Case Review

for

Irrigation Service Fee Study

1. Aandhi Khola Irrigation System
2. Bangeri Irrigation System
3. Chhattis Mauja Irrigation System
4. Kankai Irrigation System
5. Marchwar Lift Irrigation System
6. Nepal West Gandak Canal Irrigation System
7. Pithuwa Irrigation System

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Aandhi Khola Irrigation System

The Aandhi Khola Irrigation System (AKIS) is located near Galyang Bhanjyang in Syangja district of Nepal. It is accessible by the all season Pokhara-Butwal highway and lies at about 85-Km southwest of Pokhara.

Background

This hill irrigation system was constructed during 1987-1996 with the financial support from the Norwegian Agency for Development Cooperation (NORAD) and the United Mission to Nepal (UMN). The irrigation system was constructed as a part of an integrated rural development program. The management responsibilities of the irrigation system were recently, on June 27 1997, transferred over to a local beneficiaries organization called Aandhi Khola Multipurpose Water Users Association (AKWUA).

1. Main Features

1.1 Physical

Headwork

The headwork along the Aandhi Khola is of permanent type and consists of an Ogee type concrete weir equipped with a gated under-sluice on the left, a desiltation basin, and other subsidiary concrete structures. From the gated under-sluice, water is taken through a tunnel to a surge tank of a hydroelectricity plant from where the main canals start. The H/W location is geologically stable and well protected with no retrogression in the downstream. The excellent condition of the H/W requires minimal recurring operation and maintenance (O&M) cost on annual basis. The O&M works to be carried out at the headwork are of simple nature such as greasing, painting, etc. Out of the total maintenance cost of the headrace structures, the beneficiaries’ organization has to bear only 20% of it (UMN, 1997).

Canals

Just in the downstream of surge tank, two main canals emerge – one going to the east and the other to the west, measuring 5.1 and 1.5 Km respectively. Both of them are of contour type. They pass through numerous drainage crossings and some landslide prone zones. However, these canals are suitably lined with soil, cement, and concrete at various locations and are well equipped with Galvanized Iron, Reinforced Cement Concrete, and High Density Polythene pipes - buried and suspended - and other reliable canal structures. They are functioning satisfactorily and have no major problem of seepage, landslide, retrogression, or silt.

The eastern main canal has eight off-takes and correspondingly eight branches whereas the western main canal has two off-takes and two branches. All these branch canals are of ridge type and 24.02 km in total inclusive of Asardi pipe canal. They too are well protected as well as equipped with dependable structures and have no major problem of seepage, landslide, retrogression, or silt. Distribution structures have also been constructed in these canals to allow proportionate water distribution among tertiary canals or to allow rotational water supply during the times of water shortage.
The condition of the canal system is good and hardly requires maintenance more than once a year.

Command Area

The irrigation system provides irrigation facility to 282 ha of agricultural land in Jagatra Devi and Tulsi Bhanjyang villages in Syangja district and Hungi village in Palpa district. The command area has a typical hill type landscape of sloping lands up to 30°. However, more than 70% of the land is flatter than 8° and terraced. Soils in the command area are suitable for diversified agricultural practices and have no major drainage or erosion problem.

Major Structures

Major structures along the canal network include lined sections, gated regulators at off-takes, flumes, drop structures, buried pipe stretches, inverted siphons, desliting basins, cross drainage structures, pipe crossing over the suspended bridge, etc. Beyond the branch canals, water is released through proportionate water distribution boxes to respective tertiary canals. All water controlling and regulating structures are reliable, functioning efficiently, and in good physical condition enabling very good water control in the canal network.

These structures are very well constructed and are relatively expensive requiring nominal maintenance works on annual basis.

Water Adequacy

Aandhi Khola has sufficient water to meet the irrigation requirements in summer and winter seasons for the entire command area. However, water becomes scarce during the spring. As the water distribution system is based on the principles of a share system, the available water is proportionately delivered to the entire canal network. Thus, water is adequately available in the head, middle, and tail reaches in summer and winter seasons. In the spring, rotational water distribution is adopted and the inadequacy in water supply is equally shared by all the users based on the share system, irrespective of individual's land holding size.

Water Reliability and Equity

As the river source, Aandhi Khola, is perennial and the H/W and canal network of the AKIS are well rigged with necessary water controlling and regulating structures in sound physical condition, water reliability in the entire command area is insured. Similarly, water delivery in the entire command area, irrespective of their locations, is based on the share system and no special preference is given to the individuals owning larger shares against smaller shareholders. The AKWUA, thus, has been comfortably able to maintain equity in water distribution as well.

Constraints

The AKIS is integrated with the hydroelectricity plant, which has first right to available water in the source. The tailrace of the hydroelectricity plant is below the canal network and hence, the outgoing water cannot be re-tapped into AKIS. It creates shortage of irrigation water during the lean period. In addition, many structures in the AKIS are located in landslide prone areas and are relatively expensive requiring considerable amount of resources to rebuild in case of failures.
1.2 Socioeconomic

Ethnicity

The Brahmins, who constitute more than 75% of 1200 households dominate the command area inhabited by about 8,000 population. The rest are Kami, Damai, Sarki, etc (NSAE, 1997).

Migration

Overall, the labor availability for agricultural purposes is sufficient in this area. The minor occupational castes as mentioned before are the backbone of the required agricultural force in the command area. Some seasonal migrations were reported but were not found to have any substantial bearing on the availability of the agricultural force and the trend for migration, mostly to India is on decline.

Income sources

More than 83% people in the command area are dependent on agriculture and accordingly, the primary occupation as well as income source is agriculture (Sharma, 1997). About 15% people are engaged in some kinds of services and jobs in and around the project area or in other cities in Nepal as well as abroad.

Water Users Association

The AKWUA, first formed in 1985, stands as a legitimate body and is duly recognized by the country’s law. It has a three-tiered organization: Board of Directors, a management body, and the branch committees. The general meeting of the share holders also formulate different sub-committees as deemed necessary such as land distribution committee, inspection committee, election committee, etc.

The organization has kept complete records of the land, shares that different individuals have in the irrigation system, and associated obligations. The organizational check and balance are well maintained because of active council of representatives and general assembly of the shareholders in the irrigation system. These organizational organs follow mutual information sharing and controlling mechanism by means well-articulated constitution and bylaws.

1.3 Agricultural

Land tenure

The majority of the households in the command area have between 0.25 - 0.5 ha of land and the present land holding pattern indicates that the land less are about 6% whereas, big landowner (> 2 ha) are less than 1% (Sharma, 1997; NSAE, 1997). The average landholding size is 0.24 ha per household.
Tenancy

About 17% of farmers have given out their land on rent or for sharecropping (Poppe, 1993. Pp.50-51) The four common methods of tenancy are briefly described below:

a. Rental for annual cash payment
b. Sharecropping – Owner and sharecropper each get half the annual production (Adhiya)
c. Sharecropping – Sharecropper gets winter season crops only
d. Bandhak – Land is mortgaged. Moneylender gets total grain production (in lieu of interests) until such time as the debt is repaid.

Cropping pattern

Major crops grown in the area are paddy, wheat, maize, and potato. With the development of irrigation system more and more lands are being brought under cultivation. Similarly, “baari” and meadow ” are also being converted into rice fields. The cropping intensity is 289%. Coverage and yields of different crops in 1996/97 are as follows:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Summer paddy</th>
<th>Spring paddy</th>
<th>Wheat</th>
<th>Maize</th>
<th>Potato</th>
<th>Oats</th>
<th>Pulses</th>
<th>Millets</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in ha</td>
<td>268</td>
<td>4</td>
<td>248</td>
<td>263</td>
<td>11</td>
<td>8</td>
<td>1.5</td>
<td>287</td>
<td>1.3</td>
</tr>
<tr>
<td>Yield in t/ha</td>
<td>2.66</td>
<td>4.2</td>
<td>1.16</td>
<td>1.32</td>
<td>5.08</td>
<td>0.78</td>
<td>0.6</td>
<td>0.99</td>
<td>40</td>
</tr>
</tbody>
</table>

Recently, some cash crops such as sugarcane and vegetables have also been introduced implying the changing trend toward cash crops.

Agriculture support services

In the beginning, the Aandhi Khola Irrigation Project provided the agricultural support services in this area. However, with the completion of the project, the support services have also been discontinued and phased out. There is one Agriculture Service Center situated in Galyang but was reported to be lacking far behind catering to the need for such supports.

Other supports such as training, credits, agricultural inputs such as improved seeds, fertilizer, etc were also found to be lacking in the sense they are not made available to the extent farmers are in need of.

Market

People in the project area complain about inappropriate marketing facilities for their agricultural produce. At one time, many farmers grew cabbage and there was overflow of this vegetable in the local market. Similarly, marketing the sugarcane is also posing difficulty, as it has to be sold to a sugar mill down in Butwal. Other consumable crops are somehow consumed in and around the project area itself through local vendors.

2. ISF Related Terminology

Share - The labor contribution, as required by the project, during the construction phase was realized on the basis of share system in which farmers had to contribute five days of work for earning one share in the irrigation system. Owning one share was equivalent to having the water use right of 642 lps/25,000 parts = 0.02568 lps/share. It was assumed that having 36 shares in the
system would be sufficient to irrigate the land size of 0.4 ha belonging to one household on average (UMN, 1997).

Irrigation Service Fees (ISF) – It is the fee to be paid to AKWUA against receiving irrigation benefits from the irrigation system. It is charged on the basis share per season for twice a year. So, for two seasons, ISF to be paid comes to be NRs. 900/ha.

3. Resource Mobilization for Financing O&M

3.1 Assessment of Resource Mobilization Requirements

Since the system also has hydroelectricity component and Butwal Power Company is obligated to cover 80% of the maintenance cost of the headrace portion, the AKWUA has to meet the remaining 20% only. In addition, it has to cover the entire O&M expenses of the canal network beyond the surge tank by itself by raising the ISF based on the share system.

The AKWUA needs NRs. 3,00,000 per year to meet the operation and maintenance expenses of the irrigation system. The figure has been estimated by AKWUA based on the past experiences (UMN, 1997).

3.2 Assessment of Delivered Irrigation Service

The resources to be contributed for O&M of the system is based on the share system, i.e. on the amount of shares individual persons in the project area own in the irrigation system. The AKWUA is collecting NRs. 3/share/per season (twice a year) for O&M of the canal network and NRs. 2/share/year for bearing the maintenance cost of the head race structures as agreed upon with Butwal Power Company (to share 20% of the total cost).

There is no defined or special mechanism for assessing the delivered irrigation service. Usually, water demands are put forward to AKWUA based on the shares possessed by the individuals of a particular area and accordingly, water is delivered to the respective reach, separately or in combination of similar demands from other sectors. The required discharge of water per share is already fixed to be 0.025 lps. Once the water is delivered, the persons are recorded as the ones who have received the irrigation service. Based on the same, for different seasons, ISF is charged to them, which is calculated for the maximum of two seasons.

3.3 Relation between Resource Mobilization and Irrigation Service

The ISF in this system, clearly aims at the resources to be mobilized for meeting the O&M requirements of the irrigation system. However, at present, some cash is being raised for repayment of the UMN loan component as well, which is to be fully paid in three years or so. In order to payback the UMN’s standing loan, people are paying NRs.12/crop/share/per year. So in future, the AKWUA expects to raise money by ISF collection for covering the O&M costs only. The ISF is charged to them who really receive the irrigation service or to whom the irrigation system does provide the irrigation service.
3.4 Forms of Resource Mobilization

The only form of resource mobilization in this irrigation system is cash, i.e. in form of ISF, which is calculated on the basis of share system (discharge per share) and number of seasons irrigation service has been received.

3.5 Relation between ISF and Water adequacy and Reliability

Other than farmers' expression of satisfaction, there is no defined mechanism for assessing the delivered irrigation service in terms of adequacy and reliability. In other words, rates of ISF have no other relationships with the quality of irrigation service. Nevertheless, since the water availability is good for at least two seasons, and the ISF is charged for the maximum of two seasons, water adequacy and the reliability have not been big hassle in the irrigated area.

3.6 Farmers' Willingness to Pay

The gross incremental economic benefit by irrigation in the project area has been calculated as NRs. 15,800 per ha (Sharma, 1995 pp. 54-55). The irrigation cost comes to be NRs. 900 per ha, i.e. 5.7% of the gross incremental benefit. Similarly, the average gross economic return per ha in the irrigated area has been reported to be NRs. 45,760. So, the irrigation costs to be borne in form of ISF come to be 1.97% of the gross agricultural income.

Percentage wise, the price to pay for irrigation service is not very high as the incremental benefit also supports for it. However, looking in terms of the net amount to be paid, i.e. NRs. 900/ha is one of the highest in whole Nepal. Framers also did not express any hesitation to pay the amount provided the returns from agricultural activities are assured.

3.7 ISF Collection Mechanism

The predefined ISF charges are collected directly by the AKWUA with the help of its own office staff and kept in the bank account.

3.8 Means for Controlling Free Riders

The pre calculated discharge per share is the biggest basis for controlling the free riders. Whatever amount of discharge is released in the canal network, is based on the authentic shareholders’ demands who have paid for the due ISF. Demands of the nonpaying people are not incorporated in calculating the required discharge to be released in a particular reach of the canal network. If some one, who has not paid ISF, still takes the water, he is “stealing” someone else’s water, which is not that easy in a closely-knit society like in Aandhi Khola.

3.9 Utilization of Collected Fees

Though the management of the irrigation system was fully transferred to AKWUA last year, it has been collecting ISF and additional money to meet part of O&M costs and for loan repayments for last couple of years. The data regarding the collections are presented below (UMN, 1997).
Total Fees Collected from Irrigating Framers

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<tbody>
<tr>
<td>Amount in NRs.</td>
<td>32,450</td>
<td>31,970</td>
<td>46,787</td>
<td>66,943</td>
<td>94,410</td>
<td>1,64,510</td>
</tr>
</tbody>
</table>

Before turnover, the raised sum was used as a part of admin costs that was to be borne by AKWUA as the subsidy on admin costs was being gradually removed by the UMN. In addition, part of the UMN loan was also paid back out of the same money. After turnover, AKWUA is supposed to cover its all expenses related to O&M out of its ISF money. Since this is the first year after transfer, it is yet to be seen how the mobilized resources would be utilized by AKWUA.

3.10 Rules, Regulations, Role, and Authority

The AKWUA has full authority to fix ISF rates and corresponding discharges of water, sales of shares, to decide over the collection mechanism etc. However, all crucial matters are to be ratified by the Board of Directors before enforcement. It has a well-defined set of rules and regulations to enforce its decisions that abide by its legalized constitution.

3.11 Arrears and Dues

The AKWUA has no defined procedures or special ways of collecting ISF dues other than debarring the concerned from getting water. The processes for waiving such fees are also not well stipulated.

4. Sufficiency

The aforementioned figures indicate that the AKWUA is running low in order to be able to meet the estimated O&M costs of NRs. 3,00,000 per year. AKWUA members are expecting grants and donations from the District Development Committees and Village Development Committees to cover the deficit, other than by selling water shares.

Bibliography


Bangeri Irrigation System

The Bangeri Irrigation system is located in the east of Kalaiya in Bara district. It is surrounded by Vhatauda Village Development Committee in the east, Dudhaura River in the west, Kirkicha River in the north, and Banjareya VDC in the south.

The irrigation system is accessible by a seasonally motorable village road from Kalaiya, the district headquarters.

Background

Local farmers for supplemental irrigation in monsoon constructed the irrigation system in 1940. In 1989, it was selected as one of the sites of Farm Irrigation and Water Utilization Division (FIWUD) of Department of Agriculture and as per the regulations of FIWUD financial assistance was provided for the construction of diversion and control structures with some participation from the farmers. The assistance was extended for the solo purpose of improving the headwork condition. However in 1990, floods in Bolganga River washed away the diversion structure constructed by FIWUD.

1. Main Features

1.1 Physical

Headwork

The headwork is located on the river called Bolganga. It is temporary type diversion structure at sand bed lowland river. Earthen banks often get washed away during floods and have to be reconstructed after each flood. As a result, O&M costs are high and unpredictable.

Canals

In absence of permanent headwork, the main canal exists as an inundation earthen canal with lining in some portions. Off-taking the main canal are some watercourses that feed water to the individual’s farms. The main canal is 2 km long while secondary canals measure about 4 km in total.

Despite being earthen, the canals have already reached a regime condition hence O&M costs are low. The major problem in the canal network is silt deposition especially, during monsoon season.

Command Area

The command area of this irrigation system was reported to be 300 ha. However, irrigable area is only 200 ha. The general topography of the command area is flat and has alluvial soil (70%), clayey soil (20%), and silty soil (10%). No other major problems such as land erosion, water logging, etc., were reported.

