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Short Report Series
on
Locally Managed Irrigation

Report No. 14



MANAGEMENT TURNOVER IN
THE WEST GANDAK IRRIGATION SYSTEM,
NEPAL

V. S. Mishra and D. J. Molden

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The *Short Report Series* is produced by the **Program on Local Management of the International Irrigation Management Institute (IIMI)**. Support for the Series is provided by Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH through the Privatization and Self-Management of Irrigation Project (No. 91.7860.9-01.288). Individuals wishing to contribute to the Series or otherwise correspond about the Series, are invited to direct communications to the editors of the Series:

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Editors' Note

Short Report Number 14 presents a lucid description and brief assessment of management turnover in a medium-scale irrigation system in Nepal. The report describes the motivations for turnover, how it was implemented, institutional and financial arrangements made after turnover, the enabling role of infrastructural improvement and development of share-based water rights, and management performance after turnover. Data are provided on agricultural production costs and output, irrigation performance, and costs of irrigation. One of the strengths of this paper is that it demonstrates how irrigation management reform must be conceived and carried out with the objective of achieving a new balance and consistency between the physical environment, infrastructure, institutions and management practices. Since the irrigation system was both rehabilitated and reformed at the same time, it is impossible to tell to what extent the observed improvements in performance were the result of management reform versus rehabilitation of infrastructure. However, it may be more important that the Report presents a compelling example of why both "software" and "hardware" improvements, often, should be done together.

MANAGEMENT TURNOVER IN THE WEST GANDAK IRRIGATION SYSTEM, NEPAL

V. S. Mishra and D. J. Molden¹

INTRODUCTION

In Nepal, irrigation systems are broadly classified as agency-managed irrigation systems (AMIS) and farmer-managed irrigation systems (FMIS). Covering about 30 percent of the irrigated area of 1 million hectares (ha) in Nepal, AMIS were constructed with government support and are now operated and maintained by the Department of Irrigation (DOI). Farmer-managed irrigation systems are those developed and managed by autonomous local organizations of farmers.

It is generally recognized that FMIS often perform quite well when compared to AMIS (Pradhan 1989 and Benjamin et al. 1994). Features of well-managed FMIS are that timely decisions are made concerning operation and maintenance (O&M), resources are mobilized by the beneficiary farming community independent of government budget allocations, and management activities are quite sensitive to local needs and opportunities.

His Majesty's Government (HMG), Nepal has embarked on a program of management transfer in order to improve management of existing irrigation systems, increase agricultural productivity, and reduce the government's O&M burden. In Nepal, management turnover has two forms: joint management and turnover. According to the latest irrigation policy (HMG/Nepal, Ministry of Water Resources 1992), systems of less than 500 ha in the hills, and less than 2,000 ha in the terai (plains) are to be turned over to water users' associations (WUA). That is, management of O&M is to be taken over by farmers. Other systems are to be jointly managed by a WUA and the DOI. The joint-management program allows for the WUA to gradually take up increasing responsibility with the final goal of system turnover.

Of the irrigation systems that were the first to come under the joint-management program, the West Gandak Irrigation System has made the most progress. Presently, eight irrigation systems covering an area of nearly 60,000 ha are in various stages of management transfer. More systems will shortly be brought into this program. This paper describes the experience to date of management transfer at West Gandak, presents the lessons learned, and outlines prospects for future development of the system.

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The West Gandak Irrigation System

The West Gandak Irrigation System lies in the Western Development Region of Nepal bordering India (figure 1). It takes water from the Narayani River (in India, it is called the Gandak) immediately before the water reaches India. The West Gandak Irrigation System has tremendous potential because of a strong agricultural community, fertile soils, and abundant water resources from the Narayani River.

Before agency intervention there were some FMIS taking water from small drains and rivers lying within the present command area. Much of the land was covered by forest. The present irrigation system was originally constructed with aid provided by the Indian Government. A main canal with a discharge capacity of 8.5 cumecs and branch and minor canals, each of which has a capacity greater than 620 liters per second, were constructed. Below that size, irrigation was to be developed by HMG/Nepal or the local farming community. The total area served by the main canal is 8,700 ha. Additionally, two branch canals taking water off the Main Western Canal with an additional capacity of 1.8 cumecs were developed to serve 1,600 ha. Construction activities were completed in 1976, and the system was handed over to the Government of Nepal in 1979. At the time of handover, about half of the targeted area was irrigated.

The Command Area Development Project was implemented in the West Gandak Irrigation System in 1982 with the purpose of better utilization of water, increasing the involvement of farmers in construction and management, and increasing the living standards of farmers. Major features of the project were the further development of the command area, including farm ditches serving 7 to 12 ha and development of water users' groups to facilitate the management of the system.

The organizational design was to have water users' groups (WUG) at the 50 ha block level, and then federations of four blocks. These blocks and federations were to interface with the agency to manage the irrigation system. In reality, the WUG never materialized and remained only as names on paper. Organizing activities started after completing construction. Organizational development was done to meet project deadlines. Little time was spent on activating groups of farmers.

The Command Area Development Project was completed in 1989. At the start of the joint-management program in 1992, less than 4,000 ha were irrigated. The discharge in the main canal was reduced to 2.2 cumecs from a design level of 8.5 cumecs due to heavy sediment buildup. There were few signs of farmer organization, and neither the agency nor the farmers were performing their required maintenance roles. Farmers were disappointed and a credibility gap developed between the agency and the farmers.

