

SH. MARK.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 AC. NO. 6971.....



**MOUNTAIN IRRIGATION SYSTEM  
 EXPERIENCES FROM  
 NEPAL, BHUTAN AND CHITRAL (Pakistan)  
 IN ASSISTING FARMER-MANAGED IRRIGATION SYSTEM**

PRACHANDA PRADHAN<sup>1</sup>

---

<sup>1</sup> Prachanda Pradhan is Head, Nepal Field Operations of International Irrigation Management Institute. This paper is prepared to present in Rabat Conference on Farmer-Managed Irrigation Systems in May 1990.

46971

**MOUNTAIN IRRIGATION SYSTEM:  
EXPERIENCES FROM  
NEPAL, BHUTAN AND CHITRAL (NORTHERN PAKISTAN)  
IN ASSISTING FARMER-MANAGED IRRIGATION SYSTEM**

Prachanda Pradhan

**INTRODUCTION**

Assistance to farmer-managed irrigation systems (FMIS) involves a series of policy issues that deal with institutional arrangements, legal restructuring of beneficiary organizations, criteria for providing material support, and approaches to strengthen beneficiary organizations. Procedures for implementation of the assistance are equally important.

Different implementation strategies were adopted in Nepal, Bhutan, and Pakistan. The International Irrigation Management Institute (IIMI) had the opportunity to participate in action research while the implementation of assistance to farmer-managed irrigation systems in these countries was carried out. The purpose of this paper is to summarize the experience of government assistance to farmer-managed irrigation systems in Nepal, Bhutan, and Chitral (northern Pakistan), and to present the lessons learned from the action research.

**IMPORTANCE OF FARMER-MANAGED IRRIGATION SYSTEMS IN THESE COUNTRIES**

Table 1 provides an overview of farmer-managed and agency-managed irrigation systems in Nepal, Bhutan, and Chitral. The figures highlight the importance of farmer-managed irrigation systems in these countries both in terms of coverage in hectares (ha) and number of systems. Farmer-managed irrigation systems make substantial contributions to food production in these countries. Despite this, in the past, irrigation agencies and national planners have failed to recognize the existence of these systems and the contribution that they make.

Table 1. Overview of farmer-managed and agency-managed irrigation systems in Nepal, Bhutan, and Chitral (northern Pakistan).

Country	FMIS (ha)	Units	Agency ha	Units	Ratio of Agency/FMIS %
Nepal <sup>1</sup>	714000	20000	350000	200	33/67
Bhutan <sup>2</sup>	27000	?	2000	2	7/93
Chitral <sup>3</sup>	18000	2000	400	7	2/98

1. Pradhan 1989.
2. Pradhan 1989 and Statistical Handbook of Bhutan 1986.
3. International Fund for Agricultural Development (IFAD) 1986. Irrigation department intends to irrigate 1500 ha but water is available only in 400 ha.

Chitral is a district in the northern part of the Northwest Frontier Province of Pakistan. It is a mountainous region with a long valley. Because of low precipitation and low rainfall in this area, irrigation is essential to agriculture and the lives of the people (Vander Velde 1989:5-7). Over 90 percent of the irrigation systems are constructed and maintained by the farmers using stones, tree trunks, and planks. In many systems, the farmers have organized themselves effectively to acquire and distribute water, and carry out desilting and maintenance activities regularly. However, in order to increase agricultural production through crop intensification or expansion of irrigated area, many of these systems need external assistance (IFAD 1986). The government assistance being planned will be dependent upon beneficiary participation.

In Nepal there is a long tradition of farmer-managed irrigation systems, with almost 70 percent of all the country's irrigation systems under farmer management. The first agency-managed system was built only in 1923. Previously, there were systems with state patronage, but the farmers always played a major role in management. Nevertheless, the existence of farmer-managed irrigation systems was not recognized by the government until 1981 (Pradhan 1989), when the Irrigation Sector Policy for the Fulfillment of Basic Needs in Nepal included a program of assistance to these systems for rehabilitation and improvement (Ministry of Water Resources 1989.)

Ninety percent of Bhutan's irrigation systems are managed by the farmers. The Agriculture Department came into existence only in 1961, and the Irrigation Unit under the Department was created in 1969. At that time, the government provided annual maintenance grants to these systems. As a result, the farmers' irrigation organizations ceased operating and maintaining the systems themselves. In 1981, the Royal Government of Bhutan promulgated the Decentralization Act and subsequent funds from IFAD and the European Economic Community prompted the government to recognize the importance of farmer-managed irrigation systems. A program to strengthen these organizations and make them responsible for management is now being prepared (Pradhan 1989).