1 Most of the information presented here, unless otherwise cited, is based on an intensive interview with the Chairman of the Bangeri Irrigation system, Mr. Ramashraya Prasad Sah. His input is greatly appreciated.
Major Structures

Major structures in the irrigation system include a head regulator at the intake point (which does not exist at present as it was washed away by the flood), one escape structure at 300m d/s of intake, and 4 cross regulators. Most of the off-takes along the main canal do not have appropriate water controlling or regulating structures. Thus, the intensity of water controlling or regulating structures are as low as 0.025I/ha. Farmers make use of mud or temporary obstacles to divert water from the main canal to the off-takes.

Water Adequacy

The irrigation system gets adequate water only during monsoon season (Jesth - Mansir) in order to be able to deliver water adequately to the entire command area. Virtually, the irrigation system remains dry when the availability of water declines in the river.

Water Reliability and Equity

Overall, water reliability was reported to be very poor in the system. The system enjoys good supply of water if there is a good pre-monsoon rainfall in the upper catchment of the Bolganga River. The reliability declines when there is drought and there is insufficient water in the river. Similar conditions also exist when there is flood in the river and the temporary diversion constructed by the farmers gets destroyed.

From reliability point of view, whatever amount of water is diverted into the system is equitably delivered to all the farmers irrespective of their positions in the command area following rotational water distribution principles. Such deliveries are based on the landholding sizes of the farmers in different reaches of the canal network and no preference is given to large farmers over small farmers.

Constraints

The diversion structure of the Bangeri irrigation system suffers from severe flood threats. Because of temporary type headwork, the main canal acts as inundation canal intruding a large amount of silt that gets deposited in the canal during the monsoon.

1.2 Socioeconomic

Ethnicity

The command area of the irrigation system, in its 300 households, has existence of mixed ethnic groups mostly of terai origin. The residents constitute of castes such as Shah (25%), Mandal (Dhanuk) (20%), Yadav (15%), Muslim (10%), Kuswaha (10%), Kankar (5%), Thakur (5%), Malaha (5%), Dome (4%), and Bhrahmin (1%).

Migration

The migration pattern is mostly seasonal and temporal. Both inflow and outflow rates are in the range of 20-22 households, i.e. 2-3% per year. People usually go out in search of better employment in bigger cities of both Nepal and India.
Income sources

The primary source of income in the command area is agriculture. Almost all people are dependent on agriculture. A very few, who usually have less land, also do some side jobs in factories, schools, etc. in nearby cities during slack time.

Water Users Association

The irrigation system is divided into nine zones. Farmers in each select one leader. The nine leaders constitute the Irrigation Committee. The Irrigation Committee members choose a Chairman, Deputy Chairman, Secretary, and Treasurer from among themselves. The WUA has two-tiered organization with a Central Irrigation Committee and Branch Committees. The Water Users’ Association in Bangeri was formally registered with the Bara Chief District Officer’s office on 1991.

The organizational check and balance is ensured by delegating the responsibility to do so to three local leaders belonging to three major political parties.

1.3 Agricultural

Land tenure

The average land holding per household inside the command area is 0.6 ha. The farm size distribution pattern is as follows:

- Large farmers: 2-3 ha (10%)
- Medium farmers: 1-2 ha (75%)
- Small farmers: < 1 ha (15%)

However, the recently increasing trend of land fragmentation is expected to bring more and more farmers in lower categories.

Tenancy

Tenants, both in formal or informal forms, are almost nonexistent. All the lands in the command area are owner-cultivated. Nevertheless, by those involved in non-agricultural professions, a new practice of giving out the lands for sharecropping is slowly emerging with the rising number people seeking alternative employment opportunities. The sharecropping arrangements are made in very informal way with no legal recognition.

Cropping pattern

At present, the major crops grown in the command area are paddy, wheat, vegetables, maize, and lentils.

Until the early 70s, a single crop of monsoon rice was grown. During the other seasons, narcotic crops like hashish and opium were cultivated. Even though these were legally banned, government was not strict enough and farmers used to get good economic returns from them.

Later, the government started taking strong actions on those who cultivated such crops. Consequently, by the end of 70s, cultivation practices of such narcotic crops completely ceased.
Since most of the farmers in the area were mainly dependent on agriculture, the ban on narcotic crops caused an economic crisis for the farmers. Thus, to find a way out, the farmers started vegetable cultivation on a commercial basis from the early 80s. The cropping intensity of commercial vegetables at present is almost 20%.

Wheat was introduced during the late 70s and has been steadily gaining coverage. Now wheat is cultivated in 55% of the command area. Similarly, Maize was introduced during the late 70s and is presently cultivated in 10% of the area.

The main paddy is grown in 95% of the irrigated area. The spring rice is not grown at all. This is because sufficient water is not available for it during the pre-monsoon season. Thus, the total cropping intensity is 190%.

The crop yields are reported to be impressive compared to the national achievements even in the irrigated areas. In 1995/96, average yields of main paddy and wheat were observed to be 4.5 and 3.5 t/ha respectively.

**Agriculture support services**

The condition of availability of agricultural credits was reported to be satisfactory. The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) situated at Birgunj provided such services to the needy farmers.

Similarly, farmers get necessary agricultural inputs from AIC, Birgunj; National Rice Research Center, Parwanipur or private dealers at Kalaiya. Farmers in this area are well-trained on modern agriculture technologies under various programs led through different governmental and non-governmental entities.

**Market**

Farmers in the command area have good access to markets from their agricultural produce. An all-weather road runs along the south of the command area that is linked with townships of Kalaiya and Birgunj. Kalaiya and Birgunj have grain and food processing industries, businesses of supplying agricultural inputs, and numerous private grain traders.

2. **ISF Related Terminology**

Some of the commonly used terms related to irrigation service in the area are as follows:

- **'Pani pot'** Irrigation Service Fee / Water cess / Water charge.
- **'Purjee'** Slip of paper given to individual farmers who want to irrigate their fields by the authorized person indicating the status the ISF payment and their authority to irrigate.
- **'Lagat'** Record of irrigated area collected by the WUA secretary or staff.
- **'Bakyouta'** Arrears. Amount to be collected against ISF pertaining to previous years.
3. Resource Mobilization for Financing O&M

3.1 Assessment of Resource Mobilization Requirements

The summed up value of resource mobilization in different forms in 1992 was worth of NRs 28,000 and was raised to pay for Chowkidar, materials, loans, etc. (Freeman, 1992). The WUA allocate costs to farmers on the basis of land units measured in bighas. Converted to hectares, each water share obligated farmers to pay NRs. 93.33/ha in 1992. Of this, NRs. 30 was payable in labor equivalent.

In 1996/7, the resource mobilization was equivalent of 20 quintals of paddy. It was mobilized in form of labor and was mainly for constructing temporary diversion structure and desilting works in the main canal where about 30cm silt gets deposited in about 600-700m long canal stretch after each year of canal operation. The quantity of paddy raised for labor payments was to meet the costs of such jobs.

3.2 Assessment of Delivered Irrigation Service

There is no defined mechanism for assessing the delivered irrigation service to individual farmers.

3.3 Relation between Resource Mobilization and Irrigation Service

The amount of resource mobilization is assessed to exactly cover the O&M requirements - no more no less. To ensure that the two exactly match, an advance is collected from some farmers and all have to pay the remainder after the work is accomplished. Thus, the required resource to be proportionally contributed by individual farmers is the irrigation service fee itself.

As an incentive toward contributing required resources promptly, the WUA has been adopting a system of “those who pay first get the turn of water first”. No extra incentives, in quantifiable terms, are given to the executive members of WUA, even when they collect ISF.

3.4 Forms of Resource Mobilization

The WUA provides the flexibility to make payments in equivalence of cash, kind, or labor as the individuals wish. The conversion between these three depending on the market price is determined by the Central Committee and is acceptable to all. A slightly higher price is fixed for those who pay in cash. It is done to encourage labor contribution of the users.

Based on the extent of O&M requirements, the WUA fixes the amount of resources to be mobilized in proportion of the land holding sizes of the individual farmers in the irrigated area. No distinction is made between different uses of water or for irrigation application for other crops.

3.5 Relation between ISF and Water adequacy and Reliability

The required resource for O&M of the system, which itself is the irrigation service fee, is meant for availing irrigation service. Farmers adopt rotational water distribution schedule, which is fixed by taking account of water availability. So, if there is inadequate water, the deficit is equally
shared by all. Once the schedule for water distribution is decided all farmers abide by it and the water supply becomes quite reliable in the entire system. This mechanism has convinced all the farmers to pay the ISF at the same rate everywhere in the system.

3.6 Farmers' Willingness to Pay

Farmers in the irrigation system abide by the rules and regulations of the WUA. Since, the adopted practices of receiving irrigation service in return of contributing resources for O&M have been internalized by all, farmers have been not reluctant to make the payments, which usually is around NRs. 100/ha.

3.7 ISF Collection Mechanism

The responsibility of ISF collection previously was of the Chairman of WUA only. However, now the responsibility has been given to three influential representatives of local political parties. Usually, the ISF collection was reported to be easier during the times when the demand for water is high and the water availability condition is poor.

3.8 Means for Controlling Free Riders

Payments of irrigation assessments are tightly connected to water delivery. If some one does not pay does not get the irrigation service or are forced to pay fines. In addition, those who pay first get water first. Also, social pressures by other farmers and ostracism have big influence on controlling the tendency of becoming free riders.

3.9 Utilization of Collected Fees

The raised contributions are utilized for covering the O&M requirements at the diversion and silt clearing of the main canal. The whole amount is fully spent and no surplus is kept in balance. No other activities are undertaken from it either. Similarly, minimal cash transactions are done. Farmers are also satisfied because they have to pay less in cash. In addition, farmers can see the use of their money very clearly.

3.10 Rules, Regulations, Role, and Authority

The ISF is charged on the entire irrigable area within the reach of the irrigation system. The WUA has full authority to deal with such affairs and accordingly has devised many rules and regulations. However, the Chairman, who has been repeatedly been on that post for over a decade, has been very popular in these activities and farmers have started taking his verdicts as the general rules and do not dig into what is written and what is not.

3.11 Arrears and Dues

The WUA in Bangeri started collecting Irrigation Service Fees on regular basis in 1991. Basically, no arrears allowed. The nonpaying farmer either does not get water or faces social pressure and ostracism. For the defectors, no water is issued for three consecutive years.
4. Sufficiency

The Bangeri irrigation system has been successful in meeting all the irrigation management expenses out of the resource contribution by beneficiary farmers. In that sense, it has been self-sufficient and been running the system successfully for almost 10 years.

Bibliography

Chhattis Mauja Irrigation System

The Chhattis Mauja Irrigation System is located in southeast of Butwal and north of Bhairahawa in Rupandehi district. It has Sukaura Khola in the east, Tinau Khola in the west, Butwal town in the north, and Indian border in the south. The project area is along the paved road joining Butwal and Bhairahawa.

**Background**

Tharu farmers for supplemental irrigation for monsoon rice constructed the irrigation system during 1800 BS. The construction took place under the leadership of Chheda Tharu of Kumari village (hence, also called Kumari kulo).

Later in 1948, many new branches were added to the system and accordingly, the system management procedures were rearranged with a view to allocate water in proportion to land ownership.

The irrigation system has a permanent type bifurcation called Tara Prasad Bhond, which divides water between Sorah Mauja and Chhattis Mauja command areas. The ratio of water division is 40:60.

**1. Main Features**

**1.1 Physical**

*Headwork*

The source of water for the irrigation system is Tinau River, near Butwal. There is no permanent and reliable headwork for diverting water into the canal network from the source.

The river often changes its flow concentration and course. The river discharge is also reported to be decreasing and large amount of silt and boulders get deposited at the intake point.

These situations have resulted in high O&M cost for ensuring water supply into the irrigation scheme.

*Canals*

The canal stretches are mostly earthen with bolder masonry side lining at necessary portions. The main canal is about 11 km long. Direct outlets have been provided along the main canal that feed water to the channels going to different villages.

These canals have already reached a regime condition hence maintenance requirements are relatively low.

The main problem that the main canal has been facing is of silt deposition especially during monsoon season.
**Command Area**

The irrigable command area from the Chhattis Mauja irrigation system is 3500 ha. The topography is almost flat. The soils are mainly silty and the surface soil texture is coarse in the head and middle portions and fine at the tail. The seepage and percolation losses are higher at the head compared to the tail portions.

The command area of the irrigation system is always in flood threats by surrounding rivers. Besides, the low lands in the tail portion of the system suffer from submergence and consequently, water logging.

**Major Structures**

There are no permanent type water controlling or regulating structures along the main canal. Most of the 62 outlets are temporary structures with only wooden posts driven into the canal bed to define the opening width based on the irrigated area from respective openings.

**Water Adequacy**

The average discharges at Sorah-Chhatis division structure have been reported to be as follows:

- Pre-monsoon season - 0.8 m$^3$/s
- Monsoon season - 3.5 m$^3$/s
- Winter season - 1.0 m$^3$/s

The available water has generally been adequate. However, shortages have been felt during the monsoon season if there is no rainfall for several days and the discharge in the river declines. In such situations, the WUA has generally adopted the process of rotational water distribution among different outlets. Presently, water is distributed in proportion to shares based on water demand and ability to contribute resources in O&M of the irrigation system.

**Water Reliability and Equity**

Water reliability has been reported to be very good in the entire irrigation system. The water distribution schedules, as decided by the WUA, are strictly followed. However, reliability in water supply declines in the monsoon when there is flood in the Tinau River. As the water distribution schedules are fixed on the basis of shares - depending upon the land area to be irrigated and the resource contribution in the O&M activities - equity in water distribution is very much assured.

**Constraints**

The major constraint of the irrigation system is the temporary nature of the headwork. It requires enormous amount of labor to keep the temporary diversion structure intact and clean up the silt, gravel, and boulders. Continued silt intrusion into the main canal in monsoon is additional problem the beneficiaries have been facing for a long time.
1.2 Socioeconomic

Ethnicity

The irrigation system serves mixed ethnic groups of Brahmin, Chhetri, Magars, Gurungs, Tharus, Yadavs, etc. Majorities of these people have immigrated from the hills of Nepal. Some new settlers have arrived from Northern India as well.

Spatially, head and middle parts are dominated by Brahmins, Chhetries, Magar, Gurungs, etc. whereas Tharus reside in the tail portion, who in fact were in the head reach, in 50s.

Migration

After 1950, after eradication of fatal Malaria, the area has experienced a large inflow of immigrants from hilly areas of Nepal and from India. As a result, native groups, such as Tharus have been brought down to minority. At present, the inflow rate has almost ceased. Similarly, permanent outward migration has also been negligible. However, temporary migration, in search of better employment in bigger cities of Nepal and India is common. Nevertheless, the area does not suffer from acute shortage of required agricultural labor force.

Income sources

The primary occupation of the local residents is agriculture and accordingly, dependency on agriculture is high. The surrounding area does offer some alternative income opportunities but in limited scale.

Water Users Association

During mid 50s, many new settlers from the hills came into the area and became beneficiary of the irrigation system. Following that, in 1958, a three-tiered Water Users' Association was formed under the initiatives of the local farmers. Similarly, in 1979, major revisions were made in the then constitution, rules, and regulations related to irrigation management in the irrigation system. Later in 1989, the constitution was amended again and four outlets were authorized in the u/s of Sorah Chhattis division structure.

The WUA was formally registered with the Chief District Office in 1994 and gained a lawfully recognized status.

The present WUA has a four-tiered organization with Village-level Committees, Area-level Committees, Executive Committee, and a Chhattis-Sorah Joint Committee. The executive members are appointed by election.

The WUA has been able to maintain very effective check and balance mechanism by clearly defining the roles and responsibilities of all the involved at different organizational levels. Besides very well laid out rules and regulations have made all farmers clear about their expected behaviors, importance of compliance to them, and also the penalties. In addition, the general assembly is held twice a year, in which all crucial information is presented to general farmers. The WUA maintains up-to-date records of all the information, any farmer will like to have a look at.
1.3 Agricultural

**Land tenure**

The average land holding size per household in the command area is 1.0 ha in head reach and 1.6 ha in the tail reach. Farm size distribution pattern indicates that about 2/3rd households in the head reach have less than 1ha of land whereas the same proportion owns more than 1ha land in the tail reach.

About 14% farmers rent out their lands for sharecropping. The percentage drops down to about 10% and 5% as we go down the irrigation system from the middle to tail reach. Thus, most of the farms are owner-operated. Usual method of tenancy is in form of sharecropping (Adhiya). Land fragmentation was also reported to be increasing day-by-day.

**Cropping pattern**

Until the early 60s, a single crop of rice was grown in the entire command area. Later, after occurrence of a three-year drought encouraged farmers toward crop diversification to increase food production and minimize risks from such droughts. The monsoon rice, even today, has almost 100% coverage.

Wheat was introduced in late 60s and since then it has steadily been gaining coverage (now about 30%).

Maize was introduced during late 70s and is rapidly gaining coverage (>40% in the head reach and about 25% in average on scheme level).

