

REPORT NO. R-43

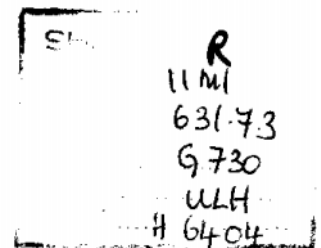
**FARMER-MANAGED IRRIGATED AGRICULTURE UNDER THE
LEFT BANK OUTFALL DRAIN STAGE 1 PROJECT, PAKISTAN**

and

**MANAGING IRRIGATION FOR ENVIRONMENTALLY
SUSTAINABLE AGRICULTURE IN PAKISTAN**

**STUDY TOUR OF PAKISTANI PILOT PROJECT
FARMER-LEADERS TO NEPAL**

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**JANUARY 1998
PAKISTAN NATIONAL PROGRAM
INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE**

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ACKNOWLEDGMENTS

This visit was the first of its kind for both the farmers and the staff of IIMI-Pakistan. The financial support from the Swiss Development Cooperation for the visit is gratefully acknowledged. The cooperation from the water users of the four pilot distributaries/ minor in organizing themselves into Water Users Federations and choosing appropriate leadership was one of the key factors that made the visit possible. Their contribution, therefore, cannot be over-emphasized. The hard **work** of the field teams behind **all** of the organizational activities also shares some of the credit for the success of the visit program. We are especially obliged to Mr. Rajan Subedi, Managing Director of Consolidated Management Services in Nepal for putting every possible effort into making the visit a success. The strenuous efforts of **Mr.** Tissa Bandaragoda, Senior Management Specialist, and Professor Gaylord V. Skogerboe, Director IIMI-Pakistan behind arranging the finances for the tour also deserve special mention, and their comments on the earlier drafts helped in improving the report. We owe a lot of thanks to the participants of the tour for the zeal they expressed for learning, and to the organizations visited in Nepal for their hospitality, without which the efforts would not have paid-off.

Last, but not least, the editorial assistance received from Ms. Verenia Duke, assistance by Ms. Samia Ali and Mr. Mobin-ud-Din Ahmad in preparing the map of the visited sites, and the secretarial assistance of Mr. Manzoor Hussain are thankfully acknowledged.

Mehmood Ul Hassan and Yameen Memon

FOREWORD

The value of study tours for those involved in introducing change to existing institutional arrangements is well illustrated by the outcome of this study tour to Nepal by a group of farmer leaders from Pakistan. The resultant changes in their attitudes and behavioral expectations could not have been achieved by any training or instructions. Considering the value of this event, IIMI's Pakistan National Program decided to document the main features of the experiences gained through this study tour. The report is compiled by two senior staff members of IIMI, who along with four other colleagues accompanied the twenty farmer leaders to Nepal.

The participants were from two pilot projects conducted by IIMI. Fifteen farmer leaders were from the pilot project in the Sindh Province, "The Farmer-Managed Irrigated Agriculture under the Left Bank Outfall Drain (LBOD) Stage-I Project Area", co-funded by the World Bank and the Swiss Development Cooperation, and five farmer leaders were from the pilot project in the Punjab, funded by the Royal Netherlands Government. The 20 farmer leaders are **all** office bearers of four Water Users Federations, representing a total **of 6,200** water users.

We appreciate the ready offer of support extended to us by the Swiss Development Cooperation to meet the entire cost of this study tour. I am sure this was an instance when funds were well spent for a worthy cause. We in IIMI are happy to have participated in an activity which will have some long-term effects on Pakistan's on-going initiatives for institutional reforms in the irrigated agriculture sector.

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EXECUTIVE SUMMARY

The *Pilot Project on Farmer-Managed Irrigated Agriculture in the LBOD Area* envisaged study tours for the leaders of the newly established Water Users Organizations. By this way, the farmer leaders could physically see how organized farmers are managing their irrigation resources. Though an inland visit to a farmer-managed distributary/ minor would have been of much value for the newly selected farmer leaders, opportunities for an inland visit was impossible because of the non-existence of a farmer-managed distributary / minor in Pakistan. The presence of all the three modes of irrigation management, i.e. agency, joint and farmer managed, at the secondary level of the system in Nepal, helped in deciding to visit Nepal. Five office bearers from each of the IIMI's three pilot distributaries/ minor in Sindh and one in Punjab participated in the visit.

Consolidated Management Services of Nepal was requested to organize the visit as it has vast experience in organizing study tours for irrigation systems. The itinerary facilitated visiting five irrigation systems in Nepal. The systems for the visit were carefully selected in order to provide an opportunity to the visitors for seeing all of the three management modes.

At the outset of the field program on December 05, 1997, participants called on the Director-General of Irrigation, Nepal, who warmly welcomed the Pakistanis to his country and its irrigation systems. Encouraging Pakistani farmers to benefit from the opportunity to learn how the Nepali farmers were managing their systems, he expressed that effective users participation at the secondary/ tertiary level of irrigation systems was paying dividends.

Pithuwa Irrigation System, to the east of Bharatpur / Chitwan Town and located in the Pithuwa Village Development Committee (VDC) area of the Chitwan District, was visited on December 06, 1997. The Water Users Association is managing this system. In order to meet its obligations, the association fixes a water tax based on the size of the user's land. WUA members expressed that the fixed supply compels users to use water more efficiently. Pakistani farmers confidently sought clarification about the topics of their interest.

A deep tube-well project was visited. The group visited this tubewell scheme after introduction to the WUA and the project staff. Though installation costs are higher, the cost of water for a community-managed tubewell is about 25% lower than that of government-managed tubewells. Users expressed that their crop yields, cropping intensities and annual incomes per unit area have increased.

The farmer-constructed irrigation system of Sorah Chhatis Mauja serves 52 villages, irrigating 16 on one branch canal and 36 on the other. The Chhatis Mauja Branch Canal has 182 tertiary units. Group members eagerly inspected the canal and turnouts at Sorah-Chhatis Mauja Irrigation System and saw the locally developed diversion structure used for water distribution.

The Chhatis Mauja Branch Canal has a total of 728 votes among the member farmers. Fines are levied for water theft and other offenses, which gradually increase with the

number of offenses by the same farmer. Water allocation is based on requirement. The main committee allocates and distributes water to branches; branches allocate and distribute to *kulharas*. When fines for abstention from channel clearance activity are not paid, irrigation water is withheld. The indigenous water structures used at the head of each channel allow proportionate water to the channels. Apart from the irrigation service fee, there are a few instances of receiving occasional grants from the District Irrigation Project. Charging entrance fees from visiting professionals and organizations also generates finances.

The Gandak West Canal System is located along the Indian border in the Nawalparasi District of Nepal. This system is physically very similar to canal systems in Pakistan. Under government management, the system deteriorated due to livestock entry and poor maintenance. The Government of Nepal and USAID ratified an agreement for joint management between the Department of Irrigation and the farmers. User groups were organized following a bottom-up approach at the turnout, minor, branch and main canal levels. Asian Development Bank (ADB) and His Majesty's Government (HMG) presented an action plan, which was reviewed by a sub-project management committee consisting of agency and farmer representatives. Shareholders elect office bearers for the *uppa tolis* and one member for higher level leadership (*toli*). Shares have been distributed among water users at Rs 1 each. The users feel that timely maintenance by the WUA prevents physical deterioration of the system. After visiting the organization of West Gandak, the participants expressed their confidence about a farmer-managed irrigation system. Pakistani farmers paid rapt attention to the presentation about the system and the organization.

The Begnas Irrigation System is the first hill irrigation system visited in Nepal, comprising a lake connected to a large canal, which the group visited on the morning of December 11, 1997. A unit water requirement for the rice crop is five liters/s/ha. This area demands high water use for crop production as the soil drains quickly. Farmers had been managing the canal system informally before the initiation of the project. However, the lake system was expanded and the canal was redesigned. The farmers participation has been included very recently in the project design. Project staff later informed the local Panchayat through the VDC that the system needed farmer participation. The government provides funds for maintenance; the organization prioritizes maintenance activities and supervises maintenance activities. Beneficiaries are not required to pay a water tax to the government. The irrigation system appears to be an agency-managed irrigation system with limited farmer participation. Though a WUA for the canal system exists, the organization is very weak because roles, responsibilities, and water rights have not been clearly defined.

The visitors had opportunities to share their experiences among themselves as well as with experienced experts of irrigation in Nepal. Besides an initial evaluation, a half-day experience-sharing meeting was conducted in Kathmandu after the group had visited all the intended irrigation systems. The group recognized that despite a difference in the context of irrigation systems in Nepal and Pakistan, the physical hierarchies were alike. The size of irrigation systems in Nepal is compatible with potential demand. System designs cater to

smaller-than-required command areas, enabling additional water supplies. Pakistani systems were constructed centuries ago with a designed cropping intensity of around 80%. While cropping intensities increased in Pakistan and maintenance is continuously neglected, system capacities reduce and the demand for water increases.

De-politicization of the organizations, government support for Participatory Irrigation Management, egalitarian land distribution, and strong by-laws and a supportive judicial system in Nepal were regarded as the main differences with that of Pakistan. Government support for farmer-managed irrigation systems, one of the crucial factors for success, is totally absent in Pakistan, where, despite several requests from established WUFs, distributaries are not being turned over to farmers. Irrigation departments support pilot projects at policy levels, but field staff directly responsible for the system are reluctant to proceed further, also indulging in regulation activities that discourage farmers from cooperating with WUFs.

The participants were of the view that the Pakistani organizations should be introvert *so* that every farmer gets his share and pays accordingly. These organizations should develop practical and realistic by-laws and frame appropriate systems, including systematic water charge collection.

In the final evaluation by the participants, the relevance of discussions with the WUOs of all the irrigation systems was regarded highly useful. The WUA of the Gandak West Canal Irrigation System won high praises as an overwhelming majority regarded the discussion to be highly useful. WUA office bearers were highly knowledgeable about their system.

Participants were also requested to evaluate the program organization, facilities provided, and coordination. The Government's enabling role in Nepali irrigation systems was highly appreciated, as Pakistani farmers are experiencing several institutional barriers to enable their organizations to operate and maintain their irrigation systems.

According to their views, the similarity of irrigation systems helped largely in learning. Initiatives for self-organization among the Nepali farmers were especially mentioned and noticed by the participants. Participants also warmed to the participatory evaluation and experience-sharing meetings.

This visit was extremely valuable in helping farmers to witness farmer-managed systems *so* that they could be inspired and encouraged. The favorable policy environment and the enabling role of the irrigation bureaucracy in Nepal was greatly appreciated, and was considered essential for the success of farmer-managed irrigation systems.

The Pakistani farmer leaders were optimistic about removing initial social barriers as the organizations start managing their systems and improve their functioning with gaining experience. The institutional barriers were perceived to be the only obstacle in the way of successful farmer-managed irrigation systems.