From this experience, certain lessons were learned: (1) institutional development efforts should proceed in conjunction with construction programs; (2) the organizing process should not be time-bound and target-driven; (3) forming functioning organizations is more than getting names on paper; (4) farmer involvement through local organizations is necessary throughout intervention to ensure that managerial and technical solutions match local requirements; and (5) organizations built with the primary purpose of facilitating a construction project do not have a good chance of succeeding in management of O&M on a sustainable basis.

Initiation of Joint Management

The need to introduce management reforms to reverse the deteriorating situation at West Gandak was recognized by HMG/Nepal. One option was to again expend large sums of government funds to remove sediment and repair the system. However, it was realized that funding repairs and cleanup without necessary management reforms would not yield a long-term solution. West Gandak was thus selected for the joint-management program. An important goal was to build the capacity of the local irrigation community to manage the system in a sustainable manner to fully and productively utilize both local and government resources.

WUA Formation

It was realized that the first task at hand was to develop a democratically formed, organized group of farmers to work with. The strategy was to develop a water users' association (WUA) that represented the entire command area. This was important as the main canal system had to be brought under control to serve the needs of the users. A description of the organizing strategy is given below.

To assist with the organizing process, a sociologist from the Department of Irrigation selected farmer organizers (FOs) from the farming community. An FO was put in charge of a 500 ha area and the farmers of the area also played a role in selecting the FO of their area (Upreti and Mishra 1994). They were hired on a temporary basis for the initial job of farmer organizing. The main duties of FOs were: (1) to collect information and data about water users, and (2) to explain clearly to farmers in the system how the joint-management program works. Basic qualifications of an FO were the ability to read and write, being an active farmer from the area where he or she is to work, and the ability to ride a bicycle. Using FOs from the farming community has proved extremely useful as they have excellent local knowledge, are generally trusted by farmers, and can communicate effectively with system management staff and bring up issues with them.

The next step in WUA formation was to draft a constitution for the entire system. FOs organized the election of members of a constitution-drafting committee. These members came from different locations throughout the entire command area and served voluntarily. With the sociologist and system manager acting as facilitators, the committee drafted a constitution that included the structure of the organization.

The draft constitution called for a four-tiered organization based on hydrologic boundaries (figure 2). The four levels are: (1) a main committee for the main canal, (2) branch committees to serve branch canals, (3) *tolis* (tertiary-level groups) for tertiary-level canals, and (4) *upa-tolis* (sub-tertiary-level groups) below the tertiary level. Farmers receiving water were to be members of the WUA. The nested organizational structure was meant to gain participation from the grass-roots level, and to be able to deal with issues at the main-system level. Two important issues were at stake. It was vital that the main canal be revitalized and brought under control to deliver water through the system. And, it was critical to get as much participation as possible from the grass-roots level for adequate representation and for better water use at the tertiary and farm levels. These issues required that the multitiered organization be established simultaneously.

A system-wide general assembly was formed consisting of representatives from each of the *upa-tolis*. This ensured representation throughout the command area. The main functions of the general assembly are to supply a system of checks and balances, and to

stimulate communication with farmers. The general assembly selects main committee chair-holders and approves major programs and policies of the WUA.

Main canal management is the responsibility of the main committee. Additionally, it is viewed as the main business house of the command area with the overall function of providing water delivery service and raising revenues to fund the service. It proposes the general policy and programs of the system. Within the policy of the WUA, each of the other organizations (branch committees, tolis, and upa-tolis) can set their programs.

Another important decision of the constituent committee was to break the area into two systems, one taking water from the Nepal Gandak Western Canal, and the other taking water from the Indian Western Main Canal, represented by the Nepal Gandak Western WUA and the Piparpati-Parsauni Main Management Committee (PPMMC). This split was logically made, as the two units are hydrologically independent of one another.

With the draft constitution in hand, the strategy was to quickly set up organizations at all tiers in the organization. The FOs first concentrated on the upa-toli level that represented the level below the tertiaries of the canal system. Farmers at the upa-toli level were informed about the date and venue of the meeting. Attending farmers selected seven to eleven members of the upa-toli, depending on the size of the area served. The committee members then selected a chairperson, a vice-chairman, and a secretary, and one other member to represent the upa-toli at the next higher organization level (toli, branch, or main committee, depending on where the upa-toli is connected). Additionally, one user is selected from each upa-toli to be a representative in the general assembly.

At the toli level, users were called to form the committee. The committee consists of representatives of the upa-tolis and others selected during the meeting. Officeholders were selected from those members appointed by the upa-tolis. Similarly, branch committees were formed.

The apex level organization, the main committee, was formed from canal organizations for canals which have outlets from the main canal. Branch canal organizations for branch canals serving large areas, with outlets serving smaller areas, are equally represented on the main committee, each branch canal organization sending one representative to be a main committee member. This person cannot hold office in the lower-tiered organization.

A meeting of the general assembly was called to elect the main committee officers. Nominees for the posts were allowed to speak, then the general assembly voted for officeholders. At West Gandak, as per the wish of farmers, the chairperson came from the tail of the canal, the vice-chairman from the head, the treasurer from tail, and the secretary from the middle section.

The next important task of the general assembly was to ratify the constitution. Minor changes were made and the constitution was passed. The association was then registered at the office of the Chief District Officer on June 29 1993, and is now legally recognized.

It was realized by all concerned that this democratically formed WUA, representing the entire command area, was a starting point for institutional development and sustainability. It provided a skeleton from which to build.