Spring rice is not grown at all. This is because sufficient water is not available for it during the pre-monsoon season. Even though cultivation would be possible if limited to some part only, the WUA has put a strong ban against spring rice cultivation, as the water requirement for it will be high and would mean a highly disproportionate distribution of water.

**Agriculture support services**

The availability of agricultural credits was reported to be satisfactory. The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) are situated in Bhairahawa and farmers have been getting their services. Besides, some private dealers are also in sufficient number in and around Bhairahawa and Butwal from where farmers can get the needed agricultural inputs such as improved seeds, fertilizers, pesticides, etc.

**Market**

Marketing is not a problem for farmers of this irrigation system. It has good market access by an all-weather road that runs north to south through the command area. Similarly, The East-West highway also crosses the eastern edge of the command area.

The nearby major markets are Butwal and Bhairahawa. Both towns have grain and food processing industries, businesses marketing agricultural inputs and numerous private grain traders.
2. **ISF Related Terminology**

There is no terminology that is used as a synonym for Irrigation Service Fee (ISF) in Chhattis Mauja Irrigation System as no such charge is directly collected from the beneficiary farmers. It is the amount of labor that has to be contributed by each of them to keep the system running. Some of ISF related terms are briefly discussed below:

'**Kulhara**'  
This unit expresses a certain share assigned to a member village, and it refers simultaneously to that village's share of water right and associated obligation.

'**Khetara**' -  
Person-day of labor for canal maintenance.

'**Khara**' -  
Amount (fine) charged to those who refrain from their share of 'Kulhara' for one day. Last year (in 2053/54), the rate of NRs.50 was fixed for 'Khara'.

3. **Resource Mobilization for Financing O&M**

3.1 Assessment of Resource Mobilization Requirements

All beneficiaries are required to contribute labor for the maintenance of the irrigation system, i.e. the headwork and main canal only - the lower canals are to be maintained by the respective area farmers and the WUA has no direct role in financing it or getting the job done. The amounts of labor are based on 'Khetara', i.e. in proportion to the irrigated lands. Depending upon the extent of work and the condition of the system at the time of maintenance, the WUA decides on number of 'Khetara' to be contributed from particular 'Kulhara'. It varies from year to year depending upon the need. In emergency situations, the WUA can ask for 'Mahajhara' for which all the able men have to come out from their houses to contribute labor.

The WUA records showed that the labor mobilization in the irrigation system in 2052/3 was about 31,500 person days. Of this, 9,000 and 15,000 person days were contributed in the maintenance of headwork and the main canal, respectively. The rest of the labor quantity was for maintenance of feeder canals and field channels in different parts of the command area.

The above figure is only of the amount of labor mobilized. Farmers also hire loader and bulldozer for the maintenance of headwork. The cost for hiring such equipment is borne out of the collected 'Khara' and other income sources such as entrance fees, lecture fees, and so on.

3.2 Assessment of Delivered Irrigation Service

The amount of delivered irrigation service is not assessed or measured as such. The irrigation network has been designed in a manner that delivers proportional water distribution, depending upon the opening size of the off takes. The openings are pre-decided and are based on "Kulhara", i.e. are to be irrigated by individual off takes. In water shortage times, rotation water distribution is practiced by shutting some of the off takes down in sequence. The off takes to be kept open and to be kept closed are fixed ahead of the water delivery into the canal network. Once, the allotted time is finished, it is assumed that the off takes have received the irrigation service, even if it may not been adequate. So, exactly how much irrigation service has been delivered is not measured.
Similarly, no distinction is made between different uses of water or for irrigation application to different crops.

3.3 Relation between Resource Mobilization and Irrigation Service

In Chhattis Mauja, the resource mobilization is closely tied with the irrigation service. Whosoever receives the irrigation service has to contribute pre-ascertained amount of resources for maintenance of the headwork and canal system. It is clearly for the purpose of meeting the cost of O&M of the system. However, the cash expenses are usually borne out of other income sources of the WUA such as entrance fees, lecture fees, penalties, etc.

3.4 Forms of Resource Mobilization

Basically, the WUA mobilizes the required resources in two forms: labor and cash. Labor is mobilized in proportion to the share of water individual "Kulhara" receives. Cash is usually collected from those who do not contribute the asked amount of labor in headwork and canal maintenance works. However, as there are always some absentees, the penalizing mechanism in cash has become regular source of cash income for the WUA to meet other direct costs, such as fuel for bulldozer, pays for the WUA staff, and so on. Some figures related to cash incomes over the last few years are given below:

Cash Income Sources in Chhattis Mauja Irrigation System

<table>
<thead>
<tr>
<th>Income Sources</th>
<th>050/51</th>
<th>051/52</th>
<th>052/53</th>
<th>053/54</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Khara' rate per person day</td>
<td>@NRs. 30.00</td>
<td>@NRs. 35.00</td>
<td>@NRs. 40.00</td>
<td>@NRs. 50.00</td>
</tr>
<tr>
<td>'Khara' amount in NRs.</td>
<td>90,000.00</td>
<td>75,000.00</td>
<td>105,000.00</td>
<td>96,000.00</td>
</tr>
<tr>
<td>Entry Fees in NRs.</td>
<td>18,000.00</td>
<td>17,500.00</td>
<td>6,300.00</td>
<td>4,500.00</td>
</tr>
<tr>
<td>Interest &amp; Fines in NRs.</td>
<td>3,500.00</td>
<td>3,000.00</td>
<td>3,300.00</td>
<td>2,400.00</td>
</tr>
<tr>
<td>Total in NRs.</td>
<td>111,500.00</td>
<td>95,500.00</td>
<td>114,600.00</td>
<td>102,900.00</td>
</tr>
</tbody>
</table>

Source: WUA records

3.5 Relation between ISF and Water adequacy and Reliability

Taking different forms of resource contribution as the irrigation service fees, Chhattis Mauja WUA does not base it on factors such as water adequacy and reliability. Even if the water availability is inadequate, the resource contribution requirement is based on the same principle, i.e. all farmers have to make contributions as required by the then status of the irrigation system in proportion to the land they irrigate irrespective of water adequacy.

The water reliability is also not a factor either. If farmers received water as per the schedule, they have to make the pre-ascertained contributions.

3.6 Farmers' Willingness to Pay

Farmers have been very well abiding by the rules and regulations of the WUA. Accordingly, farmers do make the ascertained contributions. It is simple and straightforward - if one receives water has to pay make contributions. There is no question of willingness. Looking at the amount of labor mobilized in 2052/3, @ NRs. 40 per person day, the worthiness is about NRs. 12,60,000 that comes
around NRs. 360 per hectare. Farmers have not expressed any reluctance toward contributing this amount.

However, the trend of contributing enormous amount of labor is facing difficulty day by day as people are getting better payments by doing work elsewhere. So, farmers are building up a tendency to refrain from contributing labor and rather pay for “Khara” which they consider is less than what they may earn from doing other things. Considering this tendency, the WUA is now thinking of raising the “Khara” rate higher than what a person may earn outside by doing labor works.

3.7 ISF Collection Mechanism

The responsibility of collecting ‘Khara’ is of the WUA treasurer. He keeps all the records of the “Mauja” (irrigating village) and people who are supposed to pay the ‘Khara’.

3.8 Means for Controlling Free Riders

Free riders are very strictly checked in the Chhattis Mauja Irrigation System. All ‘Kulharas’ are responsible for mobilizing the apportioned amount of labor from their respective areas. If any ‘Kulhara’ falls short of it and if it does not pay the entailing ‘Khara’, the entire ‘Kulhara’ is denied of water. It is strict and social enforced.

3.9 Utilization of Collected Fees

All the collected or raised resources are invested back into the O&M of the irrigation system. The labor mobilization is consumed while doing the maintenance of the headwork and canal system whereas the cash resources are used for covering the office running costs of the WUA and paying for fuel of bulldozer. The cash expenditure details over last few years are presented below:

<table>
<thead>
<tr>
<th>Fiscal Year1</th>
<th>050/51</th>
<th>051/52</th>
<th>052/53</th>
<th>053/54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary of staff</td>
<td>68,000.00</td>
<td>68,600.00</td>
<td>71,000.00</td>
<td>48,000.00</td>
</tr>
<tr>
<td>Diversion works: Loader/bulldozer</td>
<td>43,000.00</td>
<td>14,000.00</td>
<td>50,000.00</td>
<td>16,000.00</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>21,000.00</td>
<td>28,000.00</td>
<td>19,000.00</td>
<td>25,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>132,000.00</strong></td>
<td><strong>110,600.00</strong></td>
<td><strong>140,000.00</strong></td>
<td><strong>89,000.00</strong></td>
</tr>
<tr>
<td><strong>Balance against the previous table</strong></td>
<td>(20,500.00)</td>
<td>(15,100.00)</td>
<td>(25,400.00)</td>
<td>13,900.00</td>
</tr>
</tbody>
</table>

Source: WUA records

The budget deficits, are mainly because of higher dependency on ‘Khara’. The amount of money that would be in collected in form of ‘Khara’ is uncertain and unpredictable. Hence, it has been difficult for WUA to plan for future expenditure programs in an effective way. One of the WUA staff informed that he had not been paid for months.

3.10 Rules, Regulations, Role, and Authority

The WUA constitution is the sole legislation for all activities within the system. Subsidiary bylaws, rules, and regulations have also been laid out in detail. The WUA, delegated by the general

1In Chhattis Mauja, the period of a fiscal year is different from that of the government. It runs from the 1st of Magh to the end of Poush.
assembly, has the full authority to implement the decisions related to irrigation activities in the entire command area.

3.11 Arrears and Dues

No arrears or dues are allowed against the required resource contributions or the “Khara” imposed by the WUA. The non-payers or non-contributors become subject to water denial in the very next agricultural season.

4. Sufficiency

The process of resource mobilization in Chhattis Mauja Irrigation System has been self-sufficient as long as the maintenance requirements at the diversion had been within their capacity to maintain. However, the recurrent deficit in cash balance indicates that farmer usually run short of cash resources. Nevertheless, in 2053/4, the WUA has been successful in overcoming the deficit and generated some surplus.

Bibliography


Yoder, Robert. 1994. Organization and Management by Farmers in the Chhattis Mauja Irrigation System, Nepal. IIMI.

Kankai Irrigation System

The Kankai Irrigation System located in Jhapa district of Nepal is situated along the East-West Highway in between Damak and Birtamod. The settlement pattern is in parallel of the roads and all villagers have easy accessibility.

Background

The construction of this system was carried out in two phases. The first phase ran during 1973-80 and the second phase during 1981-91. The system is under joint management since 1993 and is being gradually turned over to beneficiary farmers. In doing so, major inputs in the irrigation system have been formation of WUA and training of WUA functionaries and beneficiary farmers on share system, resource mobilization, record keeping, and O&M of the system.

1. Main Features

1.1 Physical

Headwork

The permanent type diversion weir is at the denouncing point of Kankai River. The headwork is suffering from aberration. Similarly, H/W trash rack needs regular cleaning because of high influx of debris and floating logs. During rainy seasons, at least four laborers are to be kept standby.

The construction technique used in the H/W is of high capital cost and its rehabilitation, if the need be, will involve high cost too. However, the operational costs are relatively low.

Canals

The canal network has both lined and earthen stretches. First, 11.5 km of the main canal is lined with cement concrete and the rest 22.5 km is earthen. The canal network measuring a total of about 164 km is of three levels: main, secondary and tertiary canals. Some details of canal network are given in the annex:

Overall, the canal condition is better in phase I area compared to that of phase II area. The farmers reported occasional seepage and slides in the canal network (deep cutting from Bhalu khola to Sharda khola).

Command Area

The first phase developed a command area of 5000 ha and the second phase 2000 ha giving a total of 7000 ha. The topography is flat with slope of about 1/800. Soils in upper part are 'Brown Forest Soil' with high fertility. Soil texture varies from loamy to sandy loam and most parts of the command area have 'Alluvial' soil. Tail parts have soils highly suitable for Paddy, i.e. 'Paddy soils'. Paddy cultivation is very common and been repeatedly grown for many years.

Major Structures
In regulating structures, steel gates exit at all off take points from the Main Canal and Tertiary off takes from Secondary Canals. Total number of such regulating structures is 322. Inclusive all other subsidiary hydraulic structures, the structural density is as high as 1/5 number per ha. However, 40% of the steel gates are not functioning due to inappropriate maintenance.

Similarly many cross drain structures, mainly siphons, have been constructed as the canal network crosses over many flashy drains. These siphons, escape structures, and their regular cleaning usually require high O&M costs. Also due to flashy nature of the drains, the siphons suffer from higher chances of being outflanked. The drains are need of training works at numerous places.

**Water Adequacy**

The designed discharge of the irrigation system is 10.6 m$^3$/s, with a duty of 1.06 lps/ha. The maximum discharge possible at present is 6.2 m$^3$/s. There is acute water shortage during pre-monsoon season for early paddy cultivation. Water crisis is caused both by low flow (7.7 m$^3$/s) in the source and high water requirement for early rice cultivation. Annual rotational supply of 2 years has been adopted as the measure to deal with the water shortage.

Water shortage has also been felt during grain-filling stage of Monsoon rice if there is no rainfall for several days. Measure taken in such situation is rotational water supply among secondary canals.

**Water Reliability and equity**

Overall, water reliability in Kankai is good. However, during water shortage, reliability declines in the tail portions. Since many of the regulating steel gates are non-functional, reliability also varies with topography of the command area, i.e. lower level canals steadily draw a lot of water while supply is unreliable in canals irrigating area at higher elevation. Moreover, during pre-monsoon season, the availability of water in the river itself affects the water reliability conditions.

The water shortage in the tail portions of both main canal (S10, S11, S12) and extension area (S15, S16, S17-20) has led to complete disregard to the concept of equity in water distribution.

**Constraints**

The Kankai Irrigation System stands at flood threats by Kankai River itself at some areas in the eastern edge of the command area. Similarly, some drainage problems have become unavoidable because of low lands in tail portions that get almost submerged in rainy seasons.

Soil erosion problem is not very significant and silt intrusion is very much controlled by the settling basin.

### 1.2 Socioeconomic

**Ethnicity**

Altogether, there are 7,146 households in the command area. The Kankai irrigation system serves multi-ethnic groups of Rai, Limbu, Brahmin, Chhetri, Sattar, Rajbanshi, etc. The spatial distribution of different groups is as below:

- **Northern Parts**: Brahmins and Chhetries
- **Middle Parts**: Rai, Limbu, Tamang, and Taj puria
- **Tail Parts**: Sattar, Rajbanshi, Meche, Koche, Dhimal, etc.
**Migration**

The Sattar, Rajbanshi, Meche, Koche and Dhimal are native residents of this area. During 1964-76, a large inflow of immigrants from hilly areas (Ilam, Taplejung, Panchthar) and from India (Assam) came and settled here. The larger section of immigrants has put the native groups in minority.

The immigration rate, at present, is declining and is almost insignificant. Similarly, permanent outward migration is also nonexistent. However, temporary migration, in search of employment in bigger cities of both Nepal and India, was reported to be on rise. Nevertheless, the local availability of the required agricultural labor force is sufficient.

**Income sources**

The primary income source of the people in the command area is agriculture and related business. Alternative opportunities are very few in absences of other trades or industries. People with no regular work do labor works on daily wage basis during slack time. People in the southern part go to India and those in the northern parts go to Biratnagar or Kathmandu for work.

**Water Users Association**

A WUA representing the entire irrigation system, first formed in 1993, held its reelection in 1996. It is lawfully registered with the Jhapa Chief District Officer’s office. It has three-tiered organizational structure with a Central Committee, Secondary Canal Committees, and Tertiary Canal Committees. The executive members are generally decided by mutual discussions else by election.

The presence of the general assembly, well-articulated rules and regulations in accordance to WUA’s constitution, have been very effective in maintaining check and balance within the organizational structure.

Encouraged by the agency people based on the present Irrigation Policy, the General Assembly of Kankai farmers has ratified the proposal of the main canal committee to take over the entire system, except the main canal, by 2001. To meet the target, segments of canal network serving about 1,500 ha have to be turned over to the respective beneficiaries’ committees every year. Starting the trend of partial and gradual turnover, canal segments of S-0, S-9, S-10, S-11, S-12, and To12 serving 300, 127, 259, and 144, 385, and 28 hectares of land respectively, have already been turned over to beneficiary organizations. Respective farmers themselves are managing all these subsystems by mobilizing local resources.

1.3 Agricultural

**Land tenure**

The average land holding per household with a family size of 7 members is 0.98ha. The farm size distribution pattern indicates that the majority (71%) of the people in the command area own lands less than 1ha. Also, some lands were distributed to the land less farmers by the government in 1975 @ 1 ha/family. Still, about 19% farmers are land less. Other details are given below:
Landholding Percentage

<table>
<thead>
<tr>
<th>Landholding</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.5 ha</td>
<td>24%</td>
</tr>
<tr>
<td>0.5-1 ha</td>
<td>28%</td>
</tr>
<tr>
<td>1-5 ha</td>
<td>22%</td>
</tr>
<tr>
<td>5 ha and above</td>
<td>7%</td>
</tr>
</tbody>
</table>

Local residents also reported that fragmentation of land is continually increasing and the percentage of tenants, mostly doing sharecropping, is decreasing leaving most of the lands owner-operated.

