenance of tertiary canal and monitoring of the block using parcellary block map are the major tasks of the block committee. Measuring water-head at the block outlets can easily monitor water flows into the block. Block outlets are designed on broad crested weir formula. Water stress suffered by a crop can be analyzed using parcellary map and the map facilitates the block committee in budgeting for agriculture inputs. Block committee also initiates and supervises the construction of watercourse within the block. Block's development status in the system is presented below.

Activity	Package							Total
	1	2	3	4	5	6	7	
No of blocks	32	32	8	17	6	15	20	13
No of block revised	32	28	8	17	6	14	20	12
Area Ha. (Dec. 96)	644	735	162	330	138	381	415	280
Area revised (ha)	633	581	162	330	106	191	415	241
Parcellary map (outline)	32	32	8	17	6	15	20	13
Parcellary map, "as built"	32	32	8	17	6	6	9	10
Boundary identification	32	32	8	17	6	15	20	13
Outlet fixation	32	32	8	17	6	8	20	12
Survey/Design	32	28	8	17	5	4	5	9
Construction (WUG)	32	28	8	15	5	4	5	9
In-block structures completed	3	0	0	0	0	0	0	3

System Committee

There are eight system committees namely:

1. Hardi System Committee (23 blocks)
2. Lower Main Secondary System Committee (8 blocks)
3. Lower Link Canal System Committee (10 blocks)
4. Ramnagar Primary System Committee (15 blocks)
5. Mahadai System Committee (16 blocks)
6. Nagauliya Secondary System Committee (11 blocks)
7. Semra System Committee (16 blocks)
8. Ramnagar Secondary System Committee (26 blocks)

Each system committee has five members who respectively are system committee chairperson, system committee vice-chairman, secretary, treasurer and system committee

member. Block leaders within the system are the ex-office members of the system committee. System committee's main role is to coordinate with the block leaders and to solve the irrigation problems put forth by the block leaders. System committee has to be in touch with main committee. Office of each committee within the system has been established. System committee has to provide monitored data of the blocks to the main committee.

Main Committee

Main committee has four members who respectively are main committee chairperson, vice-chairman, secretary, and treasurer. Besides these eight, system committee chairperson will be the ex-office member in main committee. Main committee's function is to conduct "Marchwar Assembly" after Kharif and Rabi crops to discuss all the issues of the system, to prepare budget programming for the coming crop season, to review the water cess, to keep financial records update of the system, and to facilitate other irrigation related services addressed by system committees and block leaders. Fifth Marchwar assembly Kharif 2054 is one exemplary report prepared by the assembly. Office of the main committee is at Majhgaon. The building was constructed under Package No. 5 with financial support from UNCDF. Two trained employees, one is O&M manager and the other is financial/Administration manager, are assisting main committee in day-to-day work.

Sub Committees

There are other Sub-committees as following:

1. Canal operation and maintenance sub-committee,
2. Water allocation sub-committee,
3. Financial sub-committee, and
4. Canal trees preservation and protection sub-committee.

They work on behalf of main committee on different aspects as stated above in order to mobilize system committees and block committees on their respective works.

Upper Link Canal Sub-system Committee

The command area of 2,800 ha under lower link canal has been developed in phase-II. Command area of upper link canal has not been developed because of water scarcity in the source. Whatever infrastructures are developed in the phase-I, farmers are irrigating about 1,000 ha of land from them. In the future, it will appear as one more system committee. For the time being, an adhoc sub-committee with four members (chairperson, vice chairperson, secretary, treasurer) has been formed to take care of this sub-system.

Main committee's general election takes place at every 3 year and so the system committees and block committees.