The DOI played an important role in facilitating the process through the system manager and sociologist. WUA formation which lasted seven months cost US\$3,925 (Rs 196,339)² including remuneration, per diem and transportation mostly to cover the costs of the FOs.

2 US\$1 = Rs.50. The per hectare cost was 98 cents, based on an estimated irrigated area of 4,000 ha when the transfer program began.

The First Challenge

Following WUA formation came a particularly sensitive period. Earlier, farmers in the area had been "organized" without positive results. Although the general mood of the farmers had improved, there was still a problem with credibility and skepticism. If water delivery service did not improve, there would be no reason for farmers to put much effort into managing water. On the other hand, if improvement was perceived and farmers felt they had some influence on the positive change, there was a chance for success.

One of the early decisions of the general assembly, in consultation with the system manager, was to release water on May 25, 1993. In April, no water could be delivered in the West Gandak Canal because the Gandak Barrage, operated by the Indian Government was open for sediment flushing, which dropped the pond level. During this time, sediment cleanup begins in West Gandak. Previously, sediment cleanup used to last through June and July, causing the rice season to be delayed and rice yields to suffer. Given the heavy sediment buildup and limited budget, the shortened maintenance period was a challenge to farmers and the agency. The challenge presented an opportunity for the organizations to learn how to work together, and for the organizations to work with the agency.

Agency staff worked jointly with the newly formed WUA, disclosing the amount of government funds available and planning on joint future actions. Upon discussion with the WUA, it was decided that initially the agency should take a lead role in cleanup of the main canal. Branch committees and tolis would work jointly with the agency in the cleanup and repair of their sectors, and upa-tolis would clean up their portions of the canal system. In this manner, available government and farmer resources could be optimized.

The system manager used government funds as a leverage to obtain more involvement of farmers and enhance institutional development. He used the limited available budget more in the branches where there was more participation by farmers. The system managers gave attention first to the organizations that were readily willing to mobilize their own resources. This move encouraged the emerging organizations.

By the beginning of May, the farmers and the agency were extremely busy getting prepared for the opening of the main canal. There were still those that remained skeptical. Just before midnight of May 25, the water was released. When water was seen in the main canal, farmers came out in great numbers to complete the sediment cleanup in those channels that were not yet prepared. When water was released, the credibility rating of the newly formed WUA and the system manager increased dramatically.

Creating a Favorable Environment for Institutional Development

By the time of this report farmers had experienced two monsoon crops and two winter crops since the start of the joint-management program. Water delivery service has greatly improved. Several institutional development tasks were required after the initial formation. Organizations at all tiers had to start developing and enforcing rules and regulations for operation, maintenance, and resource mobilization. Record keeping had to be established and enhanced. Communications between users and committee members had to be established.

Much of this came naturally to farmers in Nepal, who have a strong tradition of local management of natural resources. System management staff encouraged farmers to develop and were open to advice from farmers. Training and applied research efforts fit well into this environment where farmers were motivated to learn. The learning helped speed the institutional development process.

Training on share system development and administration was given to main committee and branch committee members (Wilkins-Wells et al. 1994). The basic concept of the share system is two-sided (Freeman et al. 1989). Users have a right to benefit from the use of water, and there is an obligation to pay for its use in proportion to the benefit received. Ostrom (1992) has identified proportionality of benefits and costs of investments in management as a key aspect of effective institutional development in irrigation. The payment can be in cash, kind, or labor, and is critical for financing system management. In the training, committee members developed rules and regulations for operation, maintenance, resource mobilization, and administration; prepared record keeping formats; and identified requirements for a WUA O&M workforce. Trainees were taken to a nearby 3,500 ha farmer-managed irrigation system called Chhatis Mauja (Yoder 1994) which is entirely managed by farmers with share system and management concepts firmly in place. Additional training in operation and maintenance was given by the Human Resource Development and Training Branch (Thoreson 1995) to farmers focusing on maintenance requirements of the system. After this, farmers expressed confidence that they could manage the system.

Negotiations with Farmers for Turnover

Users' organizations at various tiers (branch groups, tolis, upa-tolis) were given the opportunity to take over the management of their subsystems. This takeover is important in that users are put in charge of their system and dependency on the agency is formally broken.

To initiate the process, farmers and agency staff conducted a joint walk-through of the system where problems and needs were identified. Discussions were held where farmers identify what they could do in terms of labor and cash. There were many works that would have put a strain on farmer resources so the agency used its O&M fund to perform the work. Some work was done by the agency using outside contractors, and some by contracting to the users' organization. When all points were clarified, a negotiated agreement was made. In the agreement it was stated that after work completion, the management responsibility would be turned over to the concerned users' organization.

Where the work was done by an outside contractor, quality control was done by the concerned toli, upa-toli, or branch organization. Upon completion, the concerned organization signed a completion certificate and gave it to the DOI for payment. The organization wrote a letter requesting handover of the system to the system management office with a copy to the main committee. Finally, the office and main committee turned over that portion of the canal system. After turnover, it is clearly stated that the users' organization will be in charge of future operation, maintenance, and resource mobilization to cover future costs. The agency would continue to provide advice and training and other support to encourage institutional development.

It is interesting to note that the demand for turnover occurred initially at several locations at the tail where little water had been previously available. Farmers expressed the attitude that if water was made available, they would support turnover. The joint-management program has been enthusiastically received by tail enders as it gives them an opportunity to voice their concerns about system management.