**Cropping pattern**

The existing cropping pattern, presented below, exhibits a significant coverage of Early paddy. However, farmers' strong inclination towards early paddy cultivation is mainly hindered by water availability condition and also by the condition of availability of improved variety seeds. The preference of the farmers for improved variety especially during pre-monsoon season is because it matures faster so that cultivation of monsoon paddy is not affected.

**Existing Cropping Pattern (1996/7)**

<table>
<thead>
<tr>
<th>Irrigated Crop</th>
<th>Season</th>
<th>Area in ha</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Paddy</td>
<td>Spring</td>
<td>2000</td>
<td>4.0</td>
</tr>
<tr>
<td>Paddy</td>
<td>Monsoon</td>
<td>7000</td>
<td>4.4</td>
</tr>
<tr>
<td>Wheat</td>
<td>Winter</td>
<td>3000</td>
<td>2.3</td>
</tr>
<tr>
<td>Maize</td>
<td>Winter</td>
<td>800</td>
<td>1.7</td>
</tr>
</tbody>
</table>

The practice of jute cultivation has declined significantly, compared to what was envisaged while designing the irrigation system, and is being replaced by paddy. It is basically due to absence of a favorable marketing situation for jute in terms of price and easy marketability.

The coverage of wheat, even after a slight increase, has not been able to take potential coverage mainly due to the following reasons:

- Due to preservation problem of wheat seed it has to be procured from the market at higher prices.
- Expenditure for cultivation of wheat is higher. It is so because of the greater need for insecticides, pesticides, chemical fertilizer, etc. and also because of the need for extra care as over- or under-irrigation can cause significant decline in yield.
- The food habit of wheat consumption is not very common in the command area.
- Wheat market is not promising and normally does not offer attractive price.
- Storage of wheat is difficult and costly (as compared to rice).

The coverage of maize especially during the pre-monsoon season is significant. This is mainly because of agricultural intensification caused by increase in population density.
Even though other crops like ‘Musuroo’, oilseed, linseed and ‘Khesari’ are also cultivated in the command area, apart from paddy all the crops are grown just to meet the household consumption.

**Agriculture support services**

The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) are situated at Bhadrapur, a very close by township. However, many farmers expressed that the availability of agricultural credits was unsatisfactory. The nearest point to get other agricultural inputs is Chandradangi Agricultural Farm, but services are not available adequately.

Several training programs were conducted while implementing Joint Management activities. Other agencies and programs like District Agricultural Development Office, Special Program for Food Production in Support of Food Security in Nepal (SPIN), etc. have also given training to farmers in the locality. Nevertheless, farmers complained that most of the training was not based on their actual need.

**Market**

There is a good road network of trunk road and service roads of main, secondary, and tertiary canal service roads linked with the East-West highway attached to command area. It provides very good access to nearby major markets, i.e. Birtamod (18 km), Damak (20 km), and Bhadrapur 34 (km).

**2. ISF Related Terminology**

Some of the ISF related terms in use are briefly described below:

- ‘Panipot’ – Irrigation Service Fee / Water cess / Water charge
- ‘Lagat’ - Record of irrigated area of paddy collected towards the end of each rice season by “Amins” or WUA, in case of turned over parts of the system.
- ‘Bakyouta’ - Arrears. Amount to be collected against ISF pertaining to previous years.

**3. Resource Mobilization for Financing O&M**

**3.1 Assessment of Resource Mobilization Requirements**

The Kankai Irrigation Office has been preparing an estimate of the work to be done under O&M for each year and been asking for the needed budget. However, the budget disbursed has never been in accordance to the demanded amount. The expenditures made out of the allocated budget (being less than demanded, usually all the allocated budget is spent) over last few years are presented below:
O&M Budget Expenditures and Estimation of Farmers’ Contribution

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>O&amp;M Budget Expenditure in NRs.</th>
<th>Estimate of Farmers’ contribution in NRs.</th>
<th>Total in NRs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>48,00,000/-</td>
<td>30,00,000/-</td>
<td>78,00,000/-</td>
</tr>
<tr>
<td>2051/52</td>
<td>95,00,000/-</td>
<td>50,00,000/-</td>
<td>1,45,00,000/-</td>
</tr>
<tr>
<td>2052/53</td>
<td>69,00,000/-</td>
<td>40,00,000/-</td>
<td>1,09,00,000/-</td>
</tr>
<tr>
<td>2053/54</td>
<td>71,29,000/-</td>
<td>55,00,000/-</td>
<td>1,26,29,000/-</td>
</tr>
<tr>
<td>2054/55</td>
<td>19,60,000/-</td>
<td>60,00,000/-</td>
<td>79,60,000/-</td>
</tr>
</tbody>
</table>

Source: Project records

3.2 Assessment of Delivered Irrigation Service

The delivered irrigation service is assessed in terms of irrigated area for rice crop, which is popularly grown in the entire command area. No amount is charged for other uses of water (e.g. for fishponds, domestic uses, or even irrigation for crops other than rice). The flat rate charged for received irrigation service in Kankai is NRs. 100/ha/rice. The concerned irrigation office itself enforced this rate.

The areas that do not get reliable water supply are excluded. The assessed area of rice cultivation and corresponding amount of ISF assessed and collected are given below:

ISF Assessment and Collection in Kankai Irrigation System

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Season</th>
<th>Assessed Area (ha)</th>
<th>Amount Due (NRs.)</th>
<th>ISF: Amount Collected (NRs.)</th>
<th>Collection Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>Spring</td>
<td>1316</td>
<td>3,69,300/-</td>
<td>25,763/15</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>2377</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>3693</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>1091</td>
<td>3,86,500/-</td>
<td>1,82,077/50</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>2774</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>3865</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>1315</td>
<td>4,67,800/-</td>
<td>2,95,149/25</td>
<td>63%</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>3363</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>4678</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2053/54</td>
<td>Spring</td>
<td>1321</td>
<td>4,68,200/-</td>
<td>2,15,154/53</td>
<td>46%</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>3361</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>4682</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2054/55</td>
<td>Spring</td>
<td>1288</td>
<td>5,62,400/-</td>
<td>3,15,540/75 till May</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>4336</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>5624</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Project records

1 As a part of cost sharing under joint management.
3.3 Relation between Resource Mobilization and Irrigation Service

The trend of budgetary expenses against the ISF collection is given below:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>O&amp;M Budget Expenditure in NRs.</th>
<th>ISF Collected in NRs.</th>
<th>ISF Collected Against Budgetary Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/1</td>
<td>48,00,000/-</td>
<td>25,763/15</td>
<td>0.5 %</td>
</tr>
<tr>
<td>2051/2</td>
<td>95,00,000/-</td>
<td>1,82,077/50</td>
<td>1.92 %</td>
</tr>
<tr>
<td>2052/3</td>
<td>69,00,000/-</td>
<td>2,95,149/25</td>
<td>4.28 %</td>
</tr>
<tr>
<td>2053/4</td>
<td>71,29,000/-</td>
<td>2,15,154/53</td>
<td>3.02 %</td>
</tr>
<tr>
<td>2054/5</td>
<td>19,60,000/-</td>
<td>3,15,540/75</td>
<td>16.1 % (till May)</td>
</tr>
</tbody>
</table>

![Graph showing O&M Budget Expenditure in NRs.](image)

![Graph showing ISF Collected in NRs.](image)

![Graph showing ISF Collected Against Budgetary Expenses(%)](image)
As seen from graphs above, basically, no inferential relationship is observed between collected ISF and the budgetary expenditures. In fact, O&M budgetary expenses are declining as the rate of ISF collection is increasing.

3.4 Forms of Resource Mobilization

Kankai irrigation system has two kinds of resource mobilization. Against Irrigation Service Fees, cash is collected from beneficiary farmers @ Rs.100/ha for irrigated area of rice. In addition, for canal cleaning, etc. in the sub-system not yet turned over; labor or equivalent cash is also mobilized. Last year, the mobilization in the latter form was equivalent to @ NRs. 45/ha/ household at Shibgunj

Similarly, different forms of resource mobilization also occur at different tiers of the WUA.

At the tertiary canal level: Labor resource for canal maintenance works, in variable amounts, is mobilized in almost all tertiary canals. The basis for such labor mobilization also varies from one to other. In most cases, e.g. S5T1, To12, etc., landholding size is the usual basis. In few cases, number households also have been a basis.

Similarly, the process also varies. In most cases, farmers first decide how many laborers per household have to be mobilized for the targeted works of canal maintenance. Based on it, farmers get together at some pre-defined place and jointly start the canal cleaning works. Attendance is marked for all of those who participated. It is done till the canal comes back into original and fully functional status and it may take one to three days.

In other tertiary canals, such as in SoT (1-10), the whole canal stretch is divided various segments and assigned to different groups of farmers depending upon the size of their landholdings. Farmers, usually, are given a time of one week to complete the canal cleaning works in their respective sections.

At the secondary canal level: Resources are also mobilized for canal cleaning works at secondary level. However, it is not a regular process and is not practiced uniformly in all secondary canals either. When sufficient budget used to be there with the Kankai Irrigation Office, the office cleaned the silt from the canal. As the O&M budget allocation to Kankai has been drastically reducing; farmers could not depend on the irrigation office to get the work done in the same way. It is why, some Secondary Canal Committees of the beneficiaries have started mobilizing the labor at their own.

In secondary canals, the labor mobilization requirements are very high. As that many laborers are not readily available among farmers, the farmers have adopted a practice of collecting cash also. Depending upon one's wish, donation is collected in some secondary canals, e.g. S15, S10, etc. whereas, in some, e.g. S9, cash is collected on the basis of landholding size (NRs. 25/Bigha or 37.5/ha).

At some places, the Secondary Canal Committees are also found to be insisting and assisting in desilting works in tertiary canals. In 1996, the S9 Committee asked the tertiary level committees to carry out the desilting works in all of its tertiary canals. For strict enforcement, water was not released to its tertiary canals until they were properly cleaned. This mechanism of withholding water against the canal desilting works, also abstained some tertiary canals from receiving water during the pre-monsoon season for more than week as the respective farmers did not clean them in time. Similarly, S0 Committee also makes sure that all tertiary canals in its area are properly desilted
before the water delivery. In March 1998, S0 Committee even distributed NRs. 500 to each of its tertiary canal committees for meals during the labor mobilization for desilting works.

At the Central Committee Level: The Central Committee also has its own sources of raising the fund. Even though the WUA members claim that they will use their fund to do the canal maintenance works if necessary, the available fund was not found to be sufficient to carry out such works and the fund, so far, has been used for meeting the administration costs of the WUA (Please, see the WUA balance sheet under heading 3.9).

3.5 Relation between ISF and Water adequacy and Reliability

The general trend has been of a continued increase in ISF collections after the implementation of joint management and turnover of some secondary canals to the respective Water Users Groups. The water adequacy and reliability conditions also have been reported to have slightly improved with joint management practices and increased participation of farmers in water distribution.

As it has been experienced, the “ISF collections” and “water adequacy and reliability” have been mutually supportive. If one improves, the other also improves and vice versa.

3.6 Farmers' Willingness to Pay

In relative terms Kankai farmers are willing to pay except in areas where water is not reliable. So far the matter of ISF collection is concerned, no other options have been given except to pay in cash.

3.7 ISF Collection Mechanism

The ISF collection mechanism is a slightly different in turned over parts than that of not yet turned over parts of the irrigation system. In turned over parts, the water users groups at the lowest level collect ISF by themselves. Whereas, in not yet turned over systems, “Amins” or some collectors assigned from the Kankai Irrigation Office do the work based on office’s assessment with verification from the concerned water users groups.

The WUA has a very small trained manpower but is highly dedicated to get the records straightened out. Similarly, the Kankai Irrigation Office also has trained its own manpower and provided them with necessary resources resources. However, such resources have not been sufficient and the people have very less motivation to do the ISF works.

3.8 Means for Controlling Free Riders

For controlling the free riders, who usually either do not pay the ISF or claim not to have received the irrigation service even it is not true, field verifications are done by respective water users group members during the concerned crop season. Besides, the farmers to make sure that the recipient of irrigation service pays ISF also exert social pressure.

3.9 Utilization of Collected Fees

As stipulated in the Irrigation Policy, the entire ISF amount collected by the Kankai irrigation Office and 50% of the ISF amount collected by the farmers in turned over systems go to the general treasury of the government. The 50% of the collected ISF amount by farmers is retained
by the farmers themselves. This retained sum is supposed to be used in the operation and maintenance of respective canal system. However, some ambiguity has been felt by the farmers as well as by the Kankai Irrigation Office in the arrangements for making good use of this sum. As such, no clear rules for defining the proper use of the money exist. Similarly, no O&M plans for spending this money have been made by WUA so far. A typical detail of income and expenditure of the central committee of WUA in fiscal year 2053/4 is presented below:

**WUA’s Balance Sheet of the Fiscal Year 2053/4**

<table>
<thead>
<tr>
<th>Income Source</th>
<th>Amount in NRs.</th>
<th>Expenditures</th>
<th>Amount in NRs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank balance from last year</td>
<td>1,837.50</td>
<td>Daily allowance</td>
<td>1,500.00</td>
</tr>
<tr>
<td>Membership fee</td>
<td>634.50</td>
<td>Services</td>
<td>342.00</td>
</tr>
<tr>
<td>Applications</td>
<td>130.00</td>
<td>Rent</td>
<td>600.00</td>
</tr>
<tr>
<td>Fee from picnickers</td>
<td>4,000.00</td>
<td>Stationary</td>
<td>1,751.00</td>
</tr>
<tr>
<td>Water tax (part of 10% going to the central committee)</td>
<td>2,000.00</td>
<td>Fuel</td>
<td>1,350.00</td>
</tr>
<tr>
<td>Rent of equipment</td>
<td>3,450.00</td>
<td>Contingencies</td>
<td>4,575.00</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>8,117.00</td>
<td>Furniture</td>
<td>4,730.00</td>
</tr>
<tr>
<td>Balance</td>
<td>968.00</td>
<td>Government tax</td>
<td>500.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintenance</td>
<td>3,400.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miscellaneous</td>
<td>453.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21,137.00</strong></td>
<td><strong>Total</strong></td>
<td><strong>19,201.00</strong></td>
</tr>
</tbody>
</table>

Farmers have been found to be lacking sufficient foresight in appropriate utilization of collected ISF.

3.10 Rules, Regulations, Role, and Authority

Most of ISF related and other joint management activities are being followed in accordance to Irrigation Regulation, 2045 and Irrigation Policy, 2053. However, portions of collected ISF going to different tiers of the WUA have been decided by the WUA itself. The existing rules of WUA for division of the collected ISF in turned over systems are as follows:

- 50% - goes to central treasury and deposited at the end of each month
- 10% - sent in WUA Central Committee. (However, not all sub committees are abiding by it).
- 2% - from regular dues and 10% from arrears are given to the individual collectors as incentives
- Remaining amount - retained in respective sub committee’s fund.

3.11 Arrears and Dues

When the farmers do not pay their share of ISF even up to the end of Jesth, the amount becomes ISF arrears. It has to be paid by the concerned unless the individual proves that he did not receive the irrigation service. For doing so, farmers have to give written applications stating that their fields were not irrigated. Based on the application, a team from the Kankai Irrigation Office verifies in the field during the complained crop season and if found true, the ISF is written off or waived.
Previous inaccuracies in irrigated area assessments have also made the task of collecting arrears difficult.