### IIMI's Contribution to the Study of Farmer-Managed Irrigation in These Countries

Early in its work, IIMI adopted the study of farmer-managed irrigation systems as one of the major areas of investigation. Nepal began action research on identifying alternative approaches for assisting these systems. In 1986 an international workshop was organized to discuss public intervention in farmer-managed irrigation systems (IIMI and the Water and Energy Commission Secretariat, WECS 1986).

Subsequently, IFAD/Ministry of Economic Cooperation (BMZ), Federal Republic of Germany, provided funding for IIMI to undertake expanded activities in work related to farmer-managed irrigation. As a result, IIMI extended its activities to northern Thailand, northern Pakistan, Bhutan, Sri

Lanka, Morocco, and Bangladesh. This paper confines itself to the activities and experiences of Nepal, Bhutan, and Chitral in northern Pakistan in developing a strategy to assist farmer-managed irrigation systems.

## ISSUES INVOLVED IN ASSISTING FARMER-MANAGED IRRIGATION SYSTEMS

### New Approaches for Assistance

In the past, the paternalistic approach of the governments of these countries was to take over the rehabilitation and management of the irrigation systems. However, the poor performance of agency-managed irrigation systems and increasing recurrent operation and maintenance costs have caused governments to consider other options. At present, the government of Nepal has adopted a "turnover" policy to return the management of these systems to the farmers. Turnover has not yet become a pressing problem in Bhutan and Chitral. Furthermore, in Nepal, wherever the management of an irrigation system is currently accomplished by the beneficiaries, the policy specifies strengthening these systems so that the farmers can continue operation and maintenance.

Farmer-managed irrigation systems are unique in that they already have long-established social and technical mechanisms that enable them to acquire, allocate, and distribute water for irrigation. Assistance approaches that seek to keep the operation and maintenance responsibility in the hands of the farmers must therefore capitalize on the existing expertise. Farmer participation must also be integrated into all aspects of the assistance process. Experiences in Nepal have indicated that the cost of rehabilitation can be reduced and operation and maintenance returned to the farmers by encouraging greater farmer participation in the assistance effort. Hence, assistance to farmer-managed irrigation systems means helping the farmers to improve/build their system. Inherent in this approach is the necessity for beneficiary participation in identification, planning, implementation, and operation and maintenance of the irrigation system.

This change of government philosophy requires that changes be effected in working procedures, implementation procedures, and investment criteria. Adjustments in legal provisions, and accounting and auditing procedures are also required.

### New Policy Directives

Nepal, Bhutan, and Chitral have come to realize that assistance to farmer-managed irrigation systems can yield better results than construction of new systems. In the short run, investment in these systems can bring higher returns. Furthermore, the assistance is not intended to be recurrent, as the farmers are to retain operation and maintenance responsibilities.

The IFAD-funded projects in Bhutan and Chitral have given priority to the rehabilitation and improvement of existing farmer-managed systems. In Nepal, irrigation credit from the World Bank and the Sectoral Program on Irrigation is directed at assisting these systems.

In order to achieve the objective of having the farmers manage and maintain the irrigation system productively, the government's assistance

program must be carefully planned. This program must include assistance for both physical and non-physical improvements. Non-physical improvements include improving the capacity of the farmers by strengthening their irrigation organization and teaching them to keep accounts and records.

In a participatory assistance program, the role of the beneficiaries as well as that of the government must be clearly defined. The government's role should be that of promoter of greater farmer capacity and provider of technical and financial support when necessary. Government must be careful not to make these systems dependent upon its support. The farmers' role is to take responsibility for irrigation management activities such as water acquisition, allocation, distribution, management of resources, and maintenance of the infrastructure. It is the government agency's role to help the farmers obtain training so they can perform these functions effectively.

To strengthen the capacity of the farmers to manage their irrigation systems, farmer-to-farmer training was organized in Nepal. In the Agha Khan Rural Support Programme community organizers worked with the farmers (Dani and Siddiqi 1986). Bhutan has employed development communication groups to capacitate farmers.