BENEFICIARY FARMER/TRAINING

MLIP has involved beneficiary farmers and related support agencies in planning and implementation of the program with a participatory approach. The training, workshop, farmer-to-farmer interaction, and tour outside the project area have been organized to build up farmers' capabilities for increased agricultural production and improved irrigation system management skills. Under AIDP program, basically agriculture service center (ASC) based training and village based training programs were provided to the beneficiary farmers at each Kharif and Rabi seasons through the years 1992/93 to 1995/96. Altogether, 147 ASC based training programs were organized to the male group and 20 to the female group whereas 303 village based training programs were organized to the mixed group and 10 to female group.

PREVIEW OF MLIP MANAGEMENT

Marchwar Lift Irrigation Office has been allocating operation and maintenance budget to run the system every year. The yearly budget more or less looks like as under:

Operation & Management	Budget allocated in Rs	
	Fiscal year 2053/54	Fiscal year 2054/55
i) Canal System	300,000.00	6,00,000.00
ii) Pumps & pumping station	250,000.00	-
iii) Transmission line	250,000.00	75,000.00
iv) Gravel road	400,000.00	425,000.00
v) Electricity charge	25,00,000.00	25,00,000.00
Total	**37,00,000.00**	**36,00,000.00**

The budget on canal system head was spent mainly on operation of the canal. For water scheduling and to run the pumps, a computer program named OMIS (Operation Management in Irrigation System) has been installed in water operation center (WOC), Majhgaon. Weekly schedule is prepared followed by last week data input. Data input required are crop area, source discharge, rainfall, and water flow to each block. Five field operators were engaged (their wages are supported by UNCDF) and their main tasks are to monitor the head over the crest of each block outlet. Four AOs (Association Organizers) are also engaged (their wages are paid from canal operation budget provided by HMG/N) and their main tasks are to provide the farmers agriculture services and to facilitate them in formation of the groups and in constructing the watercourse. Four to six "Dhalpas" are also engaged (their wages are borne out of canal operation budget of

HMG/N) for the period of "Kharif" season (6 months). In close collaboration of the WUA, they regularly inspect and check the main canal and primary canal conditions and do the maintenance as required by mobilizing the farmers in the system. Four pump operators, six gate operators and two Chaukidars are engaged at the pump station (their wages are borne out of operation and maintenance budget of HMG/N). Their main tasks are to receive pump operation schedule every week, to run the pumps accordingly, and to do regular maintenance of the pumps (e.g. to replace the spare parts, oiling, greasing etc.). From HMG/N side, one electrical engineer and one electrical overseer are engaged to supervise the pump station. One electrical supervisor was engaged (paid from HMG/N operation and maintenance budget) in inspecting and maintaining the transmission line which connects pumping station to the feeder point (about 11 Km).

Gravel roads of about 28 Km constructed within the system are to be maintained every year. Each year, about Rs 400,000 to 450,000 is allocated by HMG/N. Because of considerable traffic load on the section from Bangai to Semra canal tail end point, which is about 22 Km, needs maintenance each year. This road section can be considered as the main road that connects the district headquarters, Bhairahawa to sixteen village development committees of Marchwar. Last year, MLIP maintained the "Majhgaon to Bangai" section of about 1.2 Km gravel road satisfactorily which was in the worst condition. The Department of Road has also maintained "Bangai to Majhgaon section" of about 6 Km gravel road, which was also in a very bad condition. Its management, on WUA's part, is acceptable but a permanent means of generating resources needed for its maintenance on a regular basis is to be work out.

PREVIEW OF FARMER MANAGEMENT

Office has never spent any money on maintenance of earthen canals. The "WUA" has to do it all by mobilizing their resources. For this purpose, a tractor has been provided to WUA and also a motorcycle for supervising the operation and maintenance of the canal system. Some emergency budget (Rs100,000 to 200,000) has been kept apart from O&M budget in case there is a sudden breach in the canal and damage to the canal lining. (It is about 1 to 2 lakhs.)