The most impressive part of the visit was the direct interactions among the farmers of the two countries. While Pakistanis were asking questions in Urdu, their Nepali counterparts were responding in Hindi. There had been almost no job for the facilitators due to this direct dialogue. Some of the Pakistani farmers, who earlier were skeptical about farmers managing an irrigation system in Pakistan, were found to become ardent advocates of an FMIS during the participatory evaluation conducted later. The similarity of the physical hierarchy and social setup of the canal irrigation systems in both the countries further strengthened their beliefs. Most of the queries from the Pakistani leaders were related to water availability, allocation, distribution, equity, formulation of rules and their applications, effectiveness of the organizations in controlling free riding and irrigation service fees. Being agriculturists, the farmers also had many interactions about farming systems, size and tenure relationships, cropping patterns and intensities, crop yields, and income. Livestock and milk production were also discussed though less frequently. Pakistani farmers showed keen interest in managing their irrigation systems through their organizations, once these are turned-over to them.

1. INTRODUCTION TO PAKISTAN AND NEPAL IN SOUTH ASIA

1.1 Background

Pakistan and Nepal are both democracies, but Nepal is a monarchy with the King as head of state, whereas a Prime Minister assisted by a Cabinet of Ministers governs Pakistan. These two countries share a contiguity of borders in South Asia, which is cut **off** from the rest of Asia by the Himalayan mountains. South Asia has a total area of nearly **2** million square miles, which holds one-fourth of the world's population, ranking as the third major concentration of human beings **in** the world.

Neighboring countries in the region also share common histories, races, religions, languages, cultural backgrounds and colonial legacies. About 180 languages and more than 700 dialects are spoken here, but there are, however, only three main languages: English, Hindi and Urdu. Nepali has been developed / influenced off these.

Pakistan's rich historical influence is long and complicated, and Nepal's ancient documentary history began with the Changa Narayan Temple inscription of **449** AD.

In many ways, life in this region has remained the same for hundreds of years. The ancient customs may be seen side by side with the latest advances in civilization and science. Religions play a very important role in the region's social make-up because these affect people's styles of dresses and diet, and influence their choice of livelihood.

Though the area is rich in resources, such as ores and farmlands, it remains insufficiently developed, and as a result, the area has a low standard of living.

1.2 Human activities

In South Asia, man and his land have always been very closely related. A large portion of the land suitable for agriculture has been brought under cultivation, and this is the major occupation of the people. It is not only their chief means of livelihood, but also serves **as** the foundation of the region's economy, which provides food for the growing population and is the source of raw material for related industries. Adding to export products and accounting for much of the national income, agriculture also provides employment to the majority of the working population.

Every South Asian country has tried to develop its agriculture, but without changing its methods of agriculture, i.e.:

- small land holding
- feudalistic system
- ill organization combined with lack of capital

In addition, these countries have not introduced much change in the types of crops grown in particular seasons, and are taking a long time to introduce new technology.

As a result, agriculture in the region remains predominantly a subsistence way of life. Very fine fertile land, suitable climate and abundant labor is available in this region. Water storing facilities in the form of dams and barrages are present and different types of irrigation facilities are available, but the production of crops are not according to expectations.

Since the 60's, agricultural methods started changing for the better in the region:

- irrigation systems began to take new turns in agricultural development by providing reliable and controllable water supplies to the lands;
- both good seeds and good fertilizers were also introduced;
- control over weeds and pests and diseases were made possible;
- new technology and scientific methods added much more to the development of agriculture;
- governments also started providing all the possible facilities to farmers to increase crop production;
- modern agronomic science was introduced; and
- more attention was given towards agricultural research.

Topographically and climatically, the potentially productive land is as follows:

Pakistan	30%
Nepal	14%

1.3 Chief crops grown in the region

In most of the countries, there are two or three main cropping seasons, and the following crops are cultivated:

Rice: One-fourth of the world's total rice production comes from the region.

Wheat: Wheat is a staple food in the drier climates.

Maize: This crop is grown for both cattle and humans, which is grown in the plains and is used as grain as well as fodder.

Sugarcane: No big efforts are needed for its cultivation, because once it is sown, it can yield five to six crops.

Tobacco This is grown in most areas of South Asia, and in certain places, enough is grown for export.

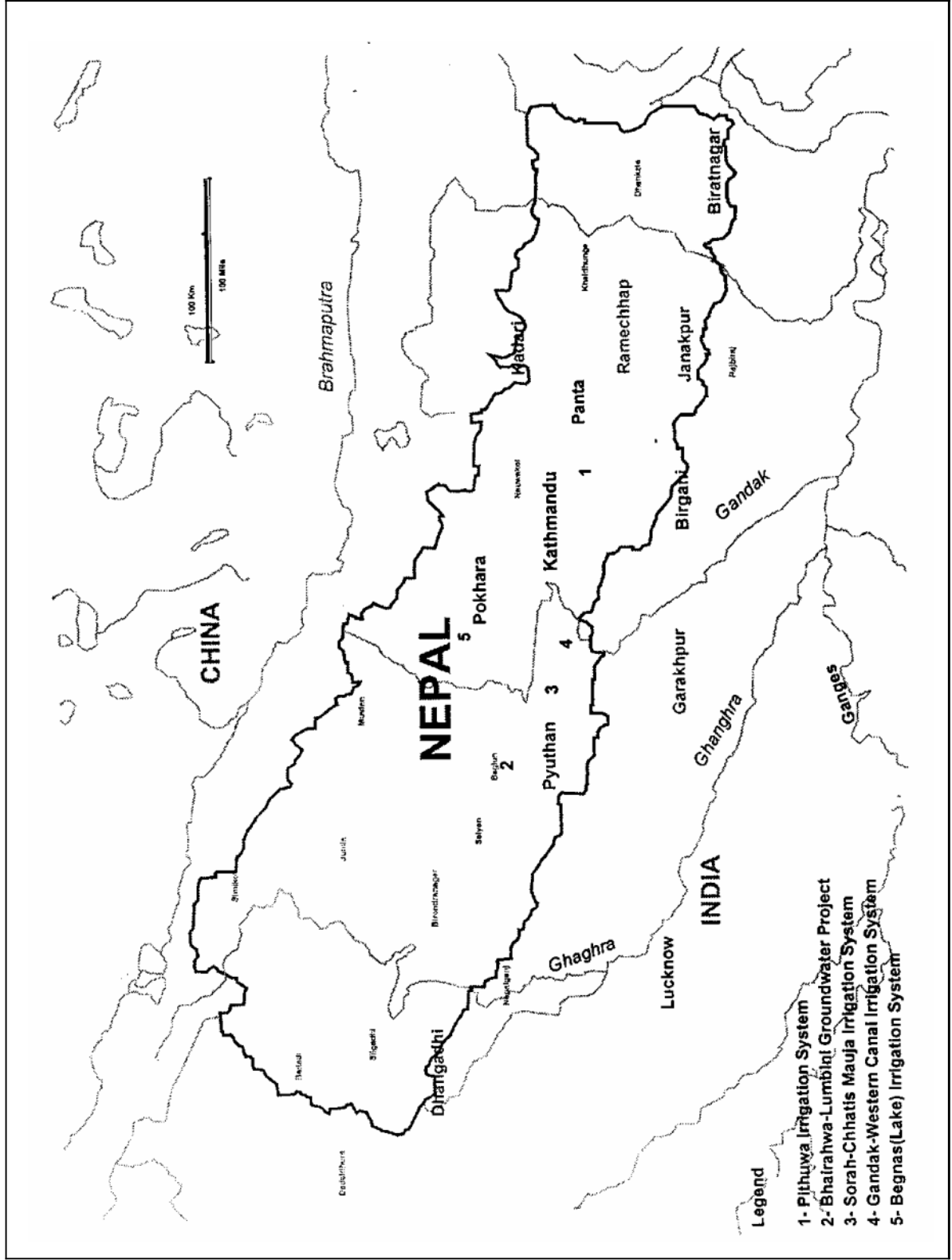
cotton This is an important cash crop and is grown in the canal irrigated areas.

Fodder These are specially cultivated for milk animals and other cattle as little grazing land is available.

Domestic animals such as cows, buffaloes, oxen, goats, sheep, pigs, donkeys and horses are an important part of the South Asian agricultural system. These are considered to be an important source of power in the rural areas, especially cattle.

These animals are a big source of meat, milk, butter, ghee, cheese and yogurt. All of these products are not used in the fresh form, but are canned or packed in fresh or dried forms. Their bones and leather are also utilized in many ways.

Map 1. Location of Irrigation Systems Visited in Nepal



2. THE STUDY TOUR

2.1 The Need

The *Pilot Project on Farmer-Managed Irrigated Agriculture in the LBOD Area* envisaged that the program would facilitate study tours for selected leaders of newly-established Water Users Organizations (WUOs) of the pilot irrigation systems in order for them to experience how other farmers are managing their irrigation resources.

Study visits of this nature have been extremely helpful in certain other countries. Unfortunately, the Pakistani experience of farmers managing irrigation systems is limited to the tertiary level. In the past, farmers had only been entrusted with the task of managing their watercourses, and their involvement at the secondary level (distributories and minors) had been altogether non-existent.

Despite the fact that an inland visit to a farmer-managed distributory / minor would have been of much value for the newly-selected farmer leaders, opportunities for farmers to have an exposure program became well nigh impossible because of the non-existence of a farmer-managed distributory / minor in Pakistan. **An** explicit growing desire from the farmer leaders also developed with the passage of time.

The idea was exchanged with a visiting IIMI consultant during the first quarter of 1997, concluding that a visit to a country with a similar social background and hydrological set-up would serve the purpose well. All three modes of irrigation management i.e. agency, joint and farmer managed at the secondary level of the system exist in Nepal. Some of the farmer-managed systems were constructed by the farmers themselves without much support from irrigation-related agencies. In total, there are approximately seventeen thousand farmer-managed systems ranging from tertiary channels to main and branch canals. It was therefore decided to take the participants to Nepal.

2.2 The Organization

Dr. Prachanda Pradhan, a former IIMI employee in Nepal and Nigeria and consultant on institutional development for IIMI-Pakistan, suggested Consolidated Management Services (CMS), a Nepal-based research and consultancy concern, suitable for conducting a visitor's program for Pakistani farmers in the process of implementing the aforesaid visit. CMS has a vast experience in organizing study tours for irrigation systems and social forestry within Nepal. Intensive communication between IIMI and CMS led to a final program, which is presented as Annex A.

The itinerary facilitated visiting live irrigation systems in Nepal, *viz.*,

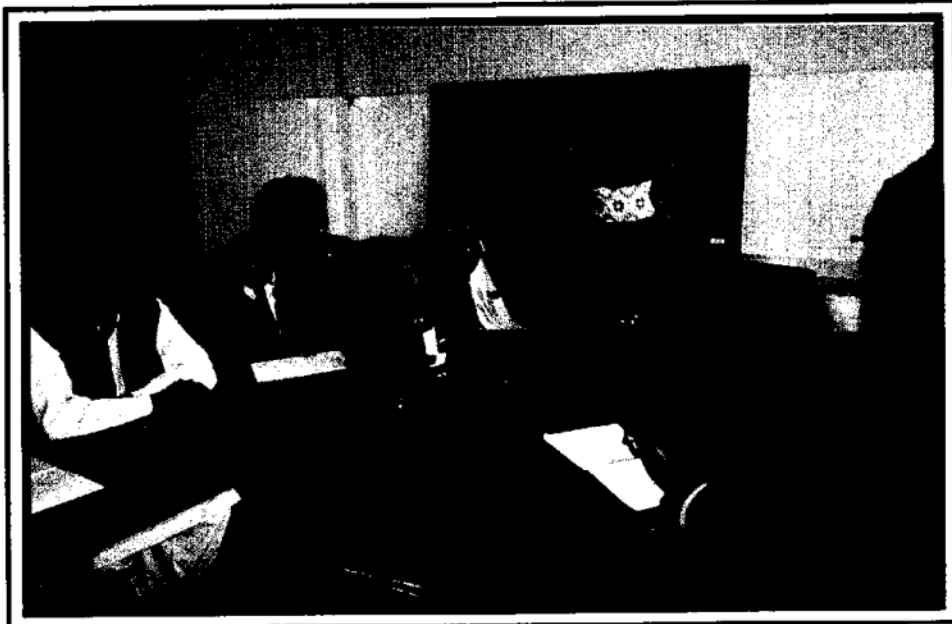
1. Canal system of Pithuwa Irrigation Project;
2. Bhariahwa Lumbini Groundwater Project;
3. Sorah-Chhatis Mauja Canal System;
4. Gandak West Canal Irrigation System; and
5. Begnas Irrigation Project.