## PROCEDURES FOR THE IMPLEMENTATION OF ASSISTANCE TO FARMER-MANAGED SYSTEMS

Procedures for the implementation of assistance programs need to consider the following important points :

1. Preparation of candidacy for assistance (inventory preparation and rapid appraisal)
2. Selection criteria
3. Technical/physical improvement
4. Non-physical/management improvement
5. Participatory planning
6. Beneficiary contributions in the form of labor/cash/construction supervision
7. Participation in implementation of the construction activities (contract versus forced account)
8. Open accounts
9. Technical supervision (by agency people or consultants)
10. Accountability and transparency
11. Bureaucratic reorientation

### Preparation of Candidacy for Assistance

Since Nepal, Bhutan, and northern Pakistan have many existing farmer-managed irrigation systems, it is necessary to prepare an inventory of irrigation systems. The inventory is then used as the basis for the selection of candidacy for assistance. In the absence of such information, candidate systems are selected on an ad hoc basis.

In Nepal, the action research project started with the preparation of an inventory of the irrigation systems in the 200 square kilometer Indrawati River watershed. An inventory of an entire watershed enables the agency to get a picture of the use of water resources from different tributaries. Using the information from the inventory, certain systems can be identified for

further detailed study (Yoder and Upadhyaya 1988) using rapid appraisal methods. Information from a rapid appraisal provides information on the physical condition of an irrigation system, social and institutional aspects, and agricultural status (Pradhan, Yoder, and Pradhan 1988).

As a result of the action research project experience in Sindhupalchok District, the Department of Irrigation in Nepal decided to inventory irrigation systems in two districts initially, with the plan to eventually inventory all the districts in the country. The information will be fed into a computerized database for use in planning, making investment decisions, and selecting irrigation systems for assistance.

### **Selection Criteria**

The purpose of extending government assistance to farmer-managed irrigation systems must be identified. The purpose might be to achieve expansion of potential command area, intensify crop production, reduce operation and maintenance costs, or to achieve a low cost investment with high returns. Criteria for selecting systems to receive assistance should be developed in support of the national agricultural and irrigation policy.

In Nepal, out of 112 systems identified during inventory preparation, only 23 systems were selected for rapid appraisal. The potential for expansion of the command area was the criterion. After rapid appraisal, only 19 systems were selected to receive assistance. Other systems were left out because the cost of rehabilitation was quite high and the return was estimated to be very low.

It is important to base selection for assistance on rational economic criteria. Sometimes local politics can play a significant part in influencing the selection process. In the action research project in Nepal, local political units were not involved in selecting the irrigation systems that would receive assistance. However, in Bhutan and Chitral, selection of candidate systems involves local political units which are responsible for presenting the requests of individual irrigation systems. The district level political body must then approve the petition before an irrigation system can receive assistance. Through this political process, it becomes more difficult to directly involve the farmers in the design and implementation process of the rehabilitation. One of the lessons learned from the Nepal experience is that active beneficiary participation in the selection, design, and implementation process can result in more improvements made at lower cost.

### **Technical and Physical Improvements**

Even when focusing on technical and physical improvements that need to be made, the decision making process that determines which technical options are selected and how the physical infrastructure impacts upon the capacity of the farmers to manage and maintain the structure must be considered. Hence, there is a decision making and management aspect that must be integrated into the selection and design of the physical infrastructure.

It is important to determine who sets the priorities for the improvement work, the extent of improvement to be done, and who makes the final decision. For assistance to irrigation systems to be managed by the beneficiaries, it is critical that the farmers be included in all aspects of the decision making.

In addition, technical and environmental information (local technology, availability of resources), and social information (water rights, local leadership structure, strength of a water users association, etc) need to be collected and factored into the process of designing the physical structures so that the farmers can operate and maintain the system in the future.

### **Non-Physical Improvements**

Although assistance to farmer-managed irrigation systems is often thought of in terms of making physical improvements, it is essential to recognize that other types of assistance are often needed. Some farmer-managed irrigation systems have very strong irrigation organizations with well defined rules and roles. However, other systems do not have irrigation organizations capable of carrying out all management functions in an equitable and efficient manner. These systems need help to improve their management of the irrigation activities.

In Chitral, the village organization is strengthened before physical improvement occurs. The village organization is responsible for managing construction of all improvements (AKRSP 1988; Hussain et al. 1986).

In the action research project in Nepal, association organizers organized the farmers and local consultants supervised the construction work. The consultants were given specific terms of reference that required them to promote the participation of the farmers and help the farmers to organize to assume management responsibilities.