4. Sufficiency

In turned over systems especially S9 and To12, the respective farmers' associations are collecting money sufficient for carrying out cleaning and desilting work on their own, e.g. in S9. NRs. 1,935/- out of NRs. 40,241/62 they collected as ISF and was spent on canal cleaning works. However, when it is to be analyzed at the entire system level, the sufficiency in terms of meeting the O&M cost from the raised ISF can be displayed as in the following graph.
## Details of Canal Features

<table>
<thead>
<tr>
<th>Branch Canal Name</th>
<th>Canal Length (km)</th>
<th>Canal Capacity (lps)</th>
<th>Area Irrigated (ha)</th>
<th>Construction Phase</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0</td>
<td>4.65</td>
<td>345</td>
<td>300</td>
<td>2</td>
<td>Turned over</td>
</tr>
<tr>
<td>S1</td>
<td>5.80</td>
<td>851</td>
<td>746</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>3.90</td>
<td>259</td>
<td>227</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>3.40</td>
<td>425</td>
<td>372</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>4.65</td>
<td>477</td>
<td>418</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>6.60</td>
<td>91</td>
<td>798</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>2.15</td>
<td>154</td>
<td>136</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>1.70</td>
<td>262</td>
<td>230</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S8</td>
<td>8.70</td>
<td>704</td>
<td>676</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>S9</td>
<td>1.20</td>
<td>144</td>
<td>127</td>
<td>1</td>
<td>Turned over</td>
</tr>
<tr>
<td>S10</td>
<td>3.32</td>
<td>295</td>
<td>259</td>
<td>1</td>
<td>Turned over</td>
</tr>
<tr>
<td>S11</td>
<td>3.20</td>
<td>165</td>
<td>144</td>
<td>1</td>
<td>Turned over</td>
</tr>
<tr>
<td>S12</td>
<td>11.10</td>
<td>441</td>
<td>385</td>
<td>1</td>
<td>Turned over</td>
</tr>
<tr>
<td>S13</td>
<td>2.00</td>
<td>310</td>
<td>214</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>S14</td>
<td>5.60</td>
<td>603</td>
<td>416</td>
<td>2</td>
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</tr>
<tr>
<td>S14A</td>
<td>2.00</td>
<td>315</td>
<td>217</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>S15</td>
<td>4.20</td>
<td>666</td>
<td>459</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>S16</td>
<td>3.60</td>
<td>474</td>
<td>327</td>
<td>2</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77.77</strong></td>
<td><strong>6981.00</strong></td>
<td><strong>6450.60</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S17</td>
<td>6.20</td>
<td></td>
<td></td>
<td>Cut-off area</td>
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</tr>
<tr>
<td>S18</td>
<td>1.45</td>
<td></td>
<td></td>
<td>Cut-off area</td>
<td></td>
</tr>
<tr>
<td>S19</td>
<td>3.10</td>
<td></td>
<td></td>
<td>Cut-off area</td>
<td></td>
</tr>
<tr>
<td>S20</td>
<td>3.00</td>
<td></td>
<td></td>
<td>Cut-off area</td>
<td></td>
</tr>
</tbody>
</table>

**Design Duty:** 1.08 lps/ha 2015.4

**Canal Density:** 4.02 m/ha Main Canal 8466.00

9.19 m/ha Branch Canal
## Main Tertiary Canal Details

<table>
<thead>
<tr>
<th>Main Tertiary Canals</th>
<th>Canal Capacity (lps)</th>
<th>Area irrigated (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To1</td>
<td>83</td>
<td>72.7</td>
</tr>
<tr>
<td>To2</td>
<td>19</td>
<td>16.6</td>
</tr>
<tr>
<td>To3</td>
<td>28</td>
<td>24.8</td>
</tr>
<tr>
<td>To4</td>
<td>32</td>
<td>27.8</td>
</tr>
<tr>
<td>To5</td>
<td>12</td>
<td>10.1</td>
</tr>
<tr>
<td>To6</td>
<td>45</td>
<td>37.2</td>
</tr>
<tr>
<td>To7</td>
<td>19</td>
<td>16.6</td>
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<td>To8</td>
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<td>24.3</td>
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<td>19.6</td>
</tr>
<tr>
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<td>74</td>
<td>67.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main Tertiary Canals</th>
<th>Canal Capacity (lps)</th>
<th>Area irrigated (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB11</td>
<td>17</td>
<td>14.8</td>
</tr>
<tr>
<td>TB12</td>
<td>52</td>
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<td>TE1</td>
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<tr>
<td>TE6</td>
<td>200</td>
<td>138.0</td>
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<tr>
<td>TE7</td>
<td>15</td>
<td>103.0</td>
</tr>
<tr>
<td>TE8</td>
<td>90</td>
<td>62.0</td>
</tr>
<tr>
<td>TE9</td>
<td>39</td>
<td>27.0</td>
</tr>
<tr>
<td>TE10</td>
<td>119</td>
<td>82.0</td>
</tr>
<tr>
<td>TE11</td>
<td>87</td>
<td>60.0</td>
</tr>
<tr>
<td>TE12</td>
<td>10</td>
<td>7.0</td>
</tr>
<tr>
<td>TE13</td>
<td>27</td>
<td>17.0</td>
</tr>
<tr>
<td>TE14</td>
<td>22</td>
<td>15.0</td>
</tr>
<tr>
<td>TE15</td>
<td>33</td>
<td>210.0</td>
</tr>
<tr>
<td>TE16</td>
<td>30</td>
<td>21.0</td>
</tr>
<tr>
<td>TE17</td>
<td>33</td>
<td>23.0</td>
</tr>
<tr>
<td>TE18</td>
<td>49</td>
<td>34.0</td>
</tr>
<tr>
<td>TE19</td>
<td>32</td>
<td>22.0</td>
</tr>
<tr>
<td>TE20</td>
<td>51</td>
<td>35.0</td>
</tr>
<tr>
<td>TE21</td>
<td>47</td>
<td>32.0</td>
</tr>
<tr>
<td>TE22</td>
<td>20</td>
<td>14.0</td>
</tr>
<tr>
<td>TE23</td>
<td>54</td>
<td>37.0</td>
</tr>
</tbody>
</table>

**Total 2244.00  2015.40**

Duty 1.11 Lps/ha
Marchwar Lift Irrigation System

The Marchwar Irrigation system, surface list type, is located in Rupandehi district in Southwest of Bhairahwa. From the access point of view, the area is linked with district headquarter by 20-km gravel feeder road joining Bhairahwa-Lumbini road.

Background

Following the HMG/N’s request for UNCDF’s assistance in construction of this irrigation project, the construction began in 1980. Under phase I, construction of pump station, and partial completion of the main distribution system and access road took place. Phase II, which ran till June 1997, completed the physical infrastructure to provide irrigation facility for 2815ha by lower level canal and 1000ha by upper level canal.

In February 1998, the management of the whole irrigation system was transferred to the WUA.

1. Main Features

1.1 Physical

Headwork

The pump station for this lift irrigation system is situated at the confluence of Dano and Hariya rivers. The pump station has 10 pumps. The O&M costs of the pump station is very high. The recurring electricity charges for operating these pumps are given below:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Electricity Charges Paid in NRs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>NRs. 10,00,000/-</td>
</tr>
<tr>
<td>2051/52</td>
<td>NRs. 12,00,000/-</td>
</tr>
<tr>
<td>2052/53</td>
<td>NRs. 12,48,000/-</td>
</tr>
<tr>
<td>2053/54</td>
<td>NRs. 15,18,000/-</td>
</tr>
</tbody>
</table>


Canals

The canal network has both lined (single brick lining) and earthen stretches. Total length of canals in the system is 55.86km in lower canal system in addition to the main canal that measures about 2.8km. The network consists of main canal; primary, secondary and tertiary canals; and watercourses and field channels below block outlets. These canals suffer from frequent leakage and breakage during canal opening in the beginning of monsoon season caused by roots of numerous ‘sisho’ planted along the banks.

There is no silt problem in the irrigation system.
Command Area

The irrigable area as determined by the project is 2800 ha, out of which only 2200 ha is presently irrigated. The general topography is flat with no soil erosion problems.

Major Structures

As water is distributed proportionally in the canal system, no regulating structures have been provided. Total no of hydraulic structures in the irrigation system are 337. Thus, the density of hydraulic structures comes to be as high as high 1/8 no per ha. Cross drainage structures are also less than the required number.

Water Adequacy

Water availability in the source has been reported to be adequate for the revised assessment of the command area of 2800 ha. However, some water shortage has been felt during canal breakage usually in the beginning of monsoon season.

As the irrigation system follows proportional water distribution, flexibility in canal operation is very limited and at least 70% of the designed discharge (6.15 cumecs) has to be pumped in order to allow the water to flow into the canal system. Such a design of the irrigation system has made the operational tasks a bit difficult for the WUA.

Water Reliability and Equity

Overall water reliability is good in the system. Water reliability declines (mainly due to canal breakage) during land preparation for monsoon rice when the water requirement is high and critical.

Similarly, as the water is distributed proportionally based on the coverage of the outlets, equity is pretty much maintained and no preference is given to individual’s landholding sizes.

Constraints

The irrigation system suffers from flood threats of Tinau River at lower ends of the command area. Similarly, problems such water logging were found to be quite severe at some locations.

1.2 Socioeconomic

Ethnicity

The project area has existence of multi-ethnic groups composed of Yadav, Brahmin (Shukla), Muslims, Lodh, etc. Yadavs were reported to be in majority.

Migration

Population inflow into the command area is almost zero. Similarly, permanent migration outside the command area was also reported to be negligible. Nevertheless, temporary migration rate in search of better employment opportunities in bigger cities of both Nepal (Butwal, Bhairahwa, Narayanghat, Kathmandu) and India (Punjab) was found to be very common.
**Income sources**

The primary occupation of the local residents is agriculture and the dependency on agriculture is also high. About 95% of the total population are engaged in farming practices.

Alternative income generating opportunities are almost nonexistent within the command area. Depending on individual’s capability and qualification, people go to different areas in search of work - Those with no education go to Punjab, India to work as laborer and those with some education go to Butwal or Bhairahwa to work in some industries and those with higher education go to Kathmandu.

**Water Users Association**

The WUA in Marchwar irrigation system was legally registered in Rupandehi Chief District Officer’s Office in 1993. The WUA has a 3-tiered organization with Main Committee (1), System Committees (8) and Block Committees (130). In addition, it also has four other sub-committees assigned for different sets of tasks.

Executive members of these committees are posted through election that is held in every 3-year. Check and balance within the organization is maintained through Marchwar Assembly that meets at the end of both winter and monsoon seasons.

1.3 Agricultural

**Land tenure**

Average family size in the command area is of 7 members. Likewise, average land holding per household is 1.2ha. The farm size distribution pattern is as under:

<table>
<thead>
<tr>
<th>Size Class</th>
<th>Percentage of Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land less</td>
<td>2.3 %</td>
</tr>
<tr>
<td>0-1 ha</td>
<td>60.0 %</td>
</tr>
<tr>
<td>1-5 ha</td>
<td>35.8 %</td>
</tr>
<tr>
<td>5-10 ha</td>
<td>1.7 %</td>
</tr>
<tr>
<td>&gt; 10 ha</td>
<td>0.2 %</td>
</tr>
</tbody>
</table>

Almost 93% of the people cultivate their own land. About 7% are share tenants.

Fragmentation of land in the command area has been reported to continually increasing owing to separation of families and increasing population.

**Cropping pattern**

The area cultivated in winter seasons is 60-70% of the total command. This is more than the recommended what has been recommended in the project paper (40%). Area under wheat is almost constant but area under mustard seeds and pulses has been slowly increasing. Sugarcane cultivation is confined to certain locations where water availability is unreliable. The sugarcane coverage is almost same. The coverage of different crops over last few years is given below:
Crop Coverage in Hectare

<table>
<thead>
<tr>
<th>Year</th>
<th>M. Rice</th>
<th>Wheat</th>
<th>Sugarcane</th>
<th>Oilseed</th>
<th>Pulses</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1993/94</td>
<td>616</td>
<td>300</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1994/95</td>
<td>2268</td>
<td>1800</td>
<td>20</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>1995/96</td>
<td>2576</td>
<td>2050</td>
<td>25</td>
<td>35</td>
<td>38</td>
</tr>
<tr>
<td>1996/97</td>
<td>2805</td>
<td>2255</td>
<td>225</td>
<td>50</td>
<td>45</td>
</tr>
</tbody>
</table>

Similarly, crop yields have been as follows:

Production in t/ha

<table>
<thead>
<tr>
<th>Year</th>
<th>M. Rice</th>
<th>Wheat</th>
<th>Sugarcane</th>
<th>Oilseed</th>
<th>Pulses</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1993/94</td>
<td>3.20</td>
<td>2.30</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1994/95</td>
<td>2.40</td>
<td>2.60</td>
<td>40</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>1995/96</td>
<td>3.40</td>
<td>1.80</td>
<td>40</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>1996/97</td>
<td>3.85</td>
<td>1.80</td>
<td>40</td>
<td>0.6</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The corresponding crop prices are as below:

Crop Prices in Nepal Rupees/1000Kg**

<table>
<thead>
<tr>
<th>Year</th>
<th>M. Rice</th>
<th>Wheat</th>
<th>Sugarcane</th>
<th>Oilseed</th>
<th>Pulses</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1993/94</td>
<td>6250.00</td>
<td>5280.00</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1994/95</td>
<td>7050.00</td>
<td>6800.00</td>
<td>2000.00</td>
<td>16700.00</td>
<td>22100.00</td>
</tr>
<tr>
<td>1995/96</td>
<td>7700.00</td>
<td>7200.00</td>
<td>2000.00</td>
<td>21000.00</td>
<td>28000.00</td>
</tr>
<tr>
<td>1996/97</td>
<td>7250.00</td>
<td>7500.00</td>
<td>1900.00</td>
<td>21300.00</td>
<td>28000.00</td>
</tr>
</tbody>
</table>

* Low coverage this year, as rehabilitation works were not accomplished.
** Source: Agricultural Marketing Bulletin, DOA, HMG.

Agriculture support services

Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC), both are situated at Bhairahawa. However, farmers expressed dissatisfaction on adequate availability of needed agricultural credits. Farmers procure necessary agricultural inputs from AIC, Bhairahawa. Sometimes, the WUA itself arranges for the seeds and fertilizers, etc for the farmers in the command area. For instance, last year, the WUA brought 30 bags of wheat seed and provided to the needy farmers.

Several training programs had been organized by the Marchwar Lift irrigation Office and associated consultants in course of the management transfer efforts. Other government agencies like District Agriculture Development Office and non-governmental agencies like RSDC (Rural Self-reliance Development Company), have also given training to farmers in the command area.

Nevertheless, farmers complained that the process of selection of participants for the training was not right.
Market

A graveled service road along the main canal connects the command area to Bhairahwa, which is the biggest market in the area. It is located at about 25km from the command area. The second market is Butwal and is 47km away.

2. ISF Related Terminology

Some of the commonly used terms in relation to Irrigation Service Fees are briefly described below:

- 'Panti sewa shulk' - Irrigation Service Fee / Water cess / Water charge.
- 'Lagat' - Record of irrigated area collected by the WUA secretary or staff.
- 'Bakyouta' - Arrears (Amount to be collected against ISF belonging to previous years.

3. Resource Mobilization for Financing O&M

3.1 Assessment of Resource Mobilization Requirements

The electricity cost for operating the pumps comes around NRs. 15,00,000 and corresponding operators' salary comes to be about NRs. 2,00,000 (salary of 8 operators and 3 guards @ NRs. 1600/- per month), annually.

The WUA has clear idea of these costs of operation. However, it does not have estimate of the maintenance requirements and associated costs. According to the agreement of management transfer, WUA is supposed to bear 10%, 20%, 30% of electricity charge in the years after the turnover but at present the WUA is very reluctant to do so and opine that the government should pay the entire amount. It does not have any plan to meet this electricity cost either. Presently, Butwal Power Company has been given maintenance contract of powerhouse for 30 months, hence, for this period WUA is relieved of this expenditure. However, the cost of canal maintenance is to be borne by the WUA itself.

3.2 Assessment of Delivered Irrigation Service

The Irrigation Service Fees are charged on annual basis. It charged from the landowner and not from the tenant. The rate is flat; i.e. @ NRs.180/ha/year based on the maximum irrigable area in a year, mostly accounted for rice. Assessing the delivered irrigation service is not in practice as such. Even though WUA members feel that different rates should be fixed for different crops they are unable to implement it because of insufficient manpower to make such assessments in the entire irrigated area. The assessments in last few years are as follows:
ISF Assessments and Collections in NRs.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Assessed Area (ha)</th>
<th>Rate per ha</th>
<th>Amount Due</th>
<th>ISF: Amount Collected</th>
<th>Collection Efficiency(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2051/52</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2052/53</td>
<td>2268</td>
<td>60</td>
<td>1,36,080</td>
<td>58,287</td>
<td>43%</td>
</tr>
<tr>
<td>2053/54</td>
<td>2576</td>
<td>120</td>
<td>3,09,120</td>
<td>72,657</td>
<td>24%</td>
</tr>
<tr>
<td>2054/55</td>
<td>2805</td>
<td>180</td>
<td>5,04,900</td>
<td>1,15,378 till March</td>
<td>23%</td>
</tr>
</tbody>
</table>


3.3 Relation between Resource Mobilization and Irrigation Service

A comparative tabulation of O&M expenses, ISF assessment, and collection is made below:

**O&M expenses and the ISF collection in NRs.**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>O&amp;M Budget Expenditure Inclusive of Electricity Costs</th>
<th>ISF: Amount Collected</th>
<th>Percentage of ISF Assessment Against O&amp;M Expenses (%)</th>
<th>Percentage of ISF Collection Against O&amp;M Expenses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>47,20,675</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2051/52</td>
<td>52,72,671</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2052/53</td>
<td>51,77,535</td>
<td>58,287</td>
<td>2.6</td>
<td>1.12</td>
</tr>
<tr>
<td>2053/54</td>
<td>47,82,617</td>
<td>72,657</td>
<td>6.5</td>
<td>1.52</td>
</tr>
<tr>
<td>2054/55</td>
<td>NA</td>
<td>1,15,378</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>


Though the available data are insufficient to draw any relationship between resource mobilization and ISF, it is quite evident that even the total ISF assessment covers less than 7% of the O&M expenses. The O&M costs on average are also as high as NRs. 1,780 per hectare.