Important aspects in selecting these sites were that it included at least one each of farmer-, agency- and jointly-managed systems, and participants had the opportunity to interact as well as physically see the systems. Visits to each site started with an introductory session, a brief description of the system's hardware and software, and a question-answer forum for clarifications. The organizations being visited were then briefed by the Pakistani participants about their own irrigation systems, including details of the process of formation of their organizations. As a gesture of goodwill, the Pakistanis also presented gifts to the organizations being visited. Visits were concluded with "walk-throughs" along the systems, wherever possible.

One of the most important aspects of the program organization was the leadership and guidance provided by Mr. Rajan Subedi, the Managing Director of CMS. He has rich experience in irrigation policy, irrigation systems and community participation in irrigation management, and is also well-versed in Hindi. He made himself available for the entire visit. His experience, leadership qualities and effective communication were major factors leading to the success of the tour, and earned him high praises from all of the participants.

3. COURTESY CALL ON THE DIRECTOR-GENERAL, IRRIGATION

At the outset of the field program on December 05, 1997, participants called on Mr. Mahindra Aryal, Director-General of Irrigation, Nepal, who warmly welcomed the Pakistanis to his country and its irrigation systems. Encouraging Pakistani farmers to



**Photograph 1. Expressing his high expectations to participants.
the D.G. Irrigation welcomes the group.**

benefit from the opportunity to learn how the Nepali farmers were managing their systems, he expressed that effective participation has enabled secondary/ tertiary level management for several centuries. He is of the opinion that governments should acknowledge farmers' experience and knowledge base, useful in reducing both costs and clashes. He requested participants to acquire maximum exposure from field visits and share it with him upon their return.

The group left his office for Chitwan by road, a town situated 140 km to the south of Kathmandu.

4. VISITS TO IRRIGATION SYSTEMS

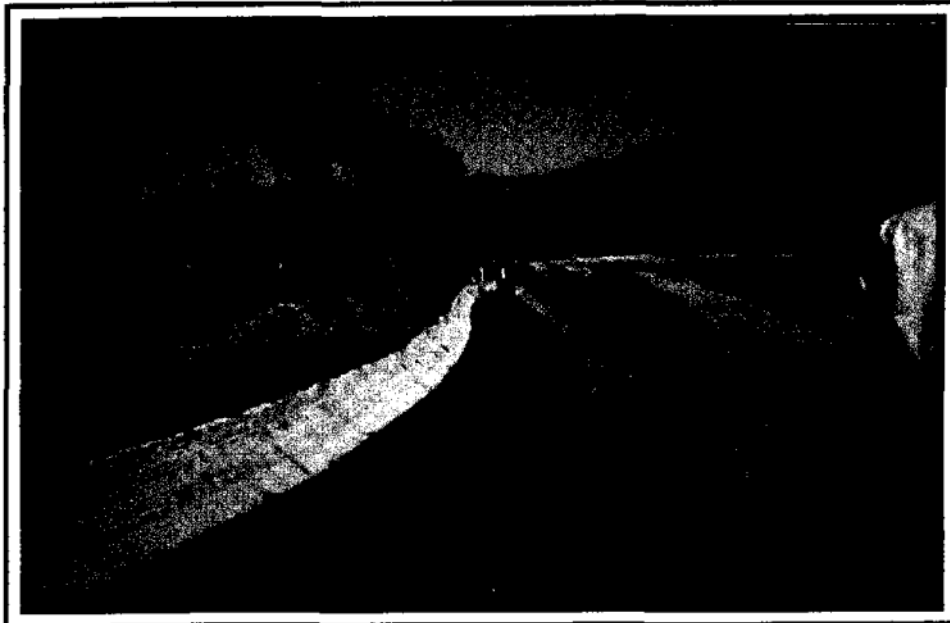
4.1 Pithuwa Irrigation Project

Pithuwa Irrigation System, to the east of Bharatpur / Chitwan Town and located in the Pithuwa Village Development Committee (VDC) area of the Chitwan District, was visited on December 06, 1997.

Here the soil is alluvial sandy loam, with the water table depth registering at around 70 feet below the ground surface. The canal originates from the Kaier River, 18 kms east of Bharatpur and 2 kms north of Bharatpur-Hetauda Highway. Construction work was initiated by His Majesty's Government (HMG) in 1970 under the Minor Irrigation Project and completed in 1973. Farmers are responsible for maintenance, who undertake labor sharing to meet this end.

This canal, 3 meters wide and 7.5 kilometers long, originally catered for a design command area of 600 ha, which has now increased to 1300 ha. Water discharge at full supply is around 1,000 liters per second, and the head regulator gate regulates the level of incoming water. One of the banks serves as the service road / inspection path. There are 19 falls, each of which is 1.5 m wide.

Seventeen tertiary branch canals lead to farm ditches and farmers' fields, each 2 km long with an average command area of 30 ha. Three of these are exceptions in that one is small with a command area of 10 ha, and two large branches irrigate 100 ha each. Two types of branch canal structures are evident: 300 mm diameter Hume pipes, and weirs with wooden gates.



Photograph 2. Fanner-maintained water channel of the Pithuwa Irrigation System.



Photograph 3. Pakistani Farmers are impressed by this drop structure of the Pithuwa Irrigation System.

Average holding sizes range from **1.2** to 1.8 ha, with the richest farmer owning 60 ha. Sharecroppers, owner-cum-sharecroppers or landless tenants operate the rest of the land.

Irrigated agriculture in the Pithuwa Irrigation System started during the 1960s when people from 7/8 districts settled and started clearing the woodland to cultivate maize and mustard crops. These people formed part of Buddhist, Hindu and Muslim communities. Rain was the only source of water at the time.

Farmers were not consulted during the construction phase initiated under the Minor Irrigation Project in the 1970s, resulting in a badly constructed canal with no diversion except a weir. Water supply did not match farmer demands. Up until **1993**, the Irrigation Department undertook maintenance of the system under contract at a total budget of Nepali Rupees 100,000, usually inadequate and with permanent cause for concern among beneficiary farmers.

The problem came under discussion in the Panchayat, a social forum for the rural population in South Asia. They also explored ways and means to mitigate problems related to irrigation supplies. After a series of discussions, farmers applied the "Community Development Program" concept, undertaken in Nepal during the 1950s when a number of committees were formed to participate in rural development. One of that program's Association Organizers (AO) resident in the area motivated the community to form a Water Users Association (**WUA**) to operate and maintain the canal. Canal maintenance conducted by WUA during the very **first** year (1984) amounted to less than one-third of the cost expended by the project authorities. After this experience, the main canal, as well as the branch canals, are cleaned once a year just before the paddy season starts - by labor contribution.

The WUA has 1,700 members with an established office which they constructed themselves. The organization has two tiers:

- I. each branch has its own committee, with its president as member of the main canal committee; and
2. the chairman and other office bearers of the main committee are elected by the General Assembly, which meets in June at the start of the paddy season.

The General Assembly performs the following functions:

- a) approval of expenditures;
- b) selection of new secretary;
- c) decisions on unsettled conflicts / disputes; and
- d) review of implementation of previous meeting's decisions.

The main canal committee has the following responsibilities:

- a) supervision and maintenance of the main canal;
- b) utilization of a Rs 18,000 allocation for bulldozer fuel to enable constructing the river **bund** (dike) to divert water;
- c) communicating the main committee's decisions to the branch canals and determining water allocations for each branch;
- d) contracting maintenance work and establishing links with HMG, Department of Irrigation (DoI) **or** other irrigation systems upstream of the intake point;
- e) ensuring that users excavate the main canal;
- f) bookkeeping, i.e. income and expenditure logs;
- g) conflict resolution; and
- h) coordination with line agencies.

Each user on the branch is a member of the fanner's assembly which elects the branch canal committee comprising 5-6 executive members, including a chairman and a secretary. The secretary performs his tasks voluntarily and is responsible for record-keeping, implementation **of** committee decisions, supervision **of** water rotation, preventing damage to structures and conflicts due to water theft.

Maintenance work is prioritized according to the availability of finances, as well as its nature and expected impact. Annual maintenance involves excavation of the main and branch canals, and also strengthening the **bund** downstream from the head regulator to raise water levels. The high velocity of river water during the monsoon season usually washes away the **bund**. The Pithuwa WUA gets water during the night in the short-supply season (February to May), as irrigation systems downstream objected to water blocking. The two **WUAs** reached this agreement a few years ago.

After consulting with various branch committees, the main committee liaises with the irrigation department to provide the required amount of water, which is influenced by the size of irrigable land and the type of crops grown. The water allocation for the paddy crop, for example, is 100 minutes per ha. The size of outlet structures is fixed according to the serviceable area of the branch canal, varying between **12** and 160 ha of land. When a user does not avail water during his turn, the cycle continues **on** to tail end users, but he remains entitled to his water allocation at the completion of the cycle.

The government is no longer paid a water tax since the WUA started managing the canal, but in order to meet its obligations, the main committee fixes a water tax based on the size of the user's land. Two types of water tax are charged: one fixed at Rs 50 per user per annum, and the other is variable, levied on annual expenditures per ha of land.

A fine of Rs **25** is imposed when a user breaks the rotation schedule, and doubled for repeating the mistake, as well as canceling his turn. The third offense results in a disconnection.

Disputes among users are resolved at the local level in meetings called for this purpose. The frequency of disputes has declined with the passage of time, and those related to water have almost disappeared.

As a result of the WUA's interaction with politicians and the bureaucracy, it recently secured a government grant worth Rs 30 million to line the canal, strengthen the banks and head regulator, and to construct a permanent breaker in the river. The association employs two low paid staff, one technical person responsible for inspection and patrolling, and the other as gate operator.

Cropping intensities have increased from 209 % to over 300 % as a result of the management transfer. WUA members express that the fixed supply compels users to make more efficient use of water in their fields. Their annual net income from crops is around 25 to 30 thousand rupees (or US\$ 667) per ha.

At the end of this visit, the group traveled to Bhairahwa, 140 km away from Chitwan, for an overnight stay.

4.2 Bhairahwa-Lumbini Groundwater Project (BLGWP)

The Manpagri Village Development Council of the Rupendehi District was the next stop on the itinerary - to visit a tubewell managed by users in Madanganj village. Financial support from the World Bank and HMG enabled this deep groundwater project undertaken by Tahal Consulting Engineers of Israel in 3 stages. The first stage was initiated in 1978 when 64 tubewells were installed, 58 of which have already been handed over to **users**. Covering a command area of 13,200 ha, the project encompasses a total of 181 deep tubewells to be installed into 1998. Each tubewell covers around 120 ha.