For each of Kharif and Rabi seasons, WUA has the tasks of inspecting, cleaning, and maintaining the canals at each system level prior to running the pumps for irrigation water. Trees on the banks and some rodent holes are the main causes of leakage through the earthen banks and sometimes also of canal breaches. Farmers have to engage in this task any time if they needed water for irrigation through pumps. If the canal is not well maintained, WUA Chairperson reduces the capacity of the pumps. In this way, WUA spends Rs 150,000 to 200,000 on labor each year. A summary of income and expenditures are presented below:

Income and Expenditure of WUA of the Year 2053/54

S. No.	Income	Rs
1.	Farmers contribution	92044.50
2.	Users' membership	11666.50
3.	**Water cess**	
	a) Hardi canal system	29361.00
	b) LMS canal system	17401.40
	c) Lower link	14780.10
	d) Ramnagar primary	176.00
	e) Ramnagar secondary	21299.00
	f) Nagauliya	11164.00
	g) Mahadai secondary	16127.70
	h) Semra	2626.50
	Water cess remained for book entry	18008.20
4.	Other incomes	20071.00
5.	Nursery and Dealership	6658.50
6.	Adult Literacy	34736.25
7.	Bank Interest	14841.51
8.	Fish Contract awarded	1900.00
9.	Contract Work of WUA	191320.59
	Total	**504182.85**
	Expenditure	
1.	Canal maintenance	198896.67
2.	Stationery	2724.00
3.	Contingency	18913.50
4.	Adult Literacy	34646.25
5.	Nursery development	28696.00
6.	Advance payment	6000.00
	Total	**289876.42**
	Balance Money	**214306.43**

Target Assessment for Coming Year 054/55

S. N.	Income	Rs
1.	Users' Membership	12,00.00
2.	Water cess	5,00,000.00
3.	Farmers contribution	1,500.00
4.	AIC's Dealership	10,000.00
5.	Bank Interest	10,000.00
6.	Tractor Income	50,000.00
7.	Trees Management	2,000.00
8.	Others (contract + house rented)	5,000.00
	Total	**5,90,500.00**
	Expenditure	**Rs**
1.	Wages a) Pump house - Pump operators 7 No. - Chaukidar 2 No. b) WOC - Office management 1 no. - Irrigation manager 1 no. - System manager 8 no. - Sub-system manager 1 no.	492400.00
2.	Canal Maintenance a) Earthen canal b) Structures	 278,300.00 451,700.00
3.	Pump House Electricity cost @ 10%	2,00,000.00
4.	Stationery	3,500.00
5.	Gravel road maintenance	2,00,000.00
6.	Guest receiving	7,500.00
7.	Others expenditure	50,000.00
	Total target expenditure assessment	**16,02,100.00**

Balance expenditure amount of Rs 1,011,600.00 shall be met by WUA and different organization/corporation/DOI etc.

After discussion, following resolutions were passed by Marchwar Assembly Kharif 2054.

1. Regarding electricity cost payment to run the pumps, not more than 10% of the total cost can be borne by WUA.

2. Regarding maintenance of the tractor, because it is needed to WUA, maintenance cost can be borne by WUA.

3. Water right for water operation shall be reserved to WUA.

4. On the basis of irrigated area if any canal system committee does not collect 70% of water cess, the committee will be deprived of receiving maintenance money. If it is 70% or more, the main committee will render help of 25% maintenance money to such canal system committee on producing action plan for maintenance works.

5. Necessary employees are to be appointed for the management of WUA.

6. If canal system committee's secretary is fully involved in collecting water cess, he will be supported by some incentives.

7. Since upper link canal farmers are receiving water from the pumps, block committees within the upper link command area shall be formed and will be given the constitutional rights.

THE EXPECTATIONS, IMPACTS OR ACHIEVEMENTS

Agriculture (Paddy)

At the start of the Kharif season, some 2,100 ha was irrigable by the project infrastructure. The farmers took however the risk to plant the total area, some 2,800 ha. Those areas that were not yet provided with an irrigation infrastructure were irrigated by traditional means, meaning pumps, over-flow of other areas, etc.