To date, 5,800 out of 10,300 ha served by secondary and lower-order canals have been turned over to upa-toli, toli, and branch committees. Through July 1996, the plan is for the WUA to take over management of the entire system, including the main canal.

Turnover to the Piparpati-Parsauni Main Management Committee

Piparpati (1.13 cumecs capacity, sometimes called Piparhawa) and Parsauni (0.56 cumecs capacity) canals, covering an area of 1,600 ha, take water from the main western canal that eventually flows into India. The two canals are governed by the Piparpati-Parsauni Main Management Committee (PPMMC). The Piparpati and the Parsauni canals were turned over to farmers in 1992 and 1993, respectively. This is the first independent irrigation system in Nepal, constructed by the agency, that was turned over to farmers.

The PPMMC has a main office where records are kept and meetings are held. From their own funds the committee hired an office secretary for record keeping and cash collection, and two field staff for operating the canal and performing routine maintenance. The committee keeps complete records of members, area, cash and kind contributions, resource mobilization, decisions, and fines.

In 1993, the committee distributed share certificates at the rate of 1 share per *kattha* (1/30 ha) at a cost of US\$0.02 (Rs 1) per share. Water is allocated based on the number of shares and on whether or not labor has been mobilized. A rotation system is used for water distribution. Presently, labor is mobilized on a per household basis, but starting in 1996, this will be based on shares.

Cash resources have been generated from a water charge at the normal government rate. Based on their experience, the committee has realized that this is insufficient for their needs and will raise the rates from US\$1.20 (Rs 60) to an equivalent of US\$2 to US\$3 (Rs 100 to Rs 150) per hectare per crop per year. The funds are used for regular and emergency maintenance and system improvements.

The major maintenance activity is sediment cleanup. The committee hires equipment from the agency office and pays the cost of fuel, oil, and the drivers' salary to clean the upper reaches of the canal. The rest is done manually. In May 1995, the Parsauni Canal was seriously breached. The committee used its funds to repair the canal and embankments, including the use of boulder pitching.

Conflict resolution is handled actively by the committee, which has a written set of rules for running the system, including ways of handling infractions. First a warning is given, then a stiff penalty of US\$60 (Rs 3,000) is levied for offenders. The committee has a record of offenders who have been successfully fined.

System improvement plans are now being executed to add an additional 300 hectares to the irrigation service area. In this case, some assistance was received from the office to construct two aqueducts. Using official funds for improvements on a cost share basis to expand the service area was considered appropriate in this circumstance, given the fact that all routine O&M are performed by the WUA.

WUA Activities and Performance

Often, WUA organizing activities face the problem that farmers get organized for major repair of their system, but are not oriented toward routine management in a productive and sustainable manner. Construction-induced organizations often collapse soon after project activities are complete. To avoid this, WUA organizing activities focused on developing capabilities of the WUA for management of future O&M of the system.

Shares

The WUA issues share certificates to water users for a small one-time fee. Farmers are allowed one share per kattha (1/30 of a ha) up to their total landholding. Shareholders then have an established right to water and can participate in WUA activities. Throughout West Gandak, farmers are moving to a system where resources are mobilized and water distributed as per the number of shares a farmer owns. An interesting experience to note is that, in general, smallholders more readily obtained their share certificates than large landholders because they see this as an opportunity to secure their water rights.

Resource Mobilization

To manage the system, the WUA must raise sufficient resources to maintain and operate the system, and to be able to upgrade the system when necessary. Subsystem level organizations develop their own rules and regulations for resource mobilization under the overall policy guidelines of the WUA. Typically, labor mobilization for canal cleanup is done on a land (or share) basis, where those with more land contribute more labor.

Cash resources recovered through a fee collection program are required for West Gandak to purchase materials, run equipment, and to pay employees and outside contractors. The fee collection program has several elements. Farmers in the joint-management program are required to pay a government water charge to recover a portion of HMG costs. The charge is US\$1.20 (Rs 60) per ha per crop. Additionally, farmers need to raise cash through a system management fee (SMF) based on actual O&M and administrative costs. Other cash resources include fines, additional charges for those pumping water from canals, and other WUA cash-raising activities. A summary of WUA resource mobilization is shown in table 1.

Table 1. WUA resource mobilization (from Pradhan et al. 1995).

Type	Total amount in US\$
Share fee	350
Water charge	3,050
Donations, fines, miscellaneous	130
Labor	66,150
Total	69,680
Average per ha	6.77

About 77 percent of the farmers paid all or part of the government water charge. The average collection rate is US\$0.30 per hectare compared to the US\$1.20 government mandated rate per crop. While this is low, it is a substantial improvement over the situation before joint management. As can be seen, farmers prefer to mobilize their own labor rather than pay cash to hire a labor workforce for maintenance such as canal cleaning. Labor mobilized was valued at US\$6.42 per hectare. The total resource mobilization, both in cash and labor amounted to US\$6.77 per ha.

The government has a policy of a 50 percent rebate to the WUA for the government water charge. This is meant to provide an incentive for farmers to collect cash resources. As an incentive for turnover, the WUA may retain 100 percent of the collected water charge. Before the joint-management program, a government tax collector collected water charges from individual farmers, and the collection rate was extremely low. Now, the WUA through its lower-tiered organizations is collecting the water charge and system management fee.

While the fee collection program provides the foundation for generating resources, the WUA is considering other options for generating cash resources. If ownership over the physical assets is turned over to users, several opportunities arise. Equipment could be rented out at times when they are not needed for the irrigation system. A toll could be levied on shops and vehicles using canal service roads. Trees and grass along embankments could be trimmed and sold. All of these would add to the income of the WUA and decrease the O&M cost for users. However, there is no legal mechanism for turning over government property to farmer groups as yet.