This is an integrated project which includes deep well drilling, pump installation, pumping shed construction, open canal and PVC pipeline water distribution systems, access service road construction, and electricity to provide power for tubewells. The estimated cost is around Rs 12 million (or US\$ 2.6 million) per tubewell.

The project design incorporates several training modules pertaining to tubewell operation and agriculture extension through on-site lectures and field demonstration plots for staff and farmers. Farmers are organized into a WUA during the construction phase, when the AO facilitates formation, registration and training as all of the schemes would ultimately be operated and maintained by the users. Stage 1 project area's cropping intensity has increased from 118% to 209 %.

The AOs identify potential project areas, then motivate and assist communities with various formalities. Communities select appropriate sites before command maps are prepared. After tendering applications to relevant authorities, the WUA provides labor to install the tubewell.

A distinct project feature is the concept of Women in Development (WID) for advocacy and development, but most of all providing women with a platform for their contribution to irrigated agriculture. Women Groups (WGs) are organized before various income generating skills are imparted. Skills training range from literacy classes to health and hygiene. Although communities have not as yet internalized women participation, they recognize and acknowledge WGs roles in inducing discipline among the male members of their society.

As the groundwater is 300 - 400 feet deep, heavy pumps, unavailable in the private sector, are required. This project resembles those of LBOD and SCARP tubewell schemes in Sindh and Punjab provinces (Pakistan), respectively, but the installation cost is much higher. In addition, operation and maintenance is also expensive. The average user pays Rs 300 per ha annually for minor maintenance, apart from electricity charges.

Nevertheless, the cost of water for a community-managed tubewell is about 25% lower than that of government-managed tubewells. Water allocation and distribution are demand-based on principle of first come, first served. Users express that their crop yields, cropping intensities and annual incomes per unit have increased.

The WUAs expect that the government will take care of major breakdowns. WUA sustainability depends on the continuous technical and financial support from the government.

The associations have framed by-laws which members can amend when monthly meetings are held, attended by both land owners and tenants. Initially, some of the organizations were politicized, but being small groups, they soon realized their mistakes and de-politicized themselves. Many of the tubewell organizations owe their capacity for functioning smoothly to concentrated membership in relatively small areas, experience of collective action (like milk selling, for instance), relatively less skewed distribution of land, and extreme scarcity of irrigation water.

4.3 Sorah-Chhatis Mauja Irrigation System

This irrigation system is easily accessible from the town of Bhairahwa, thus the participants departed from here on December 08, 1997 also, to where the site is situated close to the Indian border.

The name of the system originates from the number of villages it serves, i.e. *Soruh* = 16, *Chhatis* = 36, *Mauja* = village. The system design serves 52 villages, irrigating 16 on one branch canal and 36 on another. Sixteen thousand hectares of land had been allotted to farmers for cultivation, of which around 12,000ha is irrigated by the system. Between 60 and 300 ha of land is irrigated in each of the villages. The Chhatis Mauja branch canal has 182 tertiary units.



Photograph 4. A WUA offic-bearer initiating the visitors about his organization - one of the briefing sessions held at each of the sites visited.



Photograph 5. Group members eagerly inspect a Turnout at Sorah-Chhatis Mauja Irrigation System.

Social organization resulting from farmers' initiatives revolving around the issue of water had been evident since irrigated agriculture was introduced, but only formalized approximately 15 years ago. Organizational structures are based on social boundaries. A block of 15 ha of land forms one constituency (*kulhara*), and is entitled four votes.

The Chhatis Mauja branch canal has **728** votes. Each *kulhara* selects its own nominees (*mukhtiars*) and other committee members. The various *kulhara* are grouped into nine zones, a nominee from each forming the zonal committee (*chifar*). Thus there are **62 mukhtiars** who elect 9 *chitar niukhtiars*, one from each zone, who in turn form the membership of the branch committee.

The President, Vice President and Secretary are elected by the **728** voters. The **12** members of the branch committee appoint a treasurer, 2 supervisors (*meith mukhtiars*) to oversee the organization's technical affairs, and two watchmen (*sepahis*). Thus, the branch committee comprises **17** members, **6** of which are elected by the branch committee to the main canal committee (*mool samethe*). Following a similar procedure, the Sorah Mauja branch also elects **5** members of the *mool samethe*.

The main committee is elected every two years, which meets regularly each month, but emergency meetings are also called when necessary. The President informs the various *kulharas* about forthcoming meetings in writing, the *sepahi* delivers these letters, and each *kulharu* meets to decide who would represent them in the meeting.

The *mool samefhe* estimates expenditures and resources, the manpower needed to excavate the main and branch canals, imposes and collects fines, mobilizes resources, recovers cost and interacts with government agencies, etc.

Annual expenditures amount to between 0.15 and 0.20 million rupees, the major chunk going to salaried staff, repairs, and fuel for the borrowed bulldozer used to construct a diversion *bund* in the river.

Major sources of funds come from:

- a) people who prefer to pay *in lieu* of physical exertion;
- b) fines for water theft and other offenses (the fine for water theft gradually increases with the number of offenses by the same farmer);
- c) occasional grants from the District Irrigation Project;
- d) entrance fees from visiting professionals and organizations; and
- e) additional surcharges proportionate to area when more money is needed.

The branch committees delineate boundaries for each *kulhara*, announcing the dates and times for channel clearance. Each *kulhara* completes work according to its own methods, while branch committees inspect the quality of work done. *Meith mukhtiars* patrol the channel daily to inspect work done and keep irrigation offenses in check. *Sepahis* also

inform *meith mukhtiar*s when something goes wrong. *Sepahis* deliver written letters from committees to other organizations or individual farmers.

Water allocation is based on requirement. The main committee allocates and distributes water to branches; branches allocate and distribute to *kulharas*. Distribution is proportionate to the number of people who contribute to channel clearance activity. When fines for abstention from channel clearance activity are not paid, irrigation water is withheld. The indigenous water structures used at the head of each channel allow proportionate water to the channels.

When water becomes inadequate during peak demand seasons, it is provided to various channels in a rotational order. The branches have fast slopes at the tail ends, thus temporal delays are low. Users have never had a reason to complain about equity.

Organizational by-laws evolved with time, were approved by the committee, then registered at the district irrigation office. Disputes are settled at the local **level**. Of only three disputes during the last year, two were settled locally and the other landed at the district irrigation office, which referred it back to the organization.

4.4 Gandak West Canal System

The group stopped off at this system at around noon on December 09 *en route* from Bhairahwa to Pokhara. The Gandak West Canal System is located along the Indian border in the Nawalparasi District of Nepal. Constructed with a grant from India, the major beneficiary through the Nepal-Gandak Irrigation Development Project from Narayni River.

The total design discharge of the project is 1,800 cusecs, discharging 300 cusecs in the command area of 8,700 ha. The remaining quota of water is for use in India. The length of the main canal, three branch canals and 7 minors is around **62** kms, and the length of drainage channels is around 200 kms. The National Irrigation Association (**NIA**) of the Philippines was responsible for institutional development. This system is physically very similar to canal systems in Pakistan.

The project, initiated under a bilateral agreement between the two governments to construct a barrage, concluded during the 1940s. The canal runs towards the Indian border. The NIA attempted to encourage command area development, but met with limited success. Under government management, the system deteriorated due to livestock entry and poor maintenance. Prevalence of social diseases like corruption, political interference and anarchy among farmers were common.

The Government of Nepal and USAID ratified an agreement for joint management between the Department of Irrigation and the farmers. User groups were organized following a bottom-up approach at the turnout, minor, branch and main canal **levels**. Asian Development Bank (ADB) and HMG presented an action plan, which was reviewed by a sub-project management committee consisting of agency and farmer

representatives. The final action plan includes O&M of the canal and constructing a farm-to-market road. Farmers have contributed 26% of the road construction costs in terms of labor share and provision of land. Over the last three years, one person from each minor has been represented in the Project Management Committee.

A **full** year was spent for creating awareness through negotiations between farmers and government social organizers. **Efforts** have paid **off**: farmers have become organized and an adhoc committee had been appointed to provide the framework for by-laws and conduct election processes. Based on shares, a total of **171** user groups at the ditch level (*uppa tolis*) have been organized. Each share or *khata* is equivalent to **0.1875** ha of land and carries a face value of **1** rupee. Shareholders elect office bearers for the *uppa tolis* and one member for higher level leadership (*toli*). The *tolis* in each minor / branch feed the secondary levels that in **turn** feed the general assembly of the WUA in proportion to their command area.

The General Assembly has **35** members, of which the Chairman and Vice Chairman, Secretary and Treasurer are elected. Budgeting became inefficient as general members were only required at election time. Besides, implementing decisions also presented difficulties. During the first year office bearers were chosen on a political basis, which created many functional problems. Members now make a point of electing officer bearers known for being hard workers.

The organization revised its constitution, which members approved and then registered it with the Department of Irrigation. This constitution limited the powers of major office bearers: a management board comprising the general assembly, **4** female members elected from the **4** equal sections of the canal (**8** km section), and technical members **hired** from outside. Apart from the **4** female office bearers, there are **15** elected women in the main body of the organization. Many women work at the *toli* level. Office bearers are required to work an average of **15** days each month.

The Water Delivery Work Force comprises five persons, one of which is a coordinator. This team is responsible for handling technical work, discharge regulation, patrolling, supervision, etc. Due to water shortages during the summer (*kharif*) cropping season, various branches and minors are operated under a rotational schedule. The main canal is cleaned once in a year. A silt ejector constructed a few years ago has reduced the amount **of** siltation in the canal.

Shares have been distributed among water users at **Rs** 1 each. Those owning **shares** and paying irrigation service fees (**ISF**) **are** all members at the grassroots level entitled to receive water, **as** well as voting for office bearers in their respective *uppa tolis*. Prior to the joint management agreement, the **ISF** rate was fixed at Rs 60/ ha per crop season, but a crop-based charging structure is now in force. ISF payment levels is now under discussion and will include considerations for actual labor contribution when the canal is excavated.

The main committee informs the 171 nominees of the *uppa tolis* about their respective **ISF** shares. The government's trust in the organization is so firm that it does not involve itself in surveying crops at all. The collector reaps one-fifth of the total collection at the tertiary level, and as this proportion is quite high, dues roll in rapidly.

Though some items in the action plan are yet to be completed, the government recently turned canal responsibilities over to the WUA. Two government employees will systematically be withdrawn every successive year, and the WUA has to mobilize all necessary resources within three years to become self-sustaining. The government will monitor organizational activities until the year 2000.

Lessons learned from this exercise are:

- People do not feel responsible unless they are adequately aware of their rights and responsibilities, therefore adequate time should be spent to create awareness and a sense of ownership among the members;
- Maximum efforts should be made to create non-political organizations as politicization threatens sustainability;
- Members and office bearers should be "farmers only", **as** people with alternate occupations expend less interest, time and effort for common resource management;
- A relationship of trust between agency and organization is a major ingredient;
- Governments' enabling role is one of the key factors for success;
- Adequate time should be spent to collect required physical information about the system, as it will be necessary for many activities; and
- Women's involvement helps to improve discipline within the organization, promotes interaction, problem sharing, and awareness among all the users, which also helps to solve other water-related problems such **as** sewerage and drainage.