3.4 Forms of Resource Mobilization

In addition to ISF, the WUA has been generating substantial amount of resources in other ways too. The WUA has also been successful in mobilizing considerable amount of labor for field channel construction and cleaning them annually. Exact figures of labor mobilization were not available. ISF is collected in cash. Some data related to cash generation from other means, inclusive from ISF, are presented below:
Different Sources of Income of Marchwar WUA in NRs.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Income Sources</th>
<th>Fiscal Year 05/52</th>
<th>05/53</th>
<th>05/54</th>
<th>05/55*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Farmers' contribution from allowances</td>
<td>68,060.00</td>
<td>18,200.00</td>
<td>5,784.50</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Membership fees</td>
<td>565.00</td>
<td>6,601.50</td>
<td>4,500.00</td>
<td>6,000.00</td>
</tr>
<tr>
<td>3</td>
<td>ISF collection</td>
<td>-</td>
<td>58,286.75</td>
<td>72,517.50</td>
<td>115,377.50</td>
</tr>
<tr>
<td>4</td>
<td>Adult education program</td>
<td>18,836.25</td>
<td>15,800.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Contract of fish pond</td>
<td>-</td>
<td>-</td>
<td>1,500.00</td>
<td>400.00</td>
</tr>
<tr>
<td>6</td>
<td>Community Forestry, nursery and dealership</td>
<td>-</td>
<td>-</td>
<td>6,658.50</td>
<td>109,852.50</td>
</tr>
<tr>
<td>7</td>
<td>Commission from construction works</td>
<td>-</td>
<td>-</td>
<td>19,693.2</td>
<td>57,173.50</td>
</tr>
<tr>
<td>8</td>
<td>Renting out the tractor</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12,071.00</td>
</tr>
<tr>
<td>9</td>
<td>Fine</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100.00</td>
</tr>
<tr>
<td>10</td>
<td>Miscellaneous</td>
<td>-</td>
<td>5,105.00</td>
<td>14,966.00</td>
<td>300.00</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>87,461.25</td>
<td>103,993.25</td>
<td>125,759.35</td>
<td>301,274.50</td>
</tr>
</tbody>
</table>

Source: WUA records
* The figures of 05/5 are of up to end of Chaitra only.

From the above table, it can be seen that the shares of ISF in total income have been about 77% in 2052/3 and 41% in 2053/4. However, it is also seen that the WUA has diversified sources of income.

3.5 Relation between ISF and Water Adequacy and Reliability

No prominent relationship was noticed between the ISF and water adequacy and reliability. Whosoever irrigates his farm has to pay for ISF irrespective of the adequacy and reliability in irrigation supplies. The ISF is based on the maximum irrigable area in a year for whatever crop it may be. Usually it is rice.

3.6 Farmers' Willingness to Pay

In general, farmers were found to be willing to pay ISF. No other options are given except to pay in cash. However, the collection rates reflect that the WUA has not been able to collect all the assessments. As informed by the WUA Chair, it has been costing a lot to collect the ISF, which usually is very small amount for a WUA-paid person to go personally to the individuals and collect it. Paying ISF by coming to the WUA office has not been common so far.

Looking at the troubles of collecting ISF, the WUA is more inclined toward mobilizing required resources from sources other than ISF. The declining trend of ISF collection efficiency also substantiates the assertion.

3.7 ISF Collection Mechanism

At present only 'Main Committee' is engaged in ISF collection endeavors. The WUA, with the help of its Secretary or of temporarily hired staff, is doing related works. ISF collectors usually go door to door for collecting the assessed ISF. These collectors are WUA-paid staff.
3.8 Means for Controlling Free Riders

For controlling the free riders, field verifications are made by the block level committee members during concerned crop season upon being asked by the main committee. As the irrigation system runs on the principle of proportional water distribution and does not have fully regulatable structures along the canal network, the job of barring water to a particular block is tedious. Some social pressures are also exerted on the non-payers.

3.9 Utilization of Collected Fees

Though the amounts collected in the WUA and WUG funds are supposed to be used in the operation and maintenance of respective canal system, some ambiguity was felt in this regard. No clear rules and regulations were found for utilizing the mobilized resources properly. The WUA or lower tiers prepare no plans for spending the collected resources in O&M activities. A typical expenditure statement is given below. No money has so far been spent on the maintenance of the canal.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Expenditures on F. Y.</th>
<th>051/52</th>
<th>052/53</th>
<th>053/54</th>
<th>054/55*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Salary of staff</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>98,513.00</td>
</tr>
<tr>
<td>2</td>
<td>Allowances for staff</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,504.96</td>
</tr>
<tr>
<td>3</td>
<td>Grant and rewards</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6,300.00</td>
</tr>
<tr>
<td>4</td>
<td>Stationary</td>
<td></td>
<td>645.00</td>
<td>1,590.00</td>
<td>14,301.50</td>
</tr>
<tr>
<td>5</td>
<td>Miscellaneous (e.g. tea)</td>
<td>20.00</td>
<td>6,505.00</td>
<td>10,615.50</td>
<td>19,872.99</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20.00</td>
<td>7,150.00</td>
<td>12,205.50</td>
<td>140,492.45</td>
</tr>
</tbody>
</table>

Source: WUA records
* By the end of Chaitra only.

3.10 Rules, Regulations, Role, and Authority

Some rules and regulations for ISF collection exist. For instance:
- “If any canal committee does not collect 70% ISF, the committee will be deprived of receiving maintenance money”.
- “Those canal committees which collect more than 70% ISF will receive 25% of ISF collection for the maintenance of their respective canal”.
- “When the canal committee secretary is fully involved in collecting ISF he will be supported by an incentive of 3% of the collected amount”.

However, none of these rules have been implemented for the reason that the collected amount is so low that it is even difficult to support the existing staff.
3.11 Arrears and Dues

When farmers do not pay their ISF dues even up to the end of Jesth, 5% extra is added to the previous amount. However, this mechanism of imposing penalties has also been not very effective in improving the ISF collection rates.

There is no provision for writing off the arrears. All farmers within the command area have to pay ISF. Farmers who do not get water have to report to WUA and it will make necessary arrangements to make water available to the subject.

4. Sufficiency

With the present amount of income, including both ISF and other sources, long term sustainability of the WUA in taking over complete operation and maintenance responsibility is very questionable. Neither does the Marchwar WUA seem to have the experience as an organization to handle the O&M complexity of the irrigation system nor does it seem mentally prepared for the same. As also, discussed above the WUA has been hardly been able to collect about 7% of the total O&M expenses. A graphical presentation of the income and O&M expenses is made below:

Bibliography


IMT Impact Assessment Study, 1998. IIMI, Nepal
Nepal West Gandak Canal Irrigation System

The Nepal West Gandak Canal Irrigation System, hereafter referred to as West Gandak, is located in Semari of Rupandehi district in the east of Parasi. The project area has Narayani (Gandak) river in the east and Indian boarder on the northwest. The area is linked with east-west highway at Bardaghaat by about 11-km graveled now being paved) feeder road.

Background

Following an Indo-Nepal Gandak Agreement in 1960, the construction of Triveni Barrage started in 1964-64. In 1979, the construction of West Gandak Irrigation System completed and it was handed over to His Majesty's Government of Nepal.

During 1982-1989, the Command Area Development Project was launched in the irrigation system under which numerous tertiaries, sub-tertiary canals, and farm ditches were constructed to serve areas up to 7 to 12 ha.

Similarly, in 1992, a Joint Management Program was implemented. Accordingly, in November 1992, a sensitization meeting of farmer representatives, local leaders and representatives of line agencies was organized under the initiation of Irrigation Management and Water Utilization Division of DOI. In February 1993, a draft constitution for the beneficiaries' organization was prepared and in March, the first election of the executive members was held. Following it, on June 27, 1993, the WUA was registered at Chief District Officer's Office.

Later in 1994, the irrigation system was taken up under the Irrigation Management Transfer Project (IMTP). In November 1994, for carrying out various activities of the IMTP, a Sub-project Management Committee' was also formed, which has taken the irrigation system up to stage of full turn over in November 1997. Two distributaries namely Piparpati and Parsauni were transferred over to organized beneficiary farmers under joint management program in 1993.

In April 1995, second election of the WUA was held and in May, it established a separate office within the premises of West Gandak office. In August 1997, the WUA negotiated with the Ministry of Forestry and Soil Conservation and the 'Sisho' plantation along the main canal service road was handed over to it under community forestry program. In April 1998 a revised constitution was enacted and based on it third election has begun for different WUA's functionaries.

1. Main Features

1.1 Physical

Headwork

Water is diverted from Narayani River to the canal system by means of a permanent type intake at Triveni Barrage, which is managed by the Indian Government. For Piparpati and Parsauni distributaries, water gets into them through separate intakes provided along the Indian Main Canal. These are all permanent type and involve nominal O&M costs.
Canals

The main canal is earthen and 32km long. Total length of remaining canal network is about 740km. Eight different types of canals exit in the canal network: Main, Branch, Minor canals, and five kinds of Watercourses, which may be:

OT – Outlet Tertiary with off-take from Branch Canals
MC – Minor Canal Course with direct off-take from Main
SFD - Special Farm Ditch with direct off-take from Main
MFD - Main Farm Ditch with off-take from Branch/Minor.
FD – Farm Ditch with off-take from MC, MFD or SFD.

The condition of these canals is relatively good and suffers from the problem of silt. This has also forced farmers to mobilize considerable amount of resources for desilting works.

Command Area

The command area of West Gandak is 8700 ha. In addition, Piparpati and Parsauni Distributaries command 1600ha giving a total of 10,300ha. The topography is flat and the area possesses highly fertile alluvial soils. However, some portions of the command area suffer from silt intrusion by the canal system as well as water logging in lowland areas.

Major Structures

The irrigation system has plenty of water controlling and regulating structures. Altogether, the number of hydraulic structures is 2916. Many of them are well equipped with steel gates and regulating arrangements. The structural density comes to be 1/3.6 no. per ha. The functioning condition of these structures is also good.

Water Adequacy

Overall water availability in the irrigation system is adequate. However, some water shortage is felt during land preparation for monsoon rice. In such conditions, rotational water distribution is practiced.

Water Reliability and Equity

Similarly, overall water reliability is also very good. Equity in water distribution is well maintained during sufficient water supplies. However, during the water shortage period, tail farmers often face inequity in water supplies in the canal network considering the losses along the canal stretch. The WUA makes water distribution schedules based on the irrigated areas in different parts of the command area but has not started taking account of the losses along the canal stretches resulting in lesser supplies to the tail enders. However, this situation does arise in water-adequate times as the schedules are set for longer period than what is actually required.
**Constraints**

The eastern edge of the command area suffers from some minor flood threats by Narayani River. Drainage problems were reported to be critical in lowland areas. The foremost difficulty with the system is substantial amount of silt intrusion in the canal system that eventually gets deposited along the canal stretches and in the command area.

**1.2 Socioeconomic**

**Ethnicity**

The command area of West Gandak irrigation system has existence of multi-ethnic groups with no majority of any particular occupational castes.

**Migration**

Immigration into the command area is insignificant. Similarly, outward migration is also not prominent. However, some temporary and seasonal migration trends were reported by the local people mainly in search of better employment opportunities in bigger cities of India and Nepal. Nevertheless, the local availability of the required agricultural labor force is sufficient.

**Income sources**

The primary source of income of the local residents is agriculture and accordingly, their dependency on agriculture is also very high. Alternative income opportunities are available in very limited scale.

**Water Users Association**

The WUA in West Gandak irrigation system is legally recognized body and, as also mentioned before, was registered with the Nawalparasi Chief District Officer’s Office on June 27, 1993. The efforts of reorganizing farmers started with the commencement of the joint management program. Until recently it had a 4-tiered organization with Main Committee, Branch Committees, Toli Committees, and Upatoli Committees. Recent amendment in the WUA’s constitution has provided for Board of Directors (39 to 41 members), an Executive Committee (5 functionaries), 1 manager and 4 sections’ head (Administrative, Accounts, Technical and Judicial). The Board of Directors is constituted of elected representatives. The directors nominate Executive Committee members. Similarly, the Board of Directors also forms the Water Management Task Force. At the time of this study the WUA was going through the third election process. The WUA of Piparpatti and Parsauni areas stands separate.

The internal check and balance within the organizational structure is enforced by the general assembly, which normally meets once a year.

**1.3 Agricultural**

The average land holding per household in the command area is 1.37 ha. Some 20% farmers are sharecroppers. Distribution of farm size is given below:
Size Class | Percentage of farmers
---|---
>2 ha | 29 %
1 - 2 ha | 26 %
<1 ha | 45 %

Fragmentation of land was also reported to be increasing day by day.

**Cropping pattern**

The command area has a typical cropping pattern of rice and wheat. The areas cultivated in winter seasons are almost constant but areas under mustard and pulses are seen to be slightly increasing over the last few years. Sugarcane cultivation is confined to certain locations where water availability is unreliable. Its coverage is almost constant. The trend of different crop coverage is presented below:

### Crop Coverage in Hectare

<table>
<thead>
<tr>
<th>Year</th>
<th>M. Rice</th>
<th>Wheat</th>
<th>Sugarcane</th>
<th>Pulses</th>
<th>Oilseed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993/94</td>
<td>7410</td>
<td>3432</td>
<td>1800</td>
<td>1400</td>
<td>600</td>
</tr>
<tr>
<td>1994/95</td>
<td>7623</td>
<td>3900</td>
<td>2200</td>
<td>1200</td>
<td>800</td>
</tr>
<tr>
<td>1995/96</td>
<td>7895</td>
<td>3405</td>
<td>2038</td>
<td>1832</td>
<td>1401</td>
</tr>
<tr>
<td>1996/97</td>
<td>7650</td>
<td>3891</td>
<td>2200</td>
<td>1250</td>
<td>600</td>
</tr>
</tbody>
</table>

Corresponding crop yields in t/ha are tabulated below:

### Yields in t/ha

<table>
<thead>
<tr>
<th>Year</th>
<th>M. Rice</th>
<th>Wheat</th>
<th>Sugarcane</th>
<th>Pulses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994/95</td>
<td>3.40</td>
<td>2.40</td>
<td>44.7</td>
<td>0.60</td>
</tr>
<tr>
<td>1995/96</td>
<td>3.72</td>
<td>1.54</td>
<td>32.0</td>
<td>0.45</td>
</tr>
<tr>
<td>1996/97</td>
<td>4.28</td>
<td>2.10</td>
<td>50.0</td>
<td>1.20</td>
</tr>
</tbody>
</table>

The prices of the commonly grown crops are given as under:

### Crop Prices in Rupees/1000Kg**

<table>
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<tr>
<td>1994/95</td>
<td>7400.00</td>
<td>6500.00</td>
<td>1900.00</td>
<td>21000.00</td>
</tr>
<tr>
<td>1995/96</td>
<td>8000.00</td>
<td>7400.00</td>
<td>1900.00</td>
<td>23750.00</td>
</tr>
<tr>
<td>1996/97</td>
<td>7500.00</td>
<td>6500.00</td>
<td>1100.00</td>
<td>20000.00</td>
</tr>
</tbody>
</table>

** Source: Agricultural Marketing Bulletin, DOA, HMG.

**Agriculture Support Services**

The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) both are situated in Parasi, which is quite close to the project area. However, the availability of agricultural credits was reported to be unsatisfactory by the local people. Similarly, farmers also expressed dissatisfaction on availability of necessary improved variety seeds and fertilizers.
Several training programs have been organized for farmers in the irrigation system under joint management initiatives and IMTP. Other agencies like District Agricultural Development Office, etc. have also given training to the local farmers on various agricultural aspects.

Market

The project area is connected to the East-West Highway by a link road. The closer and promising townships are Butwal and Narayanghaat along the highway itself. Besides, Parasi also offers good marketing facilities for different agricultural products. Farmers are not facing market problems as such.

2. ISF Related Terminology

Some of the ISF related terms in use are briefly described below:

- 'Sinchai Sewa Shulk' – Irrigation Service Fee.

- "Share Sadasyata Shulk" - Membership Fee based on share system.

- 'Bakyouta' - Arrears (Amount to be collected against ISF belonging to previous years.