Through the joint-management program, the DOI is performing maintenance and operation works with its own funds. The joint-management program utilizes government funds to carry out deferred maintenance for a brief period of time while allowing farmers to gradually take over responsibility for routine maintenance. Government expenditures for maintenance were US\$6.65/ha (Rs 332/ha) for 1992, US\$9.28/ha (Rs 464/ha) in 1993, and US\$4.06/ha (Rs 203/ha) in 1994.

Canal Operation and Maintenance

At the tertiary level and below, canal operation and maintenance were always done by farmers. Along the main and branch canals, the agency has gate operators. Operation schedules on the main canal are decided jointly by the WUA and the system manager, and the agency staff operate the canal. For now, the agency pays the cost of maintaining the main canal. After turnover of branches, farmers operate branch canals with only technically advisory assistance given by the agency.

If the WUA takes over the entire system, they must bear the full cost of maintenance. A major cost is the cleanup of heavy sediment depositions. A recent study (Rana and Mishra 1995) showed that the cost of sediment cleanup of the main canal is between US\$11,030 (Rs 551,480) and US\$22,708 (Rs 1,135,400) per year or between US\$1.20 (Rs 60) and US\$2.61 (Rs 130) per hectare per year. This amount can be paid in cash or labor, and is not prohibitively high, as was previously thought. The incentive for the WUA to take full responsibility for maintenance is that they will rely on themselves for the timely cleanup of the canal. They had the previous experience of sediment buildup due to lack of timely maintenance by the agency. Farmers expect that timely cleanup would lead to timely water supplies, timely plantings, better yields, and ultimately more income to them (Verma et al. 1992).

One important task of system management staff has been to demonstrate that the canal system is operable. Before joint management, the canal system never reached its potential and the farmers lacked confidence that the system could actually work as originally expected. Because main committee members worked closely with the system manager on O&M of the system, they know the technical requirements. They now appear confident that they can perform maintenance and operational tasks.

Other Activities

Record keeping is an important management tool of the WUA. It is important to know who has paid, who has not paid, where the water is going and what decisions were made. Some branch committees have made particularly impressive progress at record keeping, while others have lagged behind.

The constitution requires that elections of WUA officers at all levels should be held after every two years. The second elections were held in May 1995 with wide participation by farmers. To participate in the elections, the West Gandak farmers had to obtain their share system certificates and bring their water charge payments up to date.

The Nandapur Minor—an Example of a Minor Canal

The Nandapur Minor, serving an area of 165 ha, was turned over to farmers in June 1994. The Nandapur Minor is managed by a toli committee and has 8 tertiary units managed by upa-tolis. Now, it is operated and maintained entirely by farmers. For cleaning, Nandapur Minor is divided into sections. Upa-toli 1 is responsible for cleaning from the head regulator to its outlet, upa-toli 2 from outlet 1 to outlet 2, and so on. Cleanup lasts 1 to 2 days, and is done on a per household basis. Each upa-toli is responsible for the cleanup of its own channels. If maintenance activities require cash, the upa-toli must request the toli committee for assistance.

The toli committee decides the operation schedule for the minor canal, which is typically a rotation schedule. The committee meets frequently and may change the schedule to meet the changing on-farm requirements throughout the year. Within the upa-tolis, the farmers arrange water distribution on an informal basis.

The toli committee of Nandapur has a complete set of records including an income/expenditure record, users' register including irrigated areas and landholdings, water charge receipts, labor mobilization records, and a minute book.

For most Nandapur farmers, the change has been quite positive. They are organized now for regular maintenance, and have developed equitable operating procedures. As testimony to the positive change, 100 percent of Nandapur farmers receiving water have paid for share certificates and have paid water charges (50% of which goes to the government, 30% retained by the toli committee and 20% given to the main committee). By mid-1995 the toli committee had cash reserves whose members feel are sufficient for improvements. There is a realization that if the WUA runs the main canal, the Nandapur Minor will have to contribute more money to the main committee for O&M of the main canal.

Performance of Irrigated Agriculture

Data on crop yields, area served, and production costs are available for comparison for 1992 and (Research and Training Branch 1993) 1994 (Pradhan et al. 1995). Both rice and wheat yields rose dramatically (table 2). In 1992, 3,200 ha of rice received irrigation, while 4,100 ha of rice received little or no irrigation. In 1994, virtually all the rice fields in the command area were irrigated. Yields for irrigated rice rose from 2.0 tons (unhusked rice) per ha to 3.4 tons (unhusked rice) per ha in 1994.³ Wheat yields changed from 1.65 tons (unhusked rice)

3 Data based on household surveys. A crop cutting survey by the DOI System Management staff in 1994 showed yields, on average, over 4 tons per ha.

per ha in 1992 to 2.44 tons (unhusked rice) per ha in 1994. National average yields in 1992/93 for irrigated rice and wheat were 2.05 tons (unhusked)/ha and 1.25 tons (unhusked rice)/ha, respectively (Agricultural Statistics Division 1994). Major reasons for this increase are: (1) an increased water supply throughout the system, and (2) timely water supply. The inflow into the main canal increased from 2.2 cumecs in 1992 to a maximum of 7.9 cumecs in 1993 (the design discharge is 8.5 cumecs).

Table 2. Crop production in 1992 and 1994, before and during joint management.