Photograph 6. Pakistani farmers pay rapt attention to this presentation about the Gandak West Canal System.



Photograph 7. Dhoro Naro Minor WUF President presents an indigenous Sindhi shawl or Ajrak to his Nepali counterpart.



Photograph 8. The breathtaking scenic Begnas Lake, located close to Pokhara - The Valley of Hanging Mountains.

The WUA experiences the following benefits:

- a) Command area and membership has increased;
- b) Low cost and effective O&M;
- c) Reliable and timely water supply; and
- d) Timely maintenance prevents physical deterioration of the system.

4.5 Begnas Irrigation System

The Begnas Irrigation System is the first hill irrigation system visited in Nepal, comprising a lake connected to a large canal, which the group visited on the morning of December 11, **1997**. Discussions with the project incharge and the President of the WUA took place before lunch.

Constructed at a cost of Rs **51** million from **1984** to **1989**, **83%** was provided by the ADB and **17%** from **HMG**. The lake is **540** m long, **32 m** wide at the base and initially covered an area of about **266** ha, which has since been extended to **300** ha. The average depth is about 6.8 m. and the storage capacity is about **2,450** ha-meters. The total catchment area is about **19** sq. kms.

The main canal is **3.55 kms** long with a command area of **580** ha and a capacity of about 8 cumecs water discharge. This canal caters to three branches equal to about **9.8 kms** with a design discharge of **3.55** cumecs, as well as to an escape channel off-take from the main canal. After the escape, the water reduces to **4** cumecs. A unit water requirement for the rice crop is **5** liters/s/ha. Cropping intensities have increased from **129 %** prior, to **200 %** after project implementation. Average yields for major crops register at around **1.3**, **1**, and **1.1** tones / ha for paddy, maize and wheat, respectively.

The basic objective of the project was to increase rice production in the area. Since the soil from the area is formed from the debris of the mountains, the structure is very coarse and highly porous in nature, with low organic matter. This demands high water use for crop production as the soil drains quickly. Water availability to the older command area has declined due to the canal's change of route.

Fanners had been managing the canal system informally before the project was initiated. Though a WUA for the canal system exists, the organization is very weak because roles and responsibilities have not been clearly defined.

The Village Development Council (VDC) appropriated the investment for the project in association with local politicians. Farmers were not consulted about planning and construction, with the result that several complaints about the design and route of the system were lodged. Project staff later informed the local Panchayat through the VDC that the system needed farmer participation. At the request of the VDC Chairman, fanners selected their leaders for each branch, who form the membership of the main committee.

The organization meets once each quarter. The government provides funds for maintenance; the organization prioritizes maintenance activities; and the organization supervises maintenance activities. No clear definition of roles within the organization exists, and maintenance work other than excavation is completed by contractors. Beneficiaries undertake the excavation of the channel through labor shares, and project staff checks the quality of work done and ensures that payments to contractors are honored. Beneficiaries are not required to pay a water tax to the government.

Achievements include:

- collecting **Rs** 53,000 to maintain a bank account under the line of credit scheme;
- construction of the service road along the canal by farmers; and
- equitable distribution of water along branch canals.

Allocation rules and membership criterion, however, remain undefined. Water flows quite freely into the primary, secondary and tertiary canals, making it easy for anyone to take water at any time. A formal office is yet to be established.

Conflict resolution is entrusted to the agency. The WUA reports the conflicts to the agency, which, in turn, resolves these according to its own laid down procedures.

The irrigation system appears to be an AMIS with limited farmer participation. The involvement of a weakly organized WUA is limited to the satisfaction of the donor requirements and has not been internalized in the project philosophy. The main reasons for limited success include:

- relative abundance of water resources (command area is not yet fully developed);
- unclear definition of roles and responsibilities for agency and WUA;
- unclear water and membership rights; and
- lack of a systematic approach.

5. GROUP INTERACTION

Mr. Rajan Subedi, Managing Director of CMS and Dr. Yameen Memon, IIMI's sociologist, facilitated group discussions among the Nepalese and visiting Pakistani farmers. Since the two countries share similar roots to their mother tongues, translations were hardly ever needed, and direct dialogue among farmers improved with the passage of time.

5.1 Pithuwa Irrigation System

Pakistani farmers confidently sought clarification about topics related to water adequacy and reliability, social organization processes, construction and maintenance, water allocation, water distribution, flexibility in water rotation schedule, conveyance losses

and method for adjustments in water turn, cropping intensity, irrigation service fee, land tax, arrangements with downstream systems, trnancy and land settlement, etc.

During the one-and-a-half-hour walk-through along the system, 5 - 6 Pakistanis grouped with one Nepali committee member, enthusiastically interacting about the design, slope, structure, length, maintenance and **all** other topics related to O&M and general agriculture, instilling in them a “feeling” for the system.

5.2 Bhairahwa-Lumbini Groundwater Project

Farmers were taken to this tubewell scheme immediately after being introduced to the WUA and project staff. They were impressed by the similarity to those of the LBOD in Sindh and SCARPs in Punjab. Their questions related to installation cost, farmer contributions, social organization process and problems faced, responsibility of major and minor O&M of the tubewells, groundwater quality, water taxation, income from crops and impact of the project upon farmers income.

Water allocation and distribution, capacity-building, by-laws, arrangements for water tax among tenants and landowners, average crop yields and intensities, memberships, penalties for defaulters, women groups and their roles, dispute resolution, social impact of the Organization, family and farm sizes, cost of water compared to government-managed tubewells, and free riding and theft, etc. were other interesting topics of open discussion for the participants.

Participants zealously drank water from the many free-flow pipes continuously discharging water without any pumpage from a high-pressure water layer somewhere in the ground. They even explored the possibility of acquiring free water by installing similar pipes, but with larger diameters to meet community requirements.

5.3 Sorah-Chhatis Mauja

This was one of the most interesting sites for participants **as** the organization was a completely “home-grown” model. People had organized themselves out of their own initiative. Water allocation and distribution among various tiers, organizational structures, by-laws, penalties and the government’s role, were the most interesting topics.

Other questions related to equity, reliability, adequacy and a range of activities outside irrigation, such **as** cooperation from contesting candidates in O&M, groundwater availability, frequency of meetings, nature and resolution of common disputes, arrangements for emergency maintenance, upward and downward communication system, marketing and farming systems, technical assistance and capacity-building, yields and income from crops, and by-laws. This formal discussion lasted for about an hour-and-a-half, continuing informally while the walk-through was conducted afterwards.

5.4 Gandak West Canal System

Topics under discussion here ranged from membership criterion to dispute settlement; tenure of the office bearers to the role of women in the organization. Clarifications were sought about the organizational structure, action and responsibilities. Visiting farmers' questions reflected that they were thinking at a generic level by asking questions such as:

- What was the most prominent mistake during the process of joint management?
- What **are** the most important points to manage an FMIS and be successful?
- What were the problems and constraints in social organization processes?
- What has the impact on the water supply situation and water productivity been?

Although a walk-through visit to the system was impossible due to heavy rain, participants expressed their confidence about an FMIS after visiting **the** organization.

6. INITIAL EVALUATION OF THE STUDY TOUR

On December 10, 1997, when the group had completed four of five planned visits, an initial evaluation was conducted in a participatory mode. With the objective of brainstorming with respect to similarities and differences between irrigation systems in Pakistan and Nepal, it was also intended to identify the applicability **of** lessons learned when converted into the Pakistan context. The facilitators' consultation with participants about the suitability of the evaluation meeting time was welcomed with high spirits and enthusiasm.

The whole group participated in the evaluation. Dr. Yameen Memon explained the objective and *modus operandi* of the proceedings, and also facilitated discussions. Farmers displayed encouraging enthusiasm, with all, bar one, expressing their opinions about various systems, as listed below.

6.1 The Pithuwa Irrigation System

a) Physical system

- The physical system in Nepal has sufficient capacity for the required amount of water; Pakistanis have to curtail their requirements in view **of** the design constraints.
- Farmers are controlling the main canals also because they are closer to the main river, therefore are able to take water on demand. In Pakistan, our distributory systems are situated far from water sources and also are supply-based.
- The Nepali systems have more water than ours.

- Since our system was constructed without **our** involvement, we do not “own” the system.
- A great similarity exists, only the size being a physical exception. With some initial difficulties and the passage of time, we will also be able to manage similar systems.
- Their maintenance problems increase at flooding times and abundant water is relative, but usually scarce. Scarcity creates the need to become organized. Conflicts and water stress are reduced due to an organized system. Sustainability comes into question when considering whether they would be able to repair a lined canal.
- Pipe outlets are better than **APM** / OF / OFRB outlets, as these are not easily tampered with by the users.

b) Social system

- There are not too many big landlords to hinder. They have self-esteem.
- The social interactions in Nepal are devoid of unnecessary bickering. These farmers are cooperative by nature. In our culture, we create problems to draw attention to ourselves.
- People are sincere with each other as they are aware of and care about each others’ rights.
- The organization has emerged out of peoples’ initiatives and not from outside pressure. We should also learn to organize ourselves to solve common problems.
- The nature of attitude is different. In our case, it is difficult to mobilize people despite several attempts.
- The executive members other than office bearers **are** not selected merely to satisfy people, but to assist the board in technical matters. The office bearers are selected on the basis of merit, and the farmers and office bearers are more knowledgeable than ours.
- Since they do not have alternate employment, they are compelled to help themselves in a manner they are familiar with.
- We can learn from them how to strengthen our organizations.
- If we will acknowledge each other’s rights like they do, conflicts will eventually diminish.

c) Role of the government

- The Nepali government only has to maintain the system, but we have a hard time getting water into the system.
- The canal systems belong to them and the Irrigation Department is supportive even though it took them 30 - 35 years to reach this level. We constantly strive hard to get access to canals from the irrigation departments.

d) Water Users Organizations

- These are apolitical, so that union becomes strength.
- They have institutionalized the solutions and efficient budgeting assists the proper use of their resources and requirements.
- They have followed a process approach and not a blue print.

e) Conflicts

- Conflicts in our case emerge because of land, lady or wealth; fortunately, they do not argue about these.
- **An** indicator for success is lack of conflict. They have literally had no conflict for the last five years, thus their functioning can be regarded as successful.

6.2 Bhairahwa-Lumbini Groundwater Project

a) Physical system

- User participation from inception allows a sense of ownership of the physical system.
- This project is largely similar to LBOD and **SCARP** in Pakistan.
- Tubewell schemes are not replicable due **to** high construction costs and the **WUAs** are unable to bear heavy maintenance burdens.
- They have sweet groundwater; our areas are waterlogged and saline.
- The integrated approaches to issues such as technical assistance, knowledge and access roads are very good.
- The free-flowing pipe is a gift of nature to them; they should popularize its use for small-scale irrigation.
- We should erect a community tubewell at the head of each watercourse to augment water in the watercourse: mixing saline water in canal water will be less detrimental for crops and adequacy will increase. (This comment attracted a lot of support from participants.)
- Theirs is a need-based system. **As** it fulfills the demand for their water needs, they pay land tax and O&M charges.

b) Social system

- The social organization has only been recently created.
- Corruption, for electricity bills for example, is non-existent. In our case, WAPDA demands money to even correct erroneous bills.

c) Role of the government

- **A** fixed electricity charge in our case is imperative.
- Backstopping, support to **WUAs**, women groups, etc. may make this project sustainable.
- Government subsidy for heavy maintenance is essential, therefore, the sustainability is doubtful.
- Much scope for technical training in water measurements exists. We need this type of training.

d) Water Users Organizations

- Organized O&M tubewells deliver cheaper water than government-managed tubewells.
- Site selection and the community's contribution during construction encourages a sense of ownership.
- The flexibility of the *kachchi warabandi* they have made is helpful. If we attempt something similar now, we should be able to undertake it successfully as we are already organized.
- Women's participation is good.
- Project is proving to be successful as cropping intensities have increased and cropping patterns changed. The yields are also high.