Farmer-to-farmer training. To strengthen the farmers' managerial capacity, farmer-to-farmer training was employed in the Nepal project. With this training method, farmers from irrigation systems in need of improved management skills were taken to visit farmer-managed irrigation systems that were well managed. The farmers of the better managed system acted as the trainers. The visiting farmers walked the length of the trainers' irrigation system, observed the physical structures, and held discussions with their hosts. The discussions usually focused on water acquisition, allocation, distribution, operation, maintenance, resource mobilization, and the role of the irrigators' organization and its rules. The opportunity to observe a well-managed irrigation system and talk to the beneficiaries of that system greatly facilitated the transfer of knowledge and identification of possibilities. When the trainees saw what other farmers had accomplished, they were effectively convinced that they could also improve the operation and maintenance and management of their own systems. If an engineer is also present during the exchange visit, he can explain the disadvantages and advantages of alternative structures so that the trainees can have a better basis upon which to make design decisions and set their priorities for the rehabilitation of their irrigation system. It is best to conduct the farmer-to-farmer exchange at the beginning of the assistance program.

Farmer consultants. Another approach to improving the management capacity of the farmers using farmer consultants was also tried in Nepal. In this approach, farmers from well-managed systems were recruited to assist and advise the farmers from the irrigation system receiving assistance. The farmer consultants provided guidance on the choice of physical structures and devices for water distribution, and rules and ways to mobilize both cash and labor resources for operation and maintenance. The farmer consultants also

helped the client farmers formulate management rules and regulations.

In Chitral, the key role is played by the village organizer. The village organization looks after many village development activities in addition to irrigation improvement projects. A main feature of the Chitral program is the requirement that a village organization be formed before any construction work can begin.

### Participatory Planning

Assistance to irrigation systems to be managed by the farmers should make optimum use of the farmers as a resource of local information. The farmers have observed the behavior of the river and know the rainfall pattern and climatic conditions over a period of time. They also know the soil and drainage conditions and often have tried different canal alignments and determined which is best after years of trial and error. This valuable experience should be incorporated into the planning and design of the rehabilitation project. Participatory planning allows technicians and farmers to exchange information and learn from each other.

Experiences from the Nepal action research project (Yoder 1989) and the Philippines (de los Reyes et al. 1986) indicate that it is necessary to have the farmers participate in all phases of the rehabilitation project, from project identification to planning and implementation. The farmers gain a sense of ownership and commitment to the improvement of the irrigation system when they are involved in planning the improvements.

At the initial stage, technicians usually feel that the participatory planning process is slow. However, taking the time to include the farmers in the initial planning process results in fewer delays and costly changes having to be made during the construction phase.

In order for participatory planning to be successful, it is necessary that bureaucratic procedures and requirements be flexible regarding design and implementation. At the policy level, it is important to determine the level of flexibility that will facilitate participatory planning and implementation while safeguarding accountability.

### Beneficiary Contributions

An important aspect of farmer participation is that of beneficiary contributions to the rehabilitation effort. The amount and type of contributions are dependent upon the government's approach. When a paternalistic approach is taken, government provides all the funds and does the work, viewing the farmers as too poor to make any contribution.

Policy makers still have not decided on the contributions that the beneficiaries should make. Should the high cost structures be constructed by the government? Should the beneficiaries share the cost of construction? If the cost is shared, what should be the cost-sharing ratio? Should the beneficiaries be required to contribute labor, or cash, or both? When debating these questions, it may be necessary to consider improvements to farmer-managed irrigation systems separately from the construction of new irrigation systems.



In the case of providing assistance to existing farmer-managed irrigation systems, it is evident that the farmers had been operating and maintaining the systems for some time before the government offered to intervene. These systems have existing agreements regarding property and water rights, for acquiring and distributing the water resource, for mobilizing resources to operate and maintain the system, and for sharing the benefits. These existing patterns must be considered in the design and implementation of the improvement work, or social values and norms and the existing management capability will be adversely affected.

Assistance to these systems should be directed to improving critical points in the system. Wherever the farmers can accomplish the improvements with their own resources, they should be encouraged to do so. For example, hard rock areas often prevent the expansion of the system, but the farmers usually do not have the resources to accomplish hard rock cutting along a section of the irrigation channel. Government assistance can be directed to overcoming this obstacle. As their contribution, the farmers can excavate the soil portions of the channel.