Crop	Area (ha)		Productivity (tons/ha)		Production (tons)	
	1992	1994	1992	1994	1992	1994
Rice (irrigated)	3,200	7,600	2	3.4	6,400	25,840
Rice (rain-fed)	4,100	—	1.9	—	7,790	
Early rice	0	40	—	4.9	—	196
Wheat	3,400	3,900	1.7	2.4	5,780	9,360
Oilseed	620	800	0.7	0.6	434	480
Pulses	1,550	1,200	0.8	0.6	1,240	720
Sugarcane	2,060	2,200	25.7	44.7	52,942	98,340

Net benefits for farmers per crop are computed showing the costs and market value of production for the major crops (table 3). The major crops of rice, wheat and sugarcane all showed substantial values for incremental net benefit.

*Table 3. Per hectare costs and benefits (in 1994 US\$/ha).**

Crop	Crop revenue		Production costs		Net benefit		Increment
	1992	1994	1992	1994	1992	1994	
Rice (irrigated)	263	404	172	243	91	161	70
Rice (rain fed)	269	0	172	0	77	—	—
Early rice	—	496	—	197	—	299	—
Wheat	174	283	156	172	18	111	93
Oilseed	166	186	68	111	98	75	—
Pulses	145	206	50	65	96	141	45
Sugarcane	622	941	363	370	259	571	312

* Estimated annual rate of inflation 10 percent.

For the system, the cost of production increased from US\$2.2 million to US\$3.5 million (table 4). On the other hand, the value of production doubled from US\$3.3 million to US\$6.6 million. The net benefit of irrigated agriculture activities taking into account cost of production

and value of production increased from US\$1.2 million to US\$3.2 million, or an increment of US\$1.98 million, or US\$193 per ha. The average household farm size is 1.9 ha, so the average increment per household was US\$102.

*Table 4. System-wide net benefit (in 1994 US\$).**

Crop	Cost of production		Value of production		Net	
	1992	1994	1992	1994	1992	1994
Rice (irrigated)	548,352	1,850,448	841,772	3,075,416	293,420	1,224,968
Rice (rain fed)	702,576	—	1,024,595	—	322,019	—
Early rice	—	7,876	—	19,860		11,984
Wheat	529,471	668,928	592,991	1,105,572	63,520	436,644
Oilseed	41,770	88,512	103,422	149,024	61,652	60,512
Pulses	77,833	77,952	225,397	247,632	108,446	169,680
Sugarcane	747,780	814,308	1,281,196	2,069,276	533,416	1,254,968
Total	2,647,782	3,508,024	4,069,373	6,666,780	1,382,473	3,158,756
Increment		860,242		2,597,407		1,776,283
Increment per ha		84		252		72

* Estimated annual rate of inflation of 10 percent.

Considering government and WUA expenditures for O&M, the net benefit is shown in table 5. While the costs for O&M increased to the WUA, this was by far offset by the value of incremental production. The incremental net benefit was US\$1.9 million or US\$182 per ha. Assuming that O&M costs in 1992 were 0 (in fact there was some labor for O&M), the incremental expenditure for O&M was US\$10.60 per ha. Comparing the incremental net benefit of US\$182 per ha to the incremental expenditure of US\$10.60 reveals a clear incentive for farmers to sustain this level of system management.

*Table 5. Incremental net benefit considering O&M costs (in 1994 US\$).**

	1992	1994
Production value	4,069,376	6,666,780
Production cost	2,647,786	3,508,024
Government costs	68,547	86,903
WUA costs		90,648
Net benefit	1,353,043	2,981,205
Incremental benefit		1,874,884
Increment benefit per ha		182

* Estimated annual rate of inflation of 10 percent.

Future Challenges

The Nepal Gandak WUA has made considerable institutional progress and is well on its way to becoming a self-sustaining WUA. However, it faces certain challenges in turnover. Presently, the Nepal Gandak main committee is still reliant on the DOI for operation and maintenance of the main canal although it acts in consultation with the committee. A critical task is for the main committee to take over more management responsibility at the main system level.

A second challenge is to be able to raise sufficient cash and labor resources for system management and to distribute the resources to where they are needed. Presently, mobilization of labor resources is sufficient to clean most of the canals at secondary level and below. Cash collection rates need to be changed to reflect actual local needs, instead of using rates based on government norms. The flow of money within the WUA needs to be improved as tolis and upa-tolis that collect the money are reluctant to give a portion of the money to the Nepal Gandak main committee because it has not yet taken over the main canal.

The third challenge for the WUA is to enforce rules. Presently, agency personnel help in distributing water and at times in resolving serious conflicts. Eventually, these tasks must be taken over by the WUA. In some lower-tiered organizations, WUAs have hired a workforce to help in the day-to-day management of the system. This has not occurred at the main system level.

On the side of the government, some policy issues need to be clarified. The WUA is keenly interested in taking over government assets, including equipment, property and buildings. These can be used to maintain the system and to generate other resources. The WUA would like to rent out equipment when it is not in use and use buildings as guesthouses. Government regulations are not clear about whether these assets can be transferred to farmer management.

The West Gandak System has progressed with turnover more rapidly than other systems in Nepal. As the time for turnover approaches, some senior officials are understandably worried about the risk that systems under farmer management may collapse, especially if farmers are not adequately prepared. For management transfer to work, however, the DOI must at some point withdraw from the systems. Top-level decision makers must be committed to this and give a clear signal to users that this will happen. If this signal is not clear, farmers will likely continue to be made dependent on the government.