6.3 Sorah-Chhatis Mauja System

a) Physical system

- Farmers use water improperly in Pakistan; otherwise, no other shortcoming is evident.

b) Social system

- Organizational structures are built around social boundaries.
- People work hard and despite their lower holdings, have a higher standard of living than their Pakistani counterparts.
- The high participation of females is encouraging.
- Corruption in our case is the major problem, drenching the national resources.
- They are managers and beneficiaries with necessary powers, thus experience a lower incidence of political interference or corruption.

c) Role of the government

- The government supports their efforts.
- The government does not collect irrigation tax; Pakistani farmers have to pay a multitude of government taxes.
- Agencies provide technical assistance.
- Nepali officials are sincere to their nation.

d) Water Users Organizations

- There is a true economic organization represented in the share system.
- Collective maintenance is performed by all; those who cannot participate, pay cash contributions.
- The organization inspects the quality of maintenance work.
- Progressive system of imposing penalties and fines induces low crime rates.
- Internal resource mobilization is positive for the organization.
- Lower tier communication system is efficient.
- Office bearers are paid for their time.
- Our organizations can learn to cooperate with opposing / conflicting parties; we should take firm initiatives on by-laws.
- Lower tiers have a wide network of organizational systems.
- They are very well focused and have divided responsibility among themselves.

6.4 Gandak West Canal System

a) Physical system

- The hierarchy is similar in both Pakistani and Nepali irrigation systems.
- Drainage should also become an integral part of our organizations.
- The system at Gandak is long, but smaller than ours. We may face more problems than they have.

b) Social system

- Pakistanis have become luxury-orientated and the Nepalis are work-orientated.
- Pakistani farmers should develop useful information-gathering initiatives and their organizations should be devoid of political interference.
- Nepali farmers are unafraid of responsibilities.
- Pakistan has the physical irrigation system although it lacks the software. **WUAs** have started inducing it, and with dedication and hard work they should be successful.
- For Pakistani farmers to remain idle now would be a crime. They should capitalize on solid principles like the Nepalese in order to be successful.

c) Role of the government

- Pakistani farmers should not blame government for their lack of success because they also contribute towards its corruption; in our case, farmers and agencies are equally responsible for corruption.
- Agencies should trust farmers in Pakistan.

d) Water Users Organizations

- Meeting attendance should be made compulsory; those who do not attend should be fined.
- a If farmers manage canals, ventures will be more successful.
- The farmers in Pakistan have politicized the irrigation system; after farmers own the system, they will become more responsible.
- Institutional Development Units, technical assistance and complete handovers are ideal.
- The West Gandak **WUAs** have planned well in the form of action steps and rotation schedules.
- Only members get water. The users in our case should also be registered so that the members are bound to obey rules.
- WUA leaders knew their system well.
- The project followed a systematic and gradual approach.
- Office bearers are more dedicated workers as they have no alternate occupations.
- Pakistani WUO leaders are confident that they will reach successful levels, although it may take some time.
- The concept of “work force” should be copied.
- WUA and agency had good relations.
- Office bearers are active and knowledgeable; they decide and follow up their decisions. Participation in regular meetings is full.
- The West Gandak people should now move to village development and cooperative marketing.

7. EXPERIENCE-SHARING MEETING

A half-day experience-sharing meeting was conducted in Kathmandu after the group had visited all the intended irrigation systems. Mr. Krishna Gautam, CMS President and Mr. Upendra Gautam, **CMS** Director, both possessing a wealth of experience in agriculture and irrigation systems in Nepal, participated in this meeting. Participants discussed the factors for success / failure of WUAs in irrigation management in Nepal and the applicability of these factors when converted to the Pakistani context.



Photograph 9, Participants keenly offer their views and experiences at the Initial Evaluation.



Photograph 10. Participants relish the opportunity to share their experiences with members of the host organization.

7.1 Difference in the Context of Irrigation Systems in Nepal and Pakistan

The roles of farmers in irrigation management differ in the following respects:

- Government support for farmer-managed irrigation systems, one of the key factors for success, is totally absent in Pakistan, where, despite several requests from established WUFs, distributories are not being turned over to farmers. Irrigation departments support pilot projects at policy levels, but field staff directly responsible for the system are reluctant to proceed further, also indulging in regulation activities that discourage farmers from cooperating with WUFs.
- The size of irrigation systems in Nepal is compatible with potential demand. System designs cater to smaller-than-required command areas, enabling additional water supplies. Pakistani systems were constructed centuries ago with a designed cropping intensity of around 80%. While cropping intensities increase and maintenance is continuously neglected, system capacities reduce and the demand for water increases.
- Water in Nepal is adequate and satisfies demand as rainfall is higher. Pakistani farmers are totally dependent on irrigation supplies due to relatively more aridity.
- Nepali society is spontaneously participatory in character; they have irrigated from springs and hill torrents for centuries. Pakistani rural society was attracted to irrigation by incentives, but had less experience of social organization.

7.2 Factors Responsible for Success of Farmer-managed Irrigation Systems in Nepal

- Strong indigenous organizations stemming from internal demand.
- Clearly visible benefits to all users and stakeholders.
- De-politicization of the organizations.
- Cooperative by nature: (*izzat*¹ considerations in Pakistani society induce opposition for no reason).
- Government support for Participatory Irrigation Management.
- All resources are utilized in Nepal; organizations do not pay anything to the government due to close proximity to the main rivers.
- Egalitarian land distribution.
- Absence of alternative sources of employment induces cooperation as a necessity.
- Strong by-laws and supportive judicial system.
- Willingness to mitigate problems.
- Enabling bureaucracy.

¹ Social Science literature explains *izzat* to be equivalent to that of extreme pride and honor. A person could elevate/ lower his *izzat* through his own actions or that of others.

7.3 Weaknesses Identified in Farmer-managed Irrigation in Nepal

- Despite excellent irrigation management, an abundance of water-focused organizations may be conducive to failure because of tax and tariff structures, pricing and trade policies, absence of good markets, etc. which are unfavorable to the agricultural environment.
- Absence of regular financing sources (e.g. when emergencies occur) may challenge sustainability; a single crop failure will disable users from paying for water.
- Irrigation systems management is too indigenous: no scope **or** planning for technology application **or** adoption exists.
- Scope for collective marketing exists, but remains unexploited.
- Small / uneconomic holdings induce inefficient agriculture.
- Lack of initiative for private sector involvement.
- Poor dissemination and adoption of modern technology.
- Low female participation in organizations despite their sizable contribution.
- The potential of irrigation systems is not fully exploited as command areas have **not** been fully developed.
- With special reference to Gandak West Canal System, four issues need to be addressed, i.e.
 - a) Office bearers should be paid as they invest half their time in WUA activities;
 - b) More sophisticated training is needed;
 - c) Trained staff should be hired from the market; and
 - d) Transport to patrol and monitor activities should be provided.

7.4 How Lessons Learned Could be Applied in the Pakistani Context

Participants raised the following points pertaining to the adoption of their experiences back home:

- a) Policy
 1. The government should recognize the contribution of the farmers and acknowledge that their participation is useful.
 2. All farmers are not corrupt and most have an innate desire to improve irrigation management as it affects their livelihood.
 3. Alternative strategies should be identified and implemented in order to convince the government **to** hand distributories over **to** the WUFs.
 4. Necessary powers and legal cover to successfully undertake O&M should be transferred to the WUFs.
 5. More farmers, represented as the real leaders, should be involved in PIDAs.
 6. Government should undertake land reforms **to** de-politicize agriculture, as big landowners, who are not agriculturists, are the major threat to irrigated agriculture in Pakistan.

b) Water Users Federations

1. WUFs should be strengthened to encompass strong links and coordination with grassroots communities.
2. WUFs need to create awareness, instill a sense of ownership and responsibility, and develop mutual trust among members so that systems are protected and properly cared for.
3. WUFs should abstain from discriminating on the bases of religion, caste, creed, or size of holding and tenancy.
4. Organizations should be introvert so that every fanner gets his share and pays accordingly.
5. WUFs should implement decisions and apply sanctions strictly.
6. Organizations should develop practical and realistic by-laws and frame appropriate systems, including systematic water charge collection.
7. Office bearers should maximize and strengthen their knowledge base.
8. They need to be more responsible to the organizations and their community.
9. They should keep close contact with the Irrigation Department.

c) Water Users

1. Farmers should learn to respect each others rights and make sacrifices for the disadvantaged.
2. They need to evolve methods for eliminating water loss as it is like gold for agriculture.
3. They need to select appropriate leadership which is also apolitical.
4. They should stand united against outside catastrophic elements.

d) Facilitators (IIMI)

1. IIMI should enhance further awareness among masses.
2. High frequency contact with grassroots communities is vitally necessary.
3. Extending assistance to WUOs to adopt formal and systematic approaches will ensure sustainable development.

8. POST VISIT EVALUATION

Participants' feelings, views and opinions came under scrutiny in a sample questionnaire provided to each when the visit concluded. This enabled an evaluation as to assess usefulness of various parts of their itinerary. The focus of the evaluation concentrated on:

- utility of the program organization;
- discussions held with the staff of the Department of Irrigation;
- exposure to various WUAs; and
- field visits.

The result of this evaluation is presented in Table 8.1.

Table 8.1. Post-visit Evaluation of the Program by the Participants (n=23).

Program Item	Highly Useful (%)	Useful (%)	Less Useful (%)	Irrelevant (%)	No Response (%)
Initial Briefing by CMS	74	26		-	-
Background Material	65	31	4	-	-
Provision of fore-hand Information	74	26		-	-
Discussions with Relevant Irrigation Officials					
DG Irrigation	22	30	44	4	-
Project Manager, Groundwater	48	30	18		4
Project In-Charge, Begnas	13	65	22	-	
Project Manager, Gandak West Canal	65	26	4	-	15
Field Visits					
Pithuwa Irrigation System	44	52	4	-	-
Groundwater Project	44	52	4	-	-
Begnas Irrigation System	-	22	56	22	-
Chhatis Mauja System	74	26	-	-	-
Gandak West Canal System	87	4			5
Field Visits					
Pithuwa	74	26		-	-
Groundwater	22	70	8		-
Begnas	4	31	61	4	-
Chhatis Mauja	74	22	4		
Gandak West Canal	57	26	4	-	

8.1 Utility of the Background Information Provided to Participants

Of the participants who responded:

1. Three of four (**74%**) were of the opinion that the introductory briefing given by CMS and prior information about each visit were highly useful. The rest regarded it useful.
2. Similarly, two of every three (**65%**) regarded background material such as maps, documentation, handouts, etc. to be highly useful. Another **31%** regarded it to be useful. Only **4%** regarded the background information to be less useful.