The beneficiaries can also contribute by managing the construction work themselves. In the action research project in Nepal, the beneficiaries were informed of the amount of money available for the improvement work. A list of structures to be constructed and the amount allocated to each structure was given to the farmers. The farmers were also informed of the funds allocated to the first priority improvements that they had identified. The farmers were advised that they could use any money they might save from the construction of first priority improvements to complete other improvements identified as second priority. The farmers then determined the daily wage rate the project would pay (lower than the regular rate), and worked longer hours in order to have the project funds cover some of the second priority improvements. This arrangement encouraged the farmers to make maximum use of scarce resources, but is only possible when the irrigators' association is cohesive and strong.

In Bhutan, the beneficiaries are expected to contribute labor to the Wandu-Punakha irrigation improvement project being funded by IFAD. However, the project manager has found it difficult to mobilize the farmers.

In Chitral, the Agha Khan Rural Support Programme has made it mandatory that the beneficiaries participate in the improvement process. Project money is not released unless the beneficiaries contribute labor. IFAD/Agricultural Development Bank (ADB) support of irrigation improvement and development is also contingent upon beneficiary participation (ADB 1987).

### Participation in Implementation of Construction Activities

The implementation of construction activities can be accomplished through contractors or through the forced account system with the participation of the beneficiaries. Implementing agencies usually prefer to give out contracts for the construction work with the agency providing only supervision. However, this arrangement isolates the farmers. Contractors usually find it difficult to depend upon the farmers' labor contributions and prefer to bring in both skilled and unskilled laborers from outside of the system. As a result, the beneficiaries remain observers to the process.

Nevertheless, if the system is to be managed and maintained by the

beneficiaries after the completion of the improvement work, it is preferable to have the farmers participate in the construction activities. Unless it is made mandatory by the government that the beneficiaries participate in the construction work, contractors are usually used.

### Open Accounts

In a project that seeks to have high beneficiary participation, it is important that all accounts be open to inspection by everyone involved. In order for the beneficiaries to make sound decisions regarding how the funds should be spent, they must know how much money is available and the costs of constructing each structure. Open accounts promote confidence and trust among the beneficiaries, technicians, and government and local leaders. When the beneficiaries can check to see if the money is being spent properly they are more likely to contribute as much as they can from their own resources and participate fully. However, in order to have truly open accounts, it is necessary to reorient agency personnel to accept the concept.

### Technical Supervision

The farmer participatory approach requires intensive technical supervision in the construction phase. However, the number of systems requiring assistance and the manpower available within an irrigation agency make it impossible to provide adequate supervision if all construction is to be supervised directly by the agency. In the action research project in Nepal, local consultants were hired to carry out technical supervision of construction. The arrangement proved to be effective and viable, enhancing and extending the capacity of the irrigation agency while providing the intensive technical supervision necessary. In addition, local consultants gained experience in the dynamics of utilizing the farmers' participation to effect irrigation improvements.

### Accountability and Transparency

Once again, to secure the cooperation and participation of the beneficiaries of the irrigation system, accountability and transparency are important. The irrigators' organization consists of all the persons using irrigation water from the system. At the irrigators' assembly the beneficiaries review the performance of the organization's executive committee, audit the accounts, and make rules and regulations. In this way, the organization's leaders are held accountable to the group. Members in charge of construction activities should also be required to keep their records and transactions open for inspection so they can be held accountable for their actions. Accountability to the irrigators and transparency of transactions promote trust and confidence which help to strengthen the farmers' organization and its ability to manage the construction activities and to operate and maintain the system in the future.

### Bureaucratic Reorientation

In order to successfully incorporate an approach to irrigation development that maximizes the participation of the beneficiaries and enhances their capacity to continue to operate and maintain the irrigation system in the future, government bureaucracies must reorient their attitudes and institute a number of changes in bureaucratic requirements related to

irrigation assistance to farmer-managed systems. Of primary importance, the requirements must be flexible so as to be able to accommodate the diverse needs and capabilities of farmers in local environments that differ greatly. The principles of accountability and transparency need to be incorporated into the accounting procedures. The option of using local consultants should be considered, and stipulations relating to the beneficiaries' participation and contributions, and the use of contractors need to be formulated.