The nurseries were planted in the period between the last week of May and the first week of July. Transplanting started in early July. The harvesting of the paddy started in October and continued throughout the December. An interesting phenomenon is that in several places harvesting was done with combine - harvesters rented from India. Yields are, according to crop cutting surveys, 3.85 tons paddy/ha; this is close to farmers' target. The development of paddy yields over the years is given below. The yield in 1992 was determined on a limited area and is not necessarily representative. The project document expected a yield of 2.5 tons. There is a general consensus among the DADO and the farmers that an average yield would be around 3.5 tons/ha. The expected average yield (EAY) is a realistic estimate for areas that can make use of supplementary irrigation. The planted area increases over the years. The resulting gross income per ha based on a price of 8 Rs/kg (1996 price), is given in the table below. In the same table, the expected average incremental yield without the project and incremental benefits are given.

Area Planted and Gross Income Generated in Kharif Season, 1992 - 1996

Year	Area ha.	Yield ton/ha.	Total Yield tons	Income Rs/ha.	Total income Rs x 100
Base Yield and Projected Yield					
BLS	850	1.5	4207	12000	33656
Project Doc.	2805	2.5	7012	20000	56100
Actual Yield (Crop Cutting Survey)					
1992	250	4.4	1100	35200	8800
1993	616	3.2	1971	25600	15770
1994	1351	2.4	3242	19200	25939
1995	2000	3.4	6800	27200	54400
1996	2800	3.85	10780	30800	86240
Expected Average Yield and Incremental Yield/Benefits					
EAY	2805	3.5	9817	28000	78400
Incremental Yield (EAY-BLS)	0	2	5610	16000	44800

BLS= Base Line Survey; EAY= Expected Average Yield.

As it can be seen, an incremental benefit of some 16,000 Rs/ha is projected now.

Rabi Season 1995/96

In the Rabi season 1995/96, an area of approx. 1,770 ha was cultivated.

Monthly Irrigation Water Supply, Rabi Season 1995/96.

Month	Nov.	Dec.	Jan.	Feb.	March	Total
Pump hours	33	290	393	-	58	774
Volume ($1000m^3$)	81	693	926	-	135	1835
Irrigation mm.	4	39	52	-	7.5	102.5
Rainfall mm.	68	7	66	70	-	211

The fact that 102 mm of irrigation was supplied (against the calculated requirement of 98 mm) indicates that there is, at this moment, a little discrepancy between the water supply and water requirement. Moreover, the fact that water could be delivered to 63% of the area instead of 40% of the area is significant.

Yields and Yield Developments

The yield in 1992/93 was determined on a limited area and is not necessarily representative. The average yield during the Rabi 1995/96 was 1.8 tons. Some part of the area was water logged because of (i) the high residual moisture in the soil, (ii) seepage from the canals, and (iii) the fact that irrigation was given around the time of a heavy rainfall. The project document expected a yield of 2.5 tons. The average yield of approx. 2.5 tons/ha is a realistic estimate for areas that can make use of irrigation. The yield, incremental yield, and incomes from wheat grown during the Rabi season are given below. The unit price of wheat is 6 Rs/kg.

Year	Area in ha	Yield ton/ha	Total Yield in tons	Income in Rs/ha	Total income Rs x 100
Base Yield and Projected Yield					
BLS	850	1.5	1275	900	7650
Project Doc.	2630	2.5	6575	15000	39450
Actual Yield (Crop Cutting Survey)					
1992/93		1.8		35200	
1993/94		2.3		25600	
1994/95		2.6		19200	
1995/96	1770	1.8	3186	10800	19116
EAY	** 1800	2.5	4500	15000	27000
Incremental Yield (EAY-BLS)	950	1	3225	9000	19350

BLS= Base Line Survey; EAY= Expected Average Yield; ** 60% command area.