8.2 Discussions with Relevant Agency Staff

There were mixed responses regarding the discussion with the Director General of Irrigation.

1. While **4%** declared it to be irrelevant to the program, **44%** regarded it to be less useful. Another 30% considered it useful. One of every three, nevertheless, regarded it highly useful. (A reason for this mixed response could be that the real value of the discussion would have been understood by participants in a meeting with him after the visit, which, due to his absence at the experience-sharing meeting, did not materialize.)
2. The majority (**65%**) declared the discussion with the Project Manager of the West Gandak Irrigation System as highly useful. To another **26%**, it was useful. About one of every ten either did not respond, or regarded it less useful.
3. Roughly half (**48%**) viewed discussions with the local BLGWP consultant as highly useful. Another 30% regarded it to be useful. Only **18%** and **4%**, respectively, regarded the discussion to be less useful or did not respond.
4. Discussions with the Project Incharge of the Begnas Lake System were regarded to be highly useful and useful by **13** and **65%**, respectively. Twenty two percent declared the discussion as less useful.

8.3 Meetings with Water Users Organizations

The exposure to the WUOs of each of the systems visited, were expressed through the following results:

1. The relevance of discussions with the WUOs of Pithuwa Irrigation System and Groundwater Project were regarded nearly equally, where 44 and 52%, respectively, declared the discussions highly useful and useful. Only **4%** regarded these to be less useful.

2. Almost three-fourths and one-fourth, respectively, viewed discussions with the Sorah-Chhatis Mauja Irrigation System WUA to be highly useful and useful. (The reason for this high appreciation is that the farmers of this system have organized themselves out of their own initiative. No government catalyst had been deployed.)
3. The WUA of the Gandak West Canal Irrigation System won high praises **as** an overwhelming majority (87%) regarded the discussion to be highly useful. The rest declared these to be useful. This appreciation stems from several reasons:
 - a) **WUA** office bearers were highly knowledgeable about their system.
 - b) Until recently this system had been jointly managed, but the government has now decided to turn the system over to the Association owing to their success. The WUA had prepared their own action plan to undertake the O&M of the system. Participants were already familiar with Joint Management Action Plans from their own experience at their respective distributories.
 - c) The physical design of the system is very similar to that of Pakistani distributories which participants intend to manage in the future. They could easily equate the system to be either larger or at least equal in size to the four distributories they were familiar with. Its management would have posed many challenges similar to those being faced by those at their respective distributories. Thus, inherently, they liked the system and could practically see the implementation of joint management between the Irrigation Department and Farmers' Organization.
4. Discussions with the Begnas Irrigation System WUA were viewed to be useful only by 22%. The rest evaluated it **as less** useful **or** irrelevant, **as** the Chairman of the **WUA** could not respond to several queries very well.

8.4 Field Programs

Participants opinions about the effectiveness of field programs were **as** follows:

1. The majority of the participants, around three of four for Pithuwa and Chhatis Mauja and roughly six of ten for West Gandak irrigation systems regarded the visits to be highly useful for learning. Another 26%, 22% and 26%, respectively, declared these visits useful.
2. The majority (61%) regarded the visit to Begnas less useful for learning. Only **4%** regarded the visit to be highly useful, while another **31%** declared it useful. Another **4%** of the respondents declared the visit to Begnas irrelevant, probably because Begnas is a lake system, with little similarity to canal systems in the Punjab and Sindh.

3. In the case of West Gandak, 13% did not evaluate the field visit. In fact, they perceived the “field visit” to be a visit to the physical system, which could not take place due to heavy rain on the day.

8.5 Program Organization and Coordination (Table 8.2)

Participants were also requested to evaluate the program organization, facilities provided, and coordination. All considered the coordination by Mr. Rajan Subedi **as** excellent.

1. The majority regarded transport facilities, accommodation and time observance (83%, 78% and 52%, respectively) to be excellent.
2. Almost half (48%) regarded food and communication among themselves **as** excellent. Nobody regarded any of the above services **to** be dissatisfactory.
3. At the worst, only **5%** regarded accommodation **as** okay, and 9% regarded food, time observance by participants, and communication among themselves to be okay.

Table 8.2. Evaluation of the program organization and related conveniences (n=23).

Services	Excellent (%)	Good (%)	O.K. (%)	Bad (Yo)	No Response. (Yo)
Coordination by Rajan Subedi	100				
Transportation	83	17			
Accommodation	78	17	5		
Food	48	39	9		4
Communication among Participants	48	43	9		

8.6 Participants’ Views about Dissemination and Application of Lessons Learned

Participants expressed that they would make strenuous efforts to apply and disseminate the lessons learned to other members of their organizations. They intend to do this by taking the following steps:

1. Arranging special meetings within different tiers of the organization for communication and dissemination;
2. Creating a sense of ownership and responsibility among the member farmers by creating awareness about rights and obligations, **as well as** ensuring regular meetings and placing an onus on full member participation;

3. Striving to eliminate conuption among themselves; if they stopped paying, who would force them to pay bribes?
4. Ensuring equal representation to all users and de-politicizingthe organizations;
5. Ensuring effective and more regular interaction between WUFs and water users;
6. Caring more for the small farmers by inducing equity, justice and harmony;
7. Making water distribution more transparent and equitable;
8. Respecting the rights of all;
9. Starting conflict resolution at local levels;
10. Helping participants of the four systems in Pakistan to meet those who could not participate in order to communicate the lessons learned;
11. Initiating work on a self-help basis; and
12. Starting efforts for community tubewells **O&M** by farmers in their areas.

8.7 What Participants Liked about the Program

In as far as experiences which gained participants' nod of approval is concerned, the following were included:

1. Participants liked the fact that more time was devoted to field programs and discussions with **WUAs**, and warmed to frequent consultations held with them during the course of the visit. The fact that the field program was systematically organized and necessary background information was provided before actual visits, helped to create more interest and fostered quick understanding and learning. The sense of responsibility demonstrated among themselves was of **high** appreciation.
2. The Government's enabling role in Nepali irrigation systems **was** highly appreciated, as Pakistani farmers are experiencing several institutional barriers to enable their organizations to operate and maintain their irrigation systems.
3. They especially liked the direct exchange of views between farmers of both countries, made easier by the fact that their respective languages were easily understood with little help.
4. According **to** their views, the similarity of irrigation systems helped largely in learning.
5. The well-versed leadership of Gandak West were especially appreciated **as** office bearers were very knowledgeable about their system. The collective ideas, farmer actions and the WUA's objective methodologies were also appreciated **as** these helped in creating a sense of ownership.
6. The WUA office bearers' (OB) sense of responsibility, coupled with excellent management of scarce resources, and Nepali farmers' acknowledgment of each others' rights were also appreciated.

7. Initiatives for self-organization among the Nepali farmers were especially mentioned and noticed by participants. The involvement of female users was viewed as a positive contribution to organizational strength.
8. Nepal farmers' selection of OBs on the bases of merit and apolitical leadership was praised very much.
9. Participants also warmed to the participatory evaluation and experience-sharing meetings.
10. Mr. Rajan Subedi's facilitation during the visit earned high praises from all of the participants.

8.8 Participants' Suggestions for Future Programs:

Participants suggested various ways in which to conduct visits of this nature in the future.

1. They suggested that the group size should be relatively smaller so that more intimate contact and interactions among participants could take place.
2. They recommended that group members' expectations should be recorded before the actual start of each visit, then evaluation meetings should be conducted daily.
3. They were of the opinion that the group should only comprise literate farmers *so* that they are able to absorb much of the program.
4. Involvement of farmers when planning visits of this nature were considered to be useful. They expressed that farmers should themselves contribute to travel costs (roughly **25%**) so that learning could be maximized. They expressed that the tour duration should be no less than one month and that Pakistani Irrigation Officials should also be invited along **as** most of the Irrigation Department's staff are cynical about the farmers capacity to manage irrigation systems. Another suggestion was that visits to various WUOs within the country should be arranged, as the context would be similar. One group of participants suggested that "Halal" food should be ensured before start of the visit.

9. CONCLUSIONS

The Social Organization Field Teams of the International Irrigation Management Institute, Pakistan, have been interacting with the farmers of three pilot distributories in Sindh and one in the Punjab provinces since 1995. The prime purpose of these interactions has been to create awareness among the farmers about the benefits of organizing themselves into Water Users Organizations and facilitate the organizational processes to manage distributory level irrigation systems.

During most of these interactions, some of the farmers and most of the agencies involved have been skeptical about the farmers managing irrigation systems. Some of those were even cynical about Pakistani farmers' ability to organize themselves at the distributory canal level for any collective cause. This belief was shaken when the farmers of IIMI's four pilot distributories / minors took initiatives to organize themselves into WUAs and WUFs with catalytic assistance from IIMI. The farmers have also been successfully organized at some other distributories in the Punjab and NWFP by other agencies. Thus, the WUFs have proved themselves socially acceptable and viable.

Since leadership patterns in rural areas is already established, the choice of leadership by the water users depended on the existing socio-cultural milieu in rural areas. Some of the chosen leaders themselves were thus skeptical about their ability to manage irrigation systems. Unfortunately, there exists a lack of precedence for farmers to manage secondary level irrigation systems. Nevertheless, this visit was extremely valuable in helping farmers to witness farmer-managed systems so that they could be inspired and encouraged. The visit was proposed to donors in this context, who happily agreed.

The presence of thousands of farmer-managed irrigation systems in Nepal influenced the decision to take participants there. The selection of the five sites to be visited was undertaken with care so that participants could experience at least one of each agency-managed, farmer-managed and jointly-managed systems. In this way, the participants could compare the performance of various management modes based on their own indicators. The fact that farmers of both countries could speak and understand the other's language was of great significance to direct communication, lending an empathetic quality to the visit. The similarity of the social structure of the two countries added to the value of the visit and was helpful for learning.

Although participants were of the view that Nepali irrigation systems were in general physically smaller than those in Pakistan, they expressed that the physical hierarchies were alike. Besides, two of the canal systems were quite comparable to the irrigation systems from which the visiting farmers came. The favorable policy environment and the enabling role of the irrigation bureaucracy in Nepal was greatly appreciated, and was considered essential for the success of farmer-managed irrigation systems. Participants also understood the usefulness of appropriate organizational structures and by-laws. They also acquired insights about the necessity for office bearers to be chosen on merit, as their knowledgability means greater success for the organizations as a whole.

The impact of the visit, as revealed by the final evaluation conducted by the participants, was that the farmer leaders from the pilot sites became highly motivated and enthusiastic about managing their irrigation systems themselves, with necessary technical assistance from the support agencies. They expressed hopes that the government shall turn over the distributories and minors to farmer organizations for self-management. The farmer leaders were optimistic about removing initial social barriers as the organizations start managing their systems and improve their functioning with gaining experience. The institutional barriers were perceived to be the only obstacle in the way of successful farmer-managed irrigation systems.