## NEW DIRECTIONS IN PROVIDING ASSISTANCE TO FARMER-MANAGED IRRIGATION SYSTEMS

### Nepal

In Nepal farmer-managed irrigation systems are now recognized as an important resource that contributes significantly to the agricultural productivity of the country. Pressures to increase food production to meet the basic needs of the increasing population have helped shape a policy of providing assistance to these irrigation systems to increase their productive capacity. Relatively poor performance of agency-managed irrigation systems and the increasing burden to the government of recurring operation and maintenance costs have caused the government to adopt a policy of assistance that strengthens the capacity of the beneficiaries to continue to operate and maintain their systems more effectively. To achieve this objective, it has been recognized that it is essential to have the farmers themselves participate in all aspects of the rehabilitation project and to provide training in improved management techniques as well as improved infrastructure. The government of Nepal has also recognized that it is necessary for the water users group to have legal status (Pradhan and Yoder 1988).

### Bhutan

The Royal Government of Bhutan has recognized the need to develop a comprehensive irrigation policy and intends to move in the direction of strengthening the irrigators' organizations so that the irrigators can assume the responsibility of operating and maintaining the systems. In the initial stage, the government undertook action research to test the participatory approach. A second research activity is being undertaken to evaluate the status and capacity of farmer-managed irrigation systems in Bhutan. The government plans to use the information collected to formulate an irrigation sector plan.

IIMI conducted a two-day irrigation training program for field researchers (section officers of the Department of Agriculture and graduate students of Dutch universities and the Dutch voluntary service). A handbook for field research based on guidelines for conducting rapid appraisals as was used by IIMI/Nepal was prepared for the researchers. The handbook was an important tool because the field researchers in Bhutan change every five months.

The Royal Government of Bhutan intends to use the information collected to develop a training program for district officials. A national workshop will be organized to analyze the problems and recommend a suitable irrigation policy for the country.

### Chitral Area Development Project

The Chitral Area Development Project will provide assistance to 80 existing farmer-managed irrigation systems as well as construct 80 new irrigation facilities. In order to provide appropriate assistance and enlist the participation of the farmers, research on the functions and performance of the existing farmer-managed systems is being conducted. The research results will be used in planning the assistance program. A flexible assistance program and procedure have already been identified as key factors for achieving high participation on the part of the beneficiaries.

Project directors and managers working in a similar mountain environment in Nepal will be taken on a tour of the Chitral systems to give them a basis for comparing the process and products of assistance to farmer-managed irrigation systems.

### THE PROCEDURE USED BY THE NEPAL ACTION RESEARCH PROJECT

The following procedure emerged from the WECS-IIMI and Ford Foundation action research project in Sindhupalchok District as a successful way of providing assistance to farmer-managed irrigation systems. This approach and the procedure can serve as guidelines that other programs can test and adapt as appropriate to their needs.

1. It is necessary to know how many systems exist within a given watershed. This information is gathered by conducting an inventory. On the basis of the inventory, potential candidates for assistance can be identified. Different criteria may be used to identify potential candidate systems: potential for expansion of command area, intensification of crops, or reducing maintenance. Once the criteria are established, candidate systems can be identified for rapid appraisal.

2. On the basis of the results of rapid appraisal of these systems, a first dialogue between the farmers and agency personnel takes place in the selected system. The purpose of the first dialogue is to obtain information on the number of beneficiaries, role and strength of the beneficiary organization, and irrigation management practices. Critical areas which need physical improvement are identified. The farmers are asked whether they want to participate in the assistance program and what contributions they can make.

3. In the second dialogue, a tentative list of irrigation improvements is prepared. Priorities for the physical improvements must be established. Working within the budget ceiling set by the government's financial contribution, the farmers, in consultation with the technicians, decide what improvement work will be undertaken using government assistance and what they will do on their own. The farmers can usually accomplish the earthworks on their own. In consultation and through regular interaction with the farmers, the engineers design the structures.

4. During the third dialogue, the farmers' contributions and the role and responsibilities of the technicians are defined. Construction work starts.

5. Assistance to farmer-managed irrigation systems involves both physical and managerial improvement of the system. During the planning phase,

assistance is given to strengthen the farmers' management capacity. A social organizer helps them conduct regular meetings. An irrigators' executive committee is elected by the farmers. The members of the committee are trained in recording the minutes of meetings, keeping records on labor mobilization, and keeping financial accounts.

A farmer-to-farmer training program is also organized for members of the irrigation organization so they can observe improved irrigation practices in another system and learn from the farmers in that system.