The following phenomena have to be noted:

The area cultivated in the Rabi season is 60 - 70% of the command area. This is more than recommended 40% without any directly visible adverse effect.

Slowly, a shift has started in the cropping pattern. The area under wheat is decreasing. The areas under other crops like kidney beans, pulses and mustered seeds, are slowly expanding. These will have important financial consequences. The kidney beans' yield is also about 2.5 ton/ha but fetch a price of 50 Rs/Kg in the market. Gross income per ha would be some Rs 125,000.00. This is high compared with the gross income and 15,000.00 Rs/ha for wheat.

Impact

Production during Kharif

Yields during Kharif have more than doubled compared to the base line survey. A yield of approx. 3.5 tons/ha is rather consistent with yields measured earlier. Considering the data of last four years, it can be provisionally concluded that paddy yields under irrigated conditions vary between 3.0 and 3.5 tons/ha, which are at least double of the yields in case of "without irrigation". The yield is 20 - 40% higher than the expectations expressed in the project document. The result is an incremental benefit of some 16,000.00 Rs/ha. This increase can most likely not be fully attributed to the provision of irrigation water, but also to the effect of the agricultural program, use of improved seeds, etc.

Production during Rabi

The main crop during Rabi is still wheat although some shifts can be seen. Yields of wheat have increased since irrigation became available. At present, a yield of 2.5 tons/ha can be considered realistic with increased and timely use of fertilizer and improved varieties.

Yield of 2.5 tons/ha was projected in the project document from compared to an average yield of 1.5 tons/ha in "without irrigation" conditions. The base line survey recorded an average yield of 1.5 tons/ha. Consequently, the incremental yield is some 1.0 ton/ha (66%).

System Output

During Kharif crop in 1996, a survey was conducted in close consultation with WUA to understand functionality of the infrastructures built in the system. The total area developed under lower link canal was 2805 ha. So, it became important to verify whether this developed area fell under irrigation scheme or not. The result is presented below.

Area not Delivered Water

Package	Command Area in ha	A	B	C	D	Total ha	Delivered %	Not delivered %
1	644	68.1		69.3	-	137.4	78.66	21.34
2	735	134.5		47.4	-	181.9	75.25	24.75
3	162	-		-	-	-	-	-
4	330	-		37.60	-	37.60	88.60	11.40
5	138	31.77		-	-	31.77	76.97	23.03
6	381	190		-	-	190.00	50.13	49.87
7	415	22.21	70	-	-	92.21	77.78	22.22
Total	**2805**	**446.58**	**70**	**154.3**	**-**	**670.88**	**76.08**	**23.92**

The total water delivered area is 2134.12 ha, i.e. 76.08% of the command area.

Expression

A= Lack of construction of canals/Aqueducts.
B= Under construction.
C= Technical reasons.
D= Social reasons.

Keeping the above assessment in mind, a walk through survey by each canal system committee together with engineer was conducted in order to cover technically irrigable areas. Besides pre built infrastructures, additional structures such as canal lining to check seepage water (917m), hume pipes (360 rm.), block outlets (11 no.), village road bridge (6 no.), foot bridge (8 no.), and cross drainage work (6 no.) were constructed in Kharif 1997.

Pump Hours

Pump hours are very important when we talk of operation cost. Total pump running hours over successive years covering Rabi as well as Kharif crops are given below.

Year	1992	1993	1994	1995	1996	1997
Pumps hours	3412	3726	6395	2687	3632	* 1190
Energy cost (Rs)	731900	719300	1371800	576400	779100	255300

* Pump hours during Rabi crop only.