Annex A
Program of the Visit
Irrigation Study Tour Program For
Pakistani Farmer Leaders (4 December - 15 December 1997)

Day	Place	Time From - To	Activity
4 th Dec.	Katmandu		- Arrival and check-in - Program briefing by CMS
5 th Dec.	Katmandu	10:30 - 11:00 11:00 - 5:00	- Meeting with Director General Irrigation Dept. Officials - Travel to Chitwan
6 th Dec.	Chitwan/Butwal	8:30 - 12:30 2:30 - 5:30	- Field visit to Pithuwa - Travel to Butwal/Bhairahawa
7 th Dec.	Butwal/Bhairahawa	8:30 - 1:30 3:00 - 4:00	- Field Visit to BLGWP - Meeting with BLGWP officials
8 th Dec.	Butwal/Bhairahawa	8:30 - 12:00 3:00 - 4:00	Visit to Sorah-Chhatis Mauja Irrigation System Visit to Lumbini (the Birthplace of Buddha)
9 th Dec.	Butwal/Pokhara	7:30 - 12:30 2:00 - 5:00	- Travel to West Gandak - Meeting with Organization and Project Staff Travel to Pokhara
10 th Dec.	Pokhara	8:30 - 12:30 2:00 - 5:00	- Sight seeing around Pokhara - Interim Evaluation
11 th Dec.	Pokhara	8:30 - 12:30 2:30 - 4:00 17:45 - 19:00	- Visit Begnas Irrigation Project - Discussion with project officials - Cultural Program
12 th Dec.	Pokhara/Katmandu	8:30 - 4:30	- Travel back to Katmandu
13 th Dec.	Katmandu	10:00 - 4:00	- Experience sharing meeting with irrigation experts
14 th Dec. 15 th Dec.			- Sight seeing day - Back to Karachi

Annex B

Persons Met During the Visit

Irrigation Department

Mr. Mahindra Aryal, Director General Irrigation, Nepal

Consolidated Management Services (CMS), Nepal

1. Mr. Krishna Gautam, President
2. Mr. Rajan Subedi, Managing Director
3. Mr. Upindra Gautam, Director
4. Professor Amrit B. Karki, CTA

Pithuwa Irrigation System

5. J. K. Shrestha, President
6. Vice President
7. Kelash Sharma, Secretary
- 8-10 3 Working Committee Member
- 11 Association Organizer

Bhairahwa-Lumbini Groundwater Project

12. P. N. Tiwari, Local Consultant, BLGWP
13. R. C. Misra, **AO**, BLGWP
14. **S. H.M. Bhattarai**, Women Group Organizer, BLGWP
15. R. Shamshad, President, WUA, Madanganj
16. Rahul, Secretary, WUA, Madanganj
17. P. Khanal, Treasurer, WUA, Madanganj
18. L. N. Bhusal, Pump Operator and trainer, BLGWP,
19. Mr. Budhi Sagar, Pump Operator, WUA, Madanganj
20. Mr. Bhindari, Farmers
21. Mr. Bahadri, Farmer
22. Mr. Thapa, Farmer

Sorah-Chhatis Mauja Irrigation System

23. Mr. Govinda Khanal, President
24. Mr. Ramchand Khanna, Secretary
25. Mr. Nair Bahadar, Treasurer,
26. Mr. Kishan Jawari Gyali, Advisor
27. Mr. Chuamandi Panday, Water User

Gandak West Canal

28. Mr. Haider Ali Momen, President
29. Mr. Sudher Panday, WUA Member
30. Subhan Ali Ansari, Chief Election Commissioner
- 31-35 5 Members of the Work Force
- 36-38 3 Fanners

Begnas Irrigation System

39. Mr. Vinod Kimal Sina, Project Manager
40. Mr. Shiwa Lal Tewari, Chairman, Water Users Association

Annex C
Participants of the Study Tour

A) Water Users Federation, Bareji Distributary, Mirpurkbas, Sindh

1. Haji ~~Yar~~ Muhammad Baluch, President
2. Manjhee Khan Lashari, Vice President
3. Haji Ghulam Hussain, General Secretary
4. Arif Iqbal, Finance Secretary
5. Faiz Muhammad, Joint Secretary

B) Water Users Federation, Dhoru Naro Minor, Nawabshah

6. Anwar Khan Zardari, President
7. Pir Muhammad Mehdi Shah Rashdi, Vice President
8. Muhammad Bukhsh Khaskheli, General Secretary
9. Muhammad Ahsan Arain, Finance Secretary
10. Rashid Ahmad, Joint Secretary

C) Water Users Federation, Heran Distributary, Sanghar

11. Haji Noor Ahmad, President
12. Sajid Hanif, Vice President
13. Haji Khushi Muhammad, General Secretary
14. Haji Muhammad Ahsan, Finance Secretary
15. Muhammad Nazeer, Joint Secretary

D) Water Users Federation, Hakra 4-R Distributary, Haroonabad

16. Mian Abdul Wahid, President
17. Muhammad Shakoor, Vice President
18. Muhammad Amin Raza, General Secretary
19. Sofi Muhammad Iqbal, Information Secretary
20. Fayyaz Ahmad, Joint Secretary Minor 1RA

E) IIMI-Pakistan

- 1. Dr. Muhammad Yameen Memon, Sociologist**
- 2. Mehmood Ul Hassan, Field Research Social Scientist**
- 3. Waheed-uz-Zaman, Senior Field Research Engineer / Field Team Leader,
Haroonabad**
- 4. Waryam Baluch, Supervisory Social Organizer, Mirpurkhas**
- 5. M. Naveed Khayal, Supervisory Social Organizer, Sanghar**
- 6. Nizam Bharchoond, Supervisory Social Organizer, Nawabshah**

IIMI-PAKISTAN PUBLICATIONS

RESEARCH REPORTS

Report NO.	Title	Author	Year
R-1	Crop-Based Irrigation Operations Study in the North West Frontier Province of Pakistan Volume I: Synthesis of Findings and Recommendations	Carlos Garces-R D.J. Bandaragoda Pierre Strosser	June 1994
	Volume II: Research Approach and Interpretation	Carlos Garces-R Ms. Zaigham Habib Pierre Strosser Tissa Bandaragoda Rana M. Afaq Saeed ur Rehman Abdul Hakim Khan	June 1994
	Volume III: Data Collection Procedures and Data Sets	Rana M. Afaq Pierre Strosser Saeed ur Rehman Abdul Hakim Khan Carlos Garces-R	June 1994
R-2	Salinity and Sodicity Research in Pakistan - Proceedings of a one-day Workshop	J.W. Kijne Marcel Kuper Muhammad Aslam	Mar 1995
R-3	Farmers' Perceptions on Salinity and Sodicity: A case study into farmers' knowledge of salinity and sodicity, and their strategies and practices to deal with salinity and sodicity in their farming system	Neeltje Kielen	May 1996
R-4	Modelling the Effects of Irrigation Management on Soil Salinity and Crop Transpiration at the Field Level (M.Sc Thesis -published as Research Report)	S M P Smets	June 1996
R-5	Water Distribution at the Secondary Level in the Chirhtian Sub-division	M Amin K Tareen Khalid Mahmood Anwar Iqbal Mushtaq Khan Marcel Kuper	July 1996
R-6	Farmers Ability to Cope with Salinity and Sodicity: Farmers' perceptions, strategies and practices for dealing with salinity and sodicity in their farming systems	Neeltje Kielen	Aug 1996
R-7	Salinity and Sodicity Effects on Soils and Crops in the Chirhtian Sub-Division: Documentation of a Restitution Process	Neeltje Kielen Muhammad Aslam Rafique Khan Marcel Kuper	Sept 1996
R-8	Tertiary Sub-System Management: [Workshop proceedings]	Khalid Riaz Robina Wahaj	Sept 1996
R-9	Mobilizing Social Organization Volunteers: An Initial Methodological Step Towards Establishing Effective Water Users Organization	Mehmoodul Hassan Zafar Iqbal Mirza D.J. Bandaragoda	Oct 1996
R-10	Canal Water Distribution at the Secondary Level in the Punjab, Pakistan (M.Sc Thesis published as Research Report)	Steven Visser	Oct 1996
R-11	Development of Sediment Transport Technology in Pakistan: An Annotated Bibliography	M. Hasnain Khan	Oct 1996

Report No.	Title	Author	Year
R-12	Modeling of Sediment Transport in Irrigation Canals of Pakistan: Examples of Application (M.Sc Thesis published as Research Report)	Gilles Belaud	Oct 1996
R-13	Methodologies for Design, Operation and Maintenance of Irrigation Canals subject to Sediment Problems: Application to Pakistan (M.Sc Thesis published as Research Report)	Alexandre Vabre	Oct 1996
R-14	Government Interventions in Social Organization for Water Resource Management: Experience of a Command Water Management Project in the Punjab, Pakistan	Waheed uz Zaman D.J.Bandaragoda	Oct 1996
R-15	Applying Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) for Building Inter-Agency Collaboration	Derk Kuiper Mushtaq A. Khan Jos van Oostrum M. Rafique Khan Nathalie Roovers Mehmood ul Hassan	Nov 1996
R-16	Hydraulic Characteristics of Chishtian Subdivision. Fordwah Canal Division	Anwar Iqbal	Nov 1996
R-17	Hydraulic Characteristics of Irrigation Channels in the Malik Sub-Division. Sadiqia Division, Fordwah Eastern Sadiqia Irrigation and Drainage Project	Khalid Mahmood	Nov 1996
R-18	Proceedings of National Conference on Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan	M. Badruddin Gaylord V. Skogerboe M.S.Shafique (Editors for all volumes)	Nov 1996
R-18.1	Volume-I: Inauguration and Deliberations		
R-18.2	Volume-II: Papers on the Theme: Managing Canal Operations		
R-18.3	Volume-III: Papers on the Theme: Water Management Below the Mogha		
R-18.4	Volume-IV: Papers on the Theme: Environmental Management of Irrigated Lands		
R-18.5	Volume-V: Papers on the Theme: Institutional Development		
R-19	Detailed Soil Survey of Eight Sample Watercourse Command Areas in Chishtian and Hasilpur Tehsils	Soil Survey of Pakistan IIMI-Pakistan	Nov 1996
R-20	Unsteady Flow Simulation of the Designed Pehur High-Level Canal and Proposed Remodeling of Machai and Miara Branch Canals. North West Frontier Province. Pakistan	Zaigham Habib Kobkial Pongput Gaylord V. Skogerboe	Dec 1996
R-21	Salinity Management Alternatives for the Rechna Doab, Punjab, Pakistan	Gauhar Rehman Waqar A. Jhangir Abdul Rehman Muhammad Aslam Gaylord V. Skogerboe	May 1997
R-21.1	Volume One: Principal Findings and Implications for Sustainable Irrigated Agriculture		
R-21.2	Volume Two: History of Irrigated Agriculture: A Select Appraisal	Gauhar Rehman Hassan Zia Munawwar Asghar Hussain	Jan 1997
R-21.3	Volume Three: Development of Procedural and Analytical Links	Gauhar Rehman Muhammad Aslam Waqar A. Jhangir Abdul Rehman Asghar Hussain Nazim Ali Hassan Zia Munawwar	Jan 1997

Report No.	Title	Author	Year
R-21.4	Volume Four: Field Data Collection and Processing	Gauhar Rehman Muhammad Aslam Waqar A. Jehangir Mobin Ud Din Ahmed Hassan Zia Munawwar Asghar Hussain Nazim Ali Faizan Ali Samia Ali	Jan 1997
R-21.5	Volume Five: Predicting Future Tubewell Salinity Discharges	Muhammad Aslam	Jan 1997
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