3. Resource Mobilization for Financing O&M

3.1 Assessment of Resource Mobilization Requirements

The WUAs in the irrigation system has figured out quite clearly how much resource will be needed to operate and maintain the irrigation system based on the previous experiences of joint management. Some O&M expenditure figures over the last few years are given below. These figures mostly pertain to the West Gandak system as Piparpati and Parsauni distributaries were already handed over to farmers about four years ago and since then farmers have been taking care of the O&M costs in those distributaries by themselves:

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<th>Fiscal Year</th>
<th>O&amp;M Budget Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>23,66,732</td>
</tr>
<tr>
<td>2051/52</td>
<td>23,52,329</td>
</tr>
<tr>
<td>2052/53</td>
<td>9,71,806</td>
</tr>
<tr>
<td>2053/54</td>
<td>10,40,229</td>
</tr>
</tbody>
</table>

Since, the irrigation system was fully transferred to the beneficiary farmers last year only, farmers’ assessment of the O&M expenses and required resource mobilizations are yet to be seen. During the next three consecutive years, the DOI has agreed to provide NRs. 2,00,000 as a contribution toward O&M, considering the needed support in transition phase.

The WUA of Piparpati and Parsauni Distributaries, which took over the management responsibilities of the respective canals about four years ago, have been making very crude assessments of the resource mobilization requirements for O&M of their respective distributaries. Usually, farmers of these distributaries contribute labor to clean up the canal stretch every year. The WUA of Piparpati and Parsauni does not have proper records of the mobilized labor.
3.2 Assessment of Delivered Irrigation Service

The delivered irrigation service is assessed in terms of the irrigated areas per crop for maximum of two main crops. The ISF is charged on seasonal basis in some areas and on yearly basis in others considering two seasons: monsoon and winter. The rate of ISF is NRs. 60/ha/crop for West Gandak area and NRs. 225/ha/year for Piparpati and Parsauni distributaries. No difference is made between different uses of water or irrigation applications for different crops.

Some assessment and collection figures inclusive of Piparpati and Parsauni areas are tabulated below:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Assessed ISF</th>
<th>Collected ISF</th>
<th>Collection Efficiency in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td></td>
<td>48,681</td>
<td></td>
</tr>
<tr>
<td>2052/53</td>
<td>2,97,440</td>
<td>111,164</td>
<td>3.73</td>
</tr>
<tr>
<td>2053/54</td>
<td>2,17,984</td>
<td>1,77,587</td>
<td>8.15</td>
</tr>
<tr>
<td>2054/55 till Baishakh</td>
<td>5,77,050</td>
<td>2,42,467</td>
<td>42.02</td>
</tr>
</tbody>
</table>

3.3 Relation between Resource Mobilization and Irrigation Service

In absence of exact amount of labor mobilization figures, especially in Piparpati and Parsauni areas, it may be misleading to draw out any relationship between the resource mobilization and the irrigation service. Further, the crop coverage figures also do not reflect any major improvement in irrigation service. In addition, the ISF assessments also do not follow a definite trend. However, it can be clearly seen from the above table that ISF collection efficiency is on rise.

3.4 Forms of Resource Mobilization

In general, two forms of resource mobilization practices are noticed: Labor and Cash. Labor is generally mobilized for desilting works in the canals. Cash is raised from share membership distribution (equivalent to NRs. 30 per ha), ISF collection @ Rs. 60/ha/crop of irrigated area in the West Gandak area and NRs. 225 in Piparpati and Parsauni area. Other cash income sources encompass tolls from vehicles that operate on the canal service road, rentals from shops and huts on the canal areas, toll from weekly markets (Haat) on the canal service roads, penalties and fines, equipment rentals, charges from pump operators that use canal water, and sale of “sisho” bushes along the main canal. In fact, “sisho” trees offer a huge sum of money as they are about 2,00,000 in number and easily give NRs. 5 per tree in a year making a sum of NRs. 10,00,000 per annum. Thus, we see that the WUA has diversified sources of income.

3.5 Relation between ISF and Water adequacy and Reliability

Despite rising trend of ISF collection efficiency, no conclusive relationship can be drawn in terms of its relationship with water adequacy and reliability. Usually, better collections are expected with improved irrigation service in terms of water reliability and adequacy.
3.6 Farmers' Willingness to Pay

In general, farmers are willing to pay for ISF provided they have received the irrigation service. No other options are given to pay ISF except to pay in cash.

3.7 ISF Collection Mechanism

The ISF is collected at the toli level. Toli members go from door to door of the farmers for collection but the records is kept in the Area-office. 20% of the amount collected from each branch is to be given to the Main Committee. At present, the people in water delivery task force, who are paid employees of the WUA, are also assisting in ISF collection efforts.

3.8 Means for Controlling Free Riders

Though there is a provision for closing water to the entire canal stretch in case of non-paying of ISF, it has proved to be difficult in practice. Usually, "bugging" is the way to make people pay ISF and stop free riding. No effective mechanisms for controlling free riders were found being adopted.

3.9 Utilization of Collected Fees

The resources collected in the toli funds are supposed to be used in the operation and maintenance of respective canal system but that was not found to be in practice. No O&M plans were found at toli levels for carrying out O&M works in their concerned stretches. However, the main committee does prepare the O&M plan and budgets for it. So far, the planned activities were never completed out of the ISF collections. Instead, such works are usually done by using the resources collected from other means.

3.10 Rules, Regulations, Role, and Authority

The constitution of WUAs governs the rules and regulations within the system. For collecting ISF, the WUA has developed its own rules and regulations. For instance, the rate of ISF has been fixed as NRs. 60/ha/crop for West Gandak and NRs. 225/ha/year for Piparpati and Parsauni areas. If any farmer within the command area does not get water he/she is allowed to pump water from the canal. In this case they have to pay 50% of the amount due for ISF. All such rules can be made and implemented by the WUA with full authority so far it does not violate the legally recognized constitution.

3.11 Arrears and Dues

When farmers do not pay their ISF dues even up to the end of Kartik for monsoon crops and by the end of Baisakh for the winter season crops, the amount is recorded as arrears. It is not waived at all unless the respective toli verifies in the field during the actual crop season that the particular area did not get water and it was not possible to irrigate even by pumping from the canal.

4. Sufficiency

As seen from the above discussions, the West Gandak is quite capable of generating the needed resources to meet the O&M costs in different ways. However, the ISF collection rates indicate
that the WUA has to count more on the alternative income sources compared to collections from ISF.

Bibliography


IMT Impact Assessment Study, 1998. IIMI, Nepal
Pithuwa Irrigation System

The Pithuwa irrigation system is located Pithuwa village, 16 km east of Bharatpur and about 2 km north of Tandi bazaar in Chitwan district. The command area is connected to Tandi bazaar, a market place on the east-west highway, by an all-weather gravel road.

Background

The construction of Pithuwa irrigation system was initiated in 1967 under Minor Irrigation Scheme of HMG/N. The construction started in 1968 and completed in 1973 at the total cost of NRs. 2,00,000. In 1974, a torrential flood washed away some parts of the main canal. As the O&M responsibility of this system was administratively under Khageri Subdivision Office, the government irrigation agency released NRs. 8,00,000 for river protection works and repaired the flood damages and improved the system as well.

Following it, till 1979, O&M responsibilities were with the Chitwan Irrigation Project and finally under District Irrigation Office of Chitwan. In 1979, the office staffs were withdrawn and the O&M responsibility shifted to users. While doing so, an agreement was also made between irrigation agency and water users that users would supply the required labor and the agency would pay them according to the prevailing wage rates. In 1980, it was also agreed that the beneficiaries’ organization would be given a government owned bulldozer for three months to tackle the problems of temporary headwork in the rainy season. The Committee also received the maintenance fund allocated by the government.

In 1996–7, the irrigation system received rehabilitation assistance from the East Rapti Project under Department of Irrigation. However, the support was limited to structural strengthening of the irrigation system, except the headwork. The condition of the headwork remains the same.

1. Main Features

1.1 Physical

Headwork

The Pithuwa Irrigation system is run-off-the-river system and captures water from the Khair Khola. The source is perennial but the discharge is very low during the dry season. The river originates from Mahabharat range of hills and has large variations in seasonal flows. There is no permanent diversion structure as such and water is diverted by piling up stones and boulders, which get washed away during the monsoon floods and need to be redone in the following season. The O&M costs of the temporary headwork in this irrigation system is very high in the sense it has to be reconstructed on a regular basis.

Further, continued degradation of upstream catchment due to deforestation, etc. have caused high flood frequency, increased silt load, and reduced dry season discharge at the intake.

Canals

The earthen approach canal of the irrigation system is 75m long and altogether there are 16 branch canals. The main canal is 7.5 km long with a design discharge of 1.4 cubic meters per second. The
canals have already reached a regime condition hence require nominal maintenance. However, silt deposition in the canals, especially during monsoon season, requires considerable amount of labor to be mobilized to get them cleaned.

Command Area

The command area measures 618 hectares with 600 households in Pithuwa, Madhavpur, and Khairate villages. The topography of the command area is flat and gently sloped from north to south. Soils are of fine loamy to loamy texture and well drained.

Major Structures

Very few permanent type of water controlling and regulating structures exist along the canal network. No pucca water distribution structures have been built in the branch canals. Even the concrete pipe outlets along the branch canals have no reliable gates and are usually regulated with the help of mud, stones, or wooden planks.

Water Adequacy

Though the main canal was originally designed for 1.4 m$^3$/s, the capacity has been greatly reduced because of continued siltation in the canal stretch. Usually, acute water shortage is observed during dry season. The available water in the source is also used for drinking. Some water shortages were felt during rice transplanting too when there was not enough rainfall. Farmers adopted rotational schedules to cope up with the shortages and shared the shortage equally in the whole command area.

Water Reliability and Equity

Whatever amount of water is available in the source, farmers avail it equally and maintain reliability in water supply even though the quantity may not be adequate. However, the reliability of water supply declines during the monsoon season in case of floods in the Khair Khola.

Similarly, equity in water distribution is very well maintained as water is distributed in proportion of individual’s landholding in the irrigated area.

Constraints

The major constraint for the irrigation system is the temporary nature of the headwork, which is always in threat of floods. Further, the silt intrusion in the canal network is also posing problems in drawing adequate amount of water from the source, even when there is enough water. This is also causing unwanted deposition of course sand in the cultivable land, especially in the head reach.

1.2 Socioeconomic

Ethnicity

The command area has mixed ethnic groups of Brahmin, Chhetri, Magar, Gurung, Tamang, Newar, Tharu and Kumal. Most of them have migrated into the area years ago from different parts of the country, especially from the hilly districts. Despite the caste variation, the farmers have developed appreciable mutual cooperation.
Migration

Until late 1960s, the area was thinly populated. However, as the immigration trend continued, per capita land and other resources became less and less. From 70s, the trend started declining as there was not much left for the new settlers. At present, the inflow has stopped. Similarly, the outflow, i.e. migrating out, permanently is not seen. However, temporary and seasonal migration of the residents is common and is mainly for better employment in bigger cities.

Income sources

The primary income source of the local residents is agriculture and accordingly, dependency on agriculture is high. The area offers very limited alternative income opportunities.

Water Users Association

A two-tiered Water Users' Association was formed in 1975 when farmers took over the system's management responsibility and initiated remodeling and extension of physical system. In 1977, the WUA collected land data and rectified the outlet sizes for uniform water distribution.

Later, the tenure of the WUA was also increased from one year to two years in 1985 and in 1991, the organization gained a legal status by registering itself with the Chitwan Chief District Officer's office.

The main committee has a chairman, a vice-chairman, a general secretary and 7 members. Similarly, Branch Committees have chairmen, secretaries and 3-5 area members depending upon the size of the outlet area covered by them. The executive members are selected or elected, depending upon the situation whether farmers have a consensus or different choices.

The check and balance in the beneficiaries' organization is maintained by the presence of the General Assembly of all the farmers and a well-stipulated constitution with enforcing rules and regulations. All organization levels, including, the general assembly, are inter-linked by means of clearly defined rules and regulations.

The General Assembly meets once a year on the date decided by the Chairperson of the Main Canal Committee. In the General Assembly, major annual maintenance plans and the budget requirements for the following year are formulated, new officials are elected/selected, and operating rules are reviewed, modified or amended.

The Main Canal Committee is responsible for the operation and maintenance of the main canal. It also acts as the coordinating body for Branch Canal Committees. The Chairperson of the Main Canal Committee is responsible for organizing, supervising, and coordinating the various management works done in the system. The Secretary kept the records of water allocation to different branch canals, attendance at the work assignments, and meeting minutes of the Main Canal Committee. In addition, each of the sixteen branch level committees is responsible for the operation and maintenance of that very branch canal.

Recently, the WUA has joined the federation of WUAs that are located in the East Rapti river basin.
1.3 Agricultural

Land tenure

The average landholding size per household is 0.56 ha. The fragmentation of the land was reported to be increasing. Majority of the land is owner-operated. There are no land-less families. However, about 12% of the farmers are tenants in the tail reach, where absentee landlords own major portions of lands. These tenants mostly cultivate the land in rain-fed conditions and do not have reliable access to canal water.

Informal share cropping (adhiya) is the general pattern of tenancy. The cost of chemical fertilizer, pesticides, etc. applied is shared equally between the landowner and the tenant and in some cases the quantity of harvest that the tenant submits to the landowner is fixed in advance.

Cropping pattern

The cropping intensity in the irrigated area is about 270%. Most farmers grow three crops in a year. Maize, paddy and oilseeds are the principal crops. Traditional varieties of maize were dominant until the late 70s. Presently improved varieties are cultivated and the coverage is about 94%. The typical crop coverage is presented below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Maize</th>
<th>Rice</th>
<th>Oilseed</th>
<th>Wheat</th>
<th>Lintel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993/94</td>
<td>580 ha</td>
<td>525 ha</td>
<td>430 ha</td>
<td>65 ha</td>
<td>50 ha</td>
</tr>
</tbody>
</table>

Similarly, till early 70s, only Ghaiya, a long-term local variety of rice was grown in a limited area under rain-fed condition. Presently, monsoon rice is very common and has about 85% coverage.

Oilseeds, that used to be cultivated during winter season only, are now cultivated immediately after the harvesting of rice.

Wheat was introduced during the late 70s and has been slow in gaining coverage (presently about 11%).

Spring rice is not grown at all. This is because sufficient water is not available for it during the pre-monsoon season. Even though cultivation would be possible if limited to some part only, the WUA has put a strong ban against spring rice cultivation, as the water requirement for it will be high and would mean a highly disproportionate distribution of water.

Agriculture support services

The availability of agricultural credits was reported to be satisfactory. The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) are situated at Bharatpur. In addition, local traders also have helped the farmers in obtaining required amount of agricultural inputs.

Market

Good road network linked with the East-West Highway has provided the farmers with ready access to the market. Nearby major markets are Narayanghat, Bharatpur and Tandi Bazaar. These towns
Several training programs have been organized for farmers in the irrigation system under joint management initiatives and IMTP. Other agencies like District Agricultural Development Office, etc. have also given training to the local farmers on various agricultural aspects.

Market

The project area is connected to the East-West Highway by a link road. The closer and promising townships are Butwal and Narayanghat along the highway itself. Besides, Parasi also offers good marketing facilities for different agricultural products. Farmers are not facing market problems as such.

2. ISF Related Terminology

Some of the ISF related terms in use are briefly described below:

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- "Share Sadasyata Shulk" - Membership Fee based on share system.
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</tbody>
</table>

Since, the irrigation system was fully transferred to the beneficiary farmers last year only, farmers’ assessment of the O&M expenses and required resource mobilizations are yet to be seen. During the next three consecutive years, the DOI has agreed to provide NRs. 2,00,000 as a contribution toward O&M, considering the needed support in transition phase.

The WUA of Piparpati and Parsauni Distributaries, which took over the management responsibilities of the respective canals about four years ago, have been making very crude assessments of the resource mobilization requirements for O&M of their respective distributaries. Usually, farmers of these distributaries contribute labor to clean up the canal stretch every year. The WUA of Piparpati and Parsauni does not have proper records of the mobilized labor.
3.2 Assessment of Delivered Irrigation Service

The delivered irrigation service is assessed in terms of the irrigated areas per crop for maximum of two main crops. The ISF is charged on seasonal basis in some areas and on yearly basis in others considering two seasons: monsoon and winter. The rate of ISF is NRs. 601/ha/crop for West Gandak area and NRs. 225/ha/year for Piparpati and Parsauni distributaries. No difference is made between different uses of water or irrigation applications for different crops.

Some assessment and collection figures inclusive of Piparpati and Parsauni areas are tabulated below:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Assessed ISF</th>
<th>Collected ISF</th>
<th>Collection Efficiency in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050/51</td>
<td>-</td>
<td>48,681</td>
<td>-</td>
</tr>
<tr>
<td>2051/52</td>
<td>-</td>
<td>98,796</td>
<td>-</td>
</tr>
<tr>
<td>2052/53</td>
<td>2,97,440</td>
<td>1,11,164</td>
<td>3.73</td>
</tr>
<tr>
<td>2053/54</td>
<td>2,17,984</td>
<td>1,77,587</td>
<td>8.15</td>
</tr>
<tr>
<td>2054/55 till Baishakh</td>
<td>5,77,050</td>
<td>2,42,467</td>
<td>42.02</td>
</tr>
</tbody>
</table>

3.3 Relation between Resource Mobilization and Irrigation Service

In absence of exact amount of labor mobilization figures, especially in Piparpati and Parsauni areas, it may be misleading to draw out any relationship between the resource mobilization and the irrigation service. Further, the crop coverage figures also do not reflect any major improvement in irrigation service. In addition, the ISF assessments also do not follow a definite trend. However, it can be clearly seen from the above table that ISF collection efficiency is on rise.

3.4 Forms of Resource Mobilization

In general, two forms of resource mobilization practices are noticed: Labor and Cash. Labor is generally mobilized for desilting works in the canals. Cash is raised from share membership distribution (equivalent to NRs. 30 per ha), ISF collection @ Rs.60/ha/crop of irrigated area in the West Gandak area and NRs. 225 in Piparpati and Parsauni area. Other cash income sources encompass tolls from vehicles that operate on the canal service road, rentals from shops and huts on the canal areas, toll from weekly markets (Haat) on the canal service roads, penalties and fines, equipment rentals, charges from pump operators that use canal water, and sale of “sisho” bushes along the main canal. In fact, “sisho” trees offer a huge sum of money as they are about 2,00,000 in number and easily give NRs. 5 per tree in a year making a sum of NRs. 10,00,000 per annum. Thus, we see that the WUA has diversified sources of income.

3.5 Relation between ISF and Water adequacy and Reliability

Despite rising trend of ISF collection efficiency, no conclusive relationship can be drawn in terms of its relationship with water adequacy and reliability. Usually, better collections are expected with improved irrigation service in terms of water reliability and adequacy.
3.6 Farmers’ Willingness to Pay

In general, farmers are willing to pay for ISF provided they have received the irrigation service. No other options are given to pay ISF except to pay in cash.

3.7 ISF Collection Mechanism

The ISF is collected at the toli level. Toli members go from door to door of the farmers for collection but the records is kept in the Area-office. 20% of the amount collected from each branch is to be given to the Main Committee. At present, the people in water delivery task force, who are paid employees of the WUA, are also assisting in ISF collection efforts.

3.8 Means for Controlling Free Riders

Though there is a provision for closing water to the entire canal stretch in case of non-paying of ISF, it has proved to be difficult in practice. Usually, “bugging” is the way to make people pay ISF and stop free riding. No effective mechanisms for controlling free riders were found being adopted.

3.9 Utilization of Collected Fees

The resources collected in the toli funds are supposed to be used in the operation and maintenance of respective canal system but that was not found to be in practice. No O&M plans were found at toli levels for carrying out O&M works in their concerned stretches. However, the main committee does prepare the O&M plan and budgets for it. So far, the planned activities were never completed out of the ISF collections. Instead, such works are usually done by using the resources collected from other means.

3.10 Rules, Regulations, Role, and Authority

The constitution of WUAs governs the rules and regulations within the system. For collecting ISF, the WUA has developed its own rules and regulations. For instance, the rate of ISF has been fixed as NRs. 60/ha/crop for West Gandak and NRs. 225/ha/year for Piparpai and Parsauni areas. If any farmer within the command area does not get water he/she is allowed to pump water from the canal. In this case they have to pay 50% of the amount due for ISF. All such rules can be made and implemented by the WUA with full authority so far it does not violate the legally recognized constitution.

3.11 Arrears and Dues

When farmers do not pay their ISF dues even up to the end of Kartik for monsoon crops and by the end of Baisakh for the winter season crops, the amount is recorded as arrears. It is not waived at all unless the respective toli verifies in the field during the actual crop season that the particular area did not get water and it was not possible to irrigate even by pumping from the canal.

4. Sufficiency

As seen from the above discussions, the West Gandak is quite capable of generating the needed resources to meet the O&M costs in different ways. However, the ISF collection rates indicate
that the WUA has to count more on the alternative income sources compared to collections from ISF.

Bibliography


IMT Impact Assessment Study, 1998. IIMI, Nepal
Pithuwa Irrigation System

The Pithuwa irrigation system is located in Pithuwa village, 16 km east of Bharatpur and about 2 km north of Tandi bazaar in Chitwan district. The command area is connected to Tandi bazaar, a market place on the east-west highway, by an all-weather gravel road.

Background

The construction of Pithuwa irrigation system was initiated in 1967 under Minor Irrigation Scheme of HMG/N. The construction started in 1968 and completed in 1973 at the total cost of NRs. 2,00,000. In 1974, a torrential flood washed away some parts of the main canal. As the O&M responsibility of this system was administratively under Khageri Subdivision Office, the government irrigation agency released NRs. 8,00,000 for river protection works and repaired the flood damages and improved the system as well.

Following it, till 1979, O&M responsibilities were with the Chitwan Irrigation Project and finally under District Irrigation Office of Chitwan. In 1979, the office staffs were withdrawn and the O&M responsibility shifted to users. While doing so, an agreement was also made between irrigation agency and water users that users would supply the required labor and the agency would pay them according to the prevailing wage rates. In 1980, it was also agreed that the beneficiaries’ organization would be given a government owned bulldozer for three months to tackle the problems of temporary headwork in the rainy season. The Committee also received the maintenance fund allocated by the government.

In 1996 -7, the irrigation system received rehabilitation assistance from the East Rapti Project under Department of Irrigation. However, the support was limited to structural strengthening of the irrigation system, except the headwork. The condition of the headwork remains the same.

1. Main Features

1.1 Physical

Headwork

The Pithuwa Irrigation system is run-off-the-river system and captures water from the Khair Khola. The source is perennial but the discharge is very low during the dry season. The river originates from Mahabharat range of hills and has large variations in seasonal flows. There is no permanent diversion structure as such and water is diverted by piling up stones and boulders, which get washed away during the monsoon floods and need to be redone in the following season. The O&M costs of the temporary headwork in this irrigation system is very high in the sense it has to be reconstructed on a regular basis.

Further, continued degradation of upstream catchment due to deforestation, etc. have caused high flood frequency, increased silt load, and reduced dry season discharge at the intake.

Canals

The earthen approach canal of the irrigation system is 75m long and altogether there are 16 branch canals. The main canal is 7.5 km long with a design discharge of 1.4 cubic meters per second. The
canals have already reached a regime condition hence require nominal maintenance. However, silt deposition in the canals, especially during monsoon season, requires considerable amount of labor to be mobilized to get them cleaned.

Command Area

The command area measures 618 hectares with 600 households in Pithuwa, Madhavpur, and Khairate villages. The topography of the command area is flat and gently sloped from north to south. Soils are of fine loamy to loamy texture and well drained.

Major Structures

Very few permanent type of water controlling and regulating structures exist along the canal network. No pucca water distribution structures have been built in the branch canals. Even the concrete pipe outlets along the branch canals have no reliable gates and are usually regulated with the help of mud, stones, or wooden planks.

Water Adequacy

Though the main canal was originally designed for 1.4 m³/s, the capacity has been greatly reduced because of continued siltation in the canal stretch. Usually, acute water shortage is observed during dry season. The available water in the source is also used for drinking. Some water shortages were felt during rice transplanting too when there was not enough rainfall. Farmers adopted rotational schedules to cope up with the shortages and shared the shortage equally in the whole command area.

Water Reliability and Equity

Whatever amount of water is available in the source, farmers avail it equally and maintain reliability in water supply even though the quantity may not be adequate. However, the reliability of water supply declines during the monsoon season in case of floods in the Khair Khola.

Similarly, equity in water distribution is very well maintained as water is distributed in proportion of individual’s landholding in the irrigated area.

Constraints

The major constraint for the irrigation system is the temporary nature of the headwork, which is always in threat of floods. Further, the silt intrusion in the canal network is also posing problems in drawing adequate amount of water from the source, even when there is enough water. This is also causing unwanted deposition of course sand in the cultivable land, especially in the head reach.

1.2 Socioeconomic

Ethnicity

The command area has mixed ethnic groups of Brahmin, Chhetri, Magar, Gurung, Tamang, Newar, Tharu and Kuma. Most of them have migrated into the area years ago from different parts of the country, especially from the hilly districts. Despite the caste variation, the farmers have developed appreciable mutual cooperation.
Migration

Until late 1960s, the area was thinly populated. However, as the immigration trend continued, per capita land and other resources became less and less. From 70s, the trend started declining as there was not much left for the new settlers. At present, the inflow has stopped. Similarly, the outflow, i.e. migrating out, permanently is not seen. However, temporary and seasonal migration of the residents is common and is mainly for better employment in bigger cities.

Income sources

The primary income source of the local residents is agriculture and accordingly, dependency on agriculture is high. The area offers very limited alternative income opportunities.

Water Users Association

A two-tiered Water Users' Association was formed in 1975 when farmers took over the system's management responsibility and initiated remodeling and extension of physical system. In 1977, the WUA collected land data and rectified the outlet sizes for uniform water distribution.

Later, the tenure of the WUA was also increased from one year to two years in 1985 and in 1991, the organization gained a legal status by registering itself with the Chitwan Chief District Officer's office.

The main committee has a chairman, a vice-chairman, a general secretary and 7 members. Similarly, Branch Committees have chairmen, secretaries and 3-5 area members depending upon the size of the outlet area covered by them. The executive members are selected or elected, depending upon the situation whether farmers have a consensus or different choices.

The check and balance in the beneficiaries' organization is maintained by the presence of the General Assembly of all the farmers and a well-stipulated constitution with enforcing rules and regulations. All organization levels, including, the general assembly, are inter-linked by means of clearly defined rules and regulations.

The General Assembly meets once a year on the date decided by the Chairperson of the Main Canal Committee. In the General Assembly, major annual maintenance plans and the budget requirements for the following year are formulated, new officials are elected/selected, and operating rules are reviewed, modified or amended.

The Main Canal Committee is responsible for the operation and maintenance of the main canal. It also acts as the coordinating body for Branch Canal Committees. The Chairperson of the Main Canal Committee is responsible for organizing, supervising, and coordinating the various management works done in the system. The Secretary kept the records of water allocation to different branch canals, attendance at the work assignments, and meeting minutes of the Main Canal Committee. In addition, each of the sixteen branch level committees is responsible for the operation and maintenance of that very branch canal.

Recently, the WUA has joined the federation of WUAs that are located in the East Rapti river basin.
1.3 Agricultural

Land tenure

The average landholding size per household is 0.56 ha. The fragmentation of the land was reported to be increasing. Majority of the land is owner-operated. There are no land-less families. However, about 12% of the farmers are tenants in the tail reach, where absentee landlords own major portions of lands. These tenants mostly cultivate the land in rain-fed conditions and do not have reliable access to canal water.

Informal share cropping (*adhiya*) is the general pattern of tenancy. The cost of chemical fertilizer, pesticides, etc. applied is shared equally between the landowner and the tenant and in some cases the quantity of harvest that the tenant submits to the landowner is fixed in advance.

Cropping pattern

The cropping intensity in the irrigated area is about 270%. Most farmers grow three crops in a year. Maize, paddy and oilseeds are the principal crops. Traditional varieties of maize were dominant until the late 70s. Presently improved varieties are cultivated and the coverage is about 94%. The typical crop coverage is presented below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Maize</th>
<th>Rice</th>
<th>Oilseed</th>
<th>Wheat</th>
<th>Lintel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993/94</td>
<td>580 ha</td>
<td>525 ha</td>
<td>430 ha</td>
<td>65 ha</td>
<td>50 ha</td>
</tr>
</tbody>
</table>

Similarly, till early 70s, only Ghaya, a long-term local variety of rice was grown in a limited area under rain-fed condition. Presently, monsoon rice is very common and has about 85% coverage.

Oilseeds, that used to be cultivated during winter season only, are now cultivated immediately after the harvesting of rice.

Wheat was introduced during the late 70s and has been slow in gaining coverage (presently about 11%).

Spring rice is not grown at all. This is because sufficient water is not available for it during the pre-monsoon season. Even though cultivation would be possible if limited to some part only, the WUA has put a strong ban against spring rice cultivation, as the water requirement for it will be high and would mean a highly disproportionate distribution of water.

Agriculture support services

The availability of agricultural credits was reported to be satisfactory. The Agricultural Development Bank (ADB) and Agricultural Inputs Corporation (AIC) are situated at Bharatpur. In addition, local traders also have helped the farmers in obtaining required amount of agricultural inputs.

Market

Good road network linked with the East-West Highway has provided the farmers with ready access to the market. Nearby major markets are Narayanghat, Bharatpur and Tandi Bazaar. These towns
have grain and food processing industries, marketing businesses of agricultural inputs, and numerous private grain traders.

2. ISF Related Terminology

No special terminology related to ISF was found being used in Pithuwa Irrigation System.

3. Resource Mobilization for Financing O&M

3.1 Assessment of Resource Mobilization Requirements

In Pithuwa irrigation system, the main canal and outlets need repair once a year whereas the diversion weir in the Khair khola need repair works more frequently. To address the problem of the headwork, the main canal committee has set aside a certain amount of money to pay for the fuel for the bulldozer. The farmers do the desilting of the main canal and branch canals by mobilizing labor from the whole command area. Additionally required cash (besides the government allocated fund) or labors are realized from the farmers in proportion of their landholding size.

The amount of labor mobilized is strikingly noticeable. For instance, the amount of labor mobilized in 1986 was equivalent to 1,200 man-days, i.e. about two man-days per household or per hectare of land besides the funds allocated by the government (Prasad, 1994).

However, uncertainty in O&M requirements and the amount of fund to be collected has made it difficult to predict and plan for related future programs.

3.2 Assessment of Delivered Irrigation Service

Water distribution schedules are based on the area to be irrigated in different sectors of the command area. In general, the farmers follow branch canal based rotational schedules. That is, each branch canal gets water for a specified length of time based on the proportion of the area that particular branch canal commanded. The distribution of water within the area of the branch canal, by means of field channels, is also based on the same principle.

Water distribution schedules are closely monitored at both the main and branch canal levels by respective committees. In this way, these committees also get clear idea about the delivered irrigation service to different parts of the irrigated command area.

No distinction is made between different uses of water or for irrigation applications for different crops.

3.3 Relation between Resource Mobilization and Irrigation Service

The resource contribution in the Pithuwa Irrigation System, both in cash and labor, is directly based on the proportion of irrigated land one owns in the command area. The first priority is to mobilize labor, as this is what is generally needed during for maintenance works. The land area that received irrigation exhibits the amount of irrigation service received. In other words, the land area in the irrigated command itself is the measure for assessing the delivered irrigation service and accordingly, the land owning individual has to proportionally contribute resources in the system’s O&M.
3.4 Forms of Resource Mobilization

In general, the needed resources for O&M are raised in two forms. One, labor mobilization in proportion to the share of water based on land area and second, fines (cash) collected from those who do not contribute their share of labor. However, cash deals are minimized as far as possible.

3.5 Relation between ISF and Water adequacy and Reliability

Since water is distributed in proportion of the land area, the water adequacy or inadequacy is the same for everybody. Similarly, whatever schedule is decided for water distribution, is implemented very seriously. So, the reliability of water supply is very much assured unless there is water scarcity in the source itself. Even in such cases, when water gets suddenly lesser than expected in the source itself, the respective committees adjust the previously prepared schedules to make that up.

3.6 Farmers' Willingness to Pay

Majority of farmers has been willfully paying or contributing the apportioned resources to system's O&M.

3.7 ISF Collection Mechanism

The main responsibility to mobilize the targeted amount of resources from the beneficiary farmers is of respective branch committees. They keep the records of each and every farmer in the command of the branch canal.

3.8 Means for Controlling Free Riders

Conflicts related to water use and resource contributions are resolved at both the main and branch canal levels of the organization. Issues related to a branch canal are handled through the Branch Canal Committees whereas the Main Canal Committee handles those of the main canal. The General Secretary had set a system of penalty for the violators. The amount of penalty depends on the severity of the violation. The defaulter had to contribute a minimum of one man-day of labor or the equivalent amount of money. Withholding the defaulter's share of water enforces the punishment rules. Similarly, non-contributors in the operation and maintenance activities are subject to the denial of irrigation water by the concerned committees. In case of non-compliance (either with the water distribution rules or the resource contribution rules) of a Branch Canal Committee, the entire branch canal could be denied water.

3.9 Utilization of Collected Fees

All the resources generated from the beneficiary farmers of the irrigation system are utilized in O&M activities of the system.

3.10 Rules, Regulations, Role, and Authority

The constitution and supporting rules and regulations of Pithuwa Irrigation system are applied to all activities within the system. The WUA has full authority to set rules and enforce them so far they are agreed upon in the general assembly and abide by the lawfully recognized WUA’s constitution.
3.11 Arrears and Dues

No arrears are allowed in the amount of resources to be contributed by individual farmers. People with arrears immediately become subject to sanctions of the defaulters as described above.

4. Sufficiency

The process of resource mobilization for financing the O&M requirements of the system has sustained and will sustain as long as the maintenance requirement at the diversion is within their capacity.

Bibliography