Finally, there is concern among some people that management transfer is against the interests of DOI because DOI staff may lose their jobs. Because of this potential conflict of interests, many question whether DOI is the appropriate agency for facilitating management turnover. One of the challenges for DOI and the Ministry of Water Resources staff is to make a shift from managing O&M to other areas of critical concern. These include management of flows of water within river basins and providing technical assistance in the areas of flow measurement, installation of appropriate structures, irrigation organization, and on-farm water use. If DOI refocuses its attention to these important areas there will be much work for the agency for many years to come, even if it gives up managing O&M of irrigation systems.

Future Visions

The system manager and Nepal Gandak main committee have unofficially targeted mid-July 1996 as the time for full turnover of the system. If there is a favorable environment and there are no unexpected events, this will happen. The WUA will be fully in charge of the system.

For two to three years, the Department of Irrigation will monitor the situation closely, and provide assistance when required. During this time, certain physical works such as drainage improvements may be provided under a cost share program with DOI. After that, assistance from DOI will decrease to a level typical in other systems.

Better water control should give the opportunity for more crop diversification. Improved agricultural services and marketing are essential to reach the full potential of the area. It is envisaged that through improved administration of the share system, the WUA can achieve the level of water control needed for more crop diversification and better productivity. The WUA will become a focal point for coordination of improved agricultural services.

Summary and Conclusions

Several features of management turnover at West Gandak have been unique, at least in Nepal. There has been much progress made toward the WUAs taking over management of the system. This progress has also led to better utilization of water and increased productivity of the system. While it is still too early to judge whether the improvements will be sustained, there are good signs of the capability of the farmers to maintain, operate and mobilize resources for management. Other conclusions based on the experience are highlighted below.

1. The DOI, in this case, successfully played the role of facilitator. The DOI's role was to:
 - facilitate institutional development
 - improve operations of the main system
 - perform special maintenance to bring the system back to an operable condition
 - gradually allow the WUA to take over system management
 - provide guidance and training to the newly formed WUA
2. At West Gandak, there was a clear incentive to participate in management transfer. Agricultural productivity and income improved markedly as a result of the program. It is clearly worthwhile for farmers to participate in the program.
3. The organization process visualized a single, multitiered, water users' association for each independent system (2 WUAs to cover the West Gandak project area). The entire WUA was formed in one organizing effort. This is much different from previous approaches where groups were formed first at the tertiary level, then only after those became strong organizations were they formed at the next tier, and so on. These typically never reached an apex organization for the system. The apex level main committee has been found to be essential for the management of the system to bring the main system under control, to tie the association together and to motivate lower-tier organizations to become active.
4. Initial civil works efforts focused on bringing the main system under control, as opposed to focusing on tertiary-level improvement. Farmers quickly responded to this increased supply through their own organizing efforts and maintenance of tertiary subsystems.
5. The employment of farmers from the local community as organizers was very successful. FOs enhanced communication with farmers and helped in the collection of information.

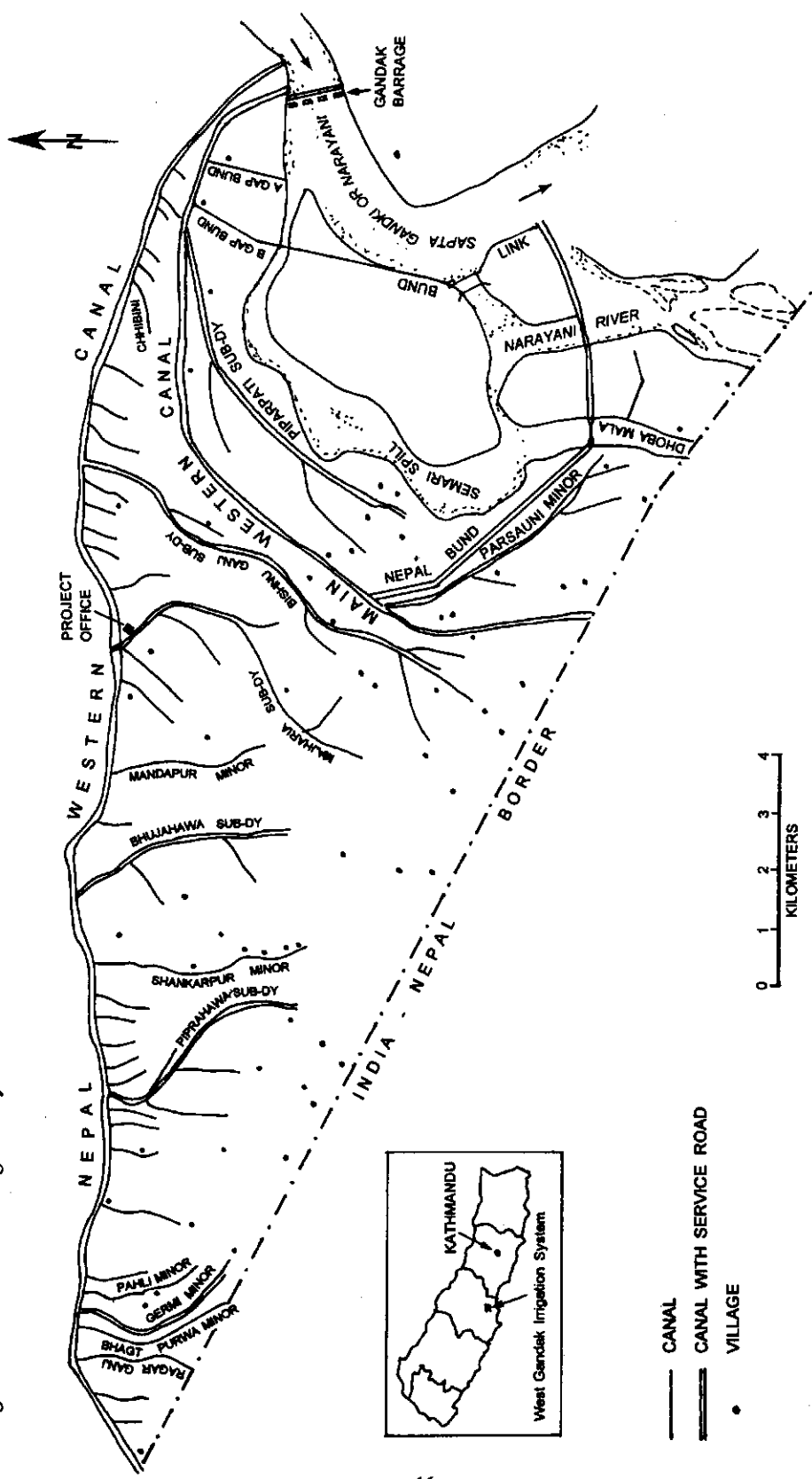
6. The amount of outside financial resources required was minimal. More emphasis was placed on institutional strengthening than on rehabilitation. This was not a pilot project where any and all necessary resources were put in to make the project a success. This was part of a larger HMG turnover/joint-management program that now covers eight systems of 60,000 ha.
7. Focusing on development of a share system for water allocation and resource mobilization helped avert the possibility of creating an overemphasis on construction or rehabilitation. The share system provides a means for mobilizing resources for O&M on an equitable basis with costs proportional to benefits. WUAs have enthusiastically embraced the concept of shares, and are gradually moving to a system of water allocation and maintenance based on shares.
8. In the case of West Gandak, the management turnover program has led to a significant increase in productivity and income for farmers. This is due mostly to farmers managing water resources better than in the past and the irrigation agency responding in good faith to the needs of an organized WUA.