## LESSONS LEARNED FROM THE NEPAL ACTION RESEARCH PROJECT

The following lessons emerged from the Nepal action research project. Discussion is currently underway within the Ministry of Water Resources and the Department of Irrigation as to how to translate this experience into improved irrigation development policy and procedures.

1. The existing accounting procedures and audit systems need to be remodeled to allow greater flexibility. Structures need to be adapted to the requirements of the actual field site and local needs. Some of these changes cannot be anticipated until actual work begins. A flexible design procedure is essential so that the structures can be adjusted as necessary.

2. Farmers find it difficult to understand blueprints and design sketches. Engineers need to use three-dimensional scaled models to explain to the farmers how the proposed structures look and operate. Observing actual structures in operation in another farmer-managed system would also help. The experience of the action research project indicates that almost 40 percent of the structures required design changes during the construction phase. Many of the structures that were originally designed were unnecessary. The engineers had used blueprints and design sketches to explain the construction and use of the structures to the farmers. However, it was not until the farmers actually saw the structures begin to take shape and where they would be installed that they fully comprehended and then requested changes.

3. It is very important to maintain transparent accounts--accounts of income and expenditures open to all for inspection. The beneficiaries need to be given information on the status of the project. Being informed allows the beneficiaries to determine how to best mobilize their own resources and assume management responsibilities. This creates a sense of ownership of the irrigation system.

4. Bureaucratic reorientation is essential in implementing effective assistance to farmer-managed irrigation systems. It is necessary to make a distinction between rehabilitation and assistance to farmer-managed irrigation systems. Rehabilitation of the system refers to making improvements to the physical condition of the system. Assistance to farmer-managed irrigation systems refers to helping the farmers to improve their system. Hence, assistance is provided to improve managerial capacity as well as physical capacity.

It is important that irrigation officials change their orientation from physical rehabilitation only to assistance. Assistance is successful when the farmers are allowed to participate fully in all activities. The reorientation

needs to occur at the central level as well as the field level. The change in attitude will be best achieved when officials can observe the results of the implementation of this type of assistance program.

## SUMMARY

Nepal, Bhutan, and Pakistan have rather recently come to recognize the important contribution that farmer-managed irrigation systems make to their national food supplies. At the same time, changes in the environment, increased population pressures, and the scarcity of local materials for maintenance have made it more and more difficult for the farmers to sustain these systems by themselves. As a result, the governments of these countries are providing assistance to farmer-managed irrigation systems to help them to increase their efficiency and productivity.

Past approaches for government intervention have caused the systems to become dependent upon external resources. Governments are now experimenting with assistance approaches that will enhance the farmers' ability to continue to operate and maintain their irrigation systems. Approaches being tried in Nepal, Bhutan, and Chitral emphasize the participation of the farmers in the entire improvement process. Innovations are also being tested to provide managerial training as well as physical improvements. IIMI's thrust has been to identify appropriate assistance strategies for farmer-managed irrigation systems by participating in programs in Nepal, Bhutan, and Chitral.

A knowledge gap continues to exist about the status and contributions of farmer-managed irrigation systems in many countries. Recognizing this, Bhutan and Pakistan, in the Chitral Area Development Project, are conducting inventories and research on farmer-managed irrigation systems in their areas.

## REFERENCES

- ~~Agricultural~~ <sup>Asian</sup> Development Bank (ADB). 1987. Appraisal of the Chitral Area Development Project in Pakistan. Manila: ADB.
- Agha Khan Rural Support Programme (AKRSP). 1988. The Agha Khan Rural Support Programme, sixth annual review, 1988. Gilgit, Pakistan: AKRSP.
- Central Statistical Office, Planning Commission, Bhutan. 1986. Statistical handbook of Bhutan. Thimpu.
- Dani, Anis A. and Najma Siddiqi. 1986. Institutional innovations in irrigation management: a case study from Northern Pakistan. In IIMI/WECES, Public Intervention in Farmer-Managed Irrigation Systems. Sri Lanka: IIMI.
- de los Reyes, Romana P. and Sylvia Ma. G. Jopillo. 1986. An evaluation of the Philippine Participatory Communal Irrigation Program. Quezon City: Institute of Philippine Culture, Ateneo de Manila University.
- Hussain, Maliha H., Hussain Wali Khan, Zahur Alam and Tariq Husain. 1986. An evaluation of irrigation projects undertaken by AKRSP in the Gilgit District of Northern Pakistan. In IIMI/WECES, Public Intervention in Farmer-Managed