ISSUES RELATED TO PROGRAM SUSTAINABILITY AND TRANSFER PROCESS

Pumps/Pumping Station

Project office (MLIP) and WUA, both are exercising at handing over and taking over of the system, respectively. This spirit still exists. WUA has replaced pump operators (10 no.) and watchman/Chaukidar (2 no.) who were employees of MLIP/DOI by their own employees as pump operators (8 no.) and Watchman/Chaukidar (3 no.) at pump station. WUA is spending Rs 190,800.00 on its employees per year. Fourteen operators within the command area selected by WUA were given three months off-site training by BTI, Butwal. The program was sponsored by UNCDF. Operation and maintenance of pumps, as agreed in consensus workshop, have been handed over to Nepal Hydro Electric (NHE), Butwal for a period of 30 months subjected to mid term review. Newly appointed operators by WUA are working as job trainees under the supervision of NHE. It is hoped that after completion of NHE management contract, they would work for WUA independently at the pump station pursuing the management left by NHE.

Operation of Maintenance of the Canal System

Since last 3-4 years, WUA is independently taking care of O&M of the canal system. Leakage and seepage through the earthen canal banks are very frequent. It is more serious when the pumps are run for the first watering of paddy and the canal is almost dry during very hot months of March, April and May. In addition, most of the main canal, primary canals, secondary canals have been forested. Roots of the trees are now spreading into banks and facilitating the leakage and seepage through banks. Trees have to be removed from the banks where lining works are proposed. Now, lining works of 500 m length in Ramnagar primary and 200 m length in Semra primary are to be constructed for the purpose of saving maintenance labor cost of "WUA" and for increasing the irrigation efficiency of the canal.

Water cess

WUA has made decision to increase water cess from Rs 60/ha to Rs 120/ha from Kharif 1996. WUA is collecting water cess @ Rs 120/ha. Water cess collection target was of Rs 283,680.00 from lower canal system, but the collection was only Rs 81,916.00. Whereas, Rs 10,499.00 was received from upper main canal. Collection is going on. Full water cess collection, as assessed, is difficult to achieve, unless canal system committees take initiatives to collect water cess. At present, it is the main committee that is doing this job. Water cess is the major factor to drive the system toward what we call sustainability. For

sustainable operation and maintenance of the pumps, water cess should have been in the range of Rs 500 to 600/ha.

CONCLUSIONS AND RECOMMENDATIONS

1. Just transferring the project to WUA does not ensure sustainability. Hence, when the project, with its minimum infrastructures and capable WUA, is transferred to WUA, technical backstopping support should be continued to WUA for maintaining the project's return at the desirable level.

2. MLIP is unique when compared to other surface irrigation scheme because of the involvement of large electricity cost and technical know-how on operation and maintenance of the pumps. With the same view, local operators selected by WUA are being provided job-site training under the supervision of Nepal Hydro Electric, Butwal - a well-established local electro-mechanical firm situated at 30 Km distance from the project site. It is expected that after 30 months of supervision contract period of NHE, local operators of "WUA" will be capable to take care of O&M of the pumping station.

3. The last year's experience reveals that WUA would be good enough to be in charge of O&M of all the canal system. The project should not intervene into the tasks of WUA.

4. About 28 Km of gravel road constructed during project implementation will also need maintenance. WUA is willing to have the ownership and responsibility to maintain this road. To create a minimum road toll fund, WUA has to be facilitated by legal document and DOI has to take initiation upon WUA's request.

5. Water cess has to be doubled each year up to 3rd years by WUA to meet the minimum expenditure on operation and maintenance of the pumps.

6. Farmers of land holding size 0.1 to 1 ha are 43%. The majority is extremely poor living at the margin between subsistence and starvation. For this reason, WUA is facing problem on water cess collection. To overcome this, skill-orientated programs need to be launched in the project area to improve their economic condition.

7. The minimum charge of electricity against the pumps is to be borne, even in non-running condition, should be made free to relieve the burden on WUA.

8. Impact study of the project, even in turned over situation, has to be made in 2 to 3 year's period by being fully attached with WUA and by providing them suggestions for the betterment and continuity of WUA's activities.