There is high potential for greatly improving the performance of agency-developed and -managed irrigation systems in several other irrigation systems in Nepal. The case of West Gandak demonstrates that Nepal's management turnover program can be an effective means for bringing about this change.

Acknowledgment

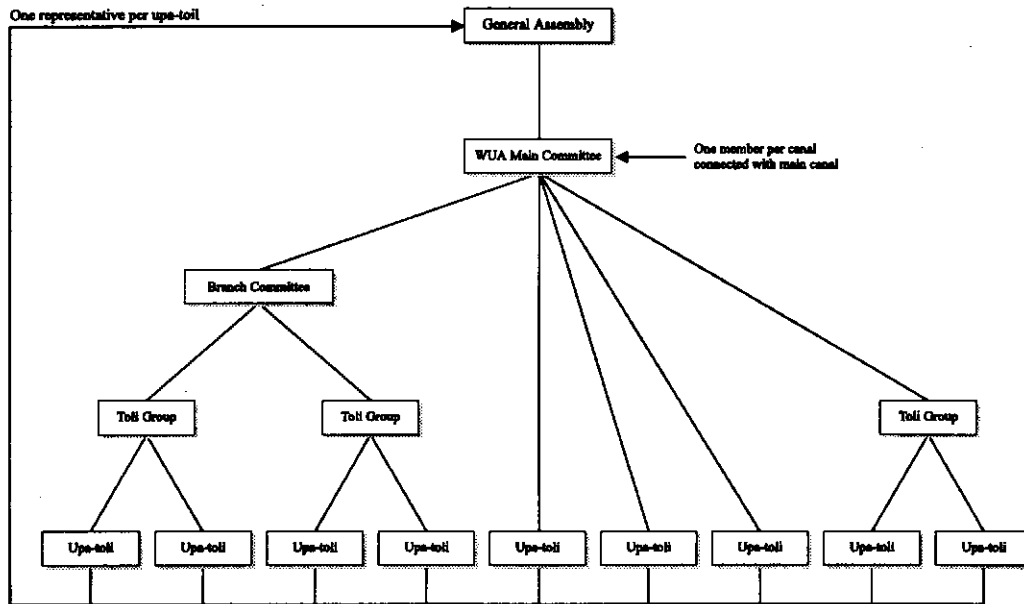
The authors would like to gratefully acknowledge the support received from the farmers at West Gandak, the HMG/Nepal Department of Irrigation, Computer Assisted Development, Inc., Ft. Collins, Colorado, and the joint HMG/N - USAID/N Irrigation Management Project (367-0153) for supporting both the work at West Gandak and the preparation of this paper. The authors acknowledge the helpful comments on the paper received from many, in particular the detailed comments from Mr. R. P. Satyal, Chief, System Management and Training Program, and Dr. Prachandra Pradhan.

Figure 1. West Gandak Irrigation System.



Note: SUB-DY = Sub-Distributary.

Figure 2. Organization chart for Nepal Gandak Western Irrigation System Water Users' Association.



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|------------------------------------|---|
| General Assembly | — Elects main committee chair-holders |
| | — Approves policy and programs |
| Main Committee | — Makes policy and program |
| | — Hires staff |
| | — Oversees day-to-day O&M |
| Branch Committee, Tolis, Upa-tolis | — Organizations responsible for management of their respective canals under policy guidelines of WUA. |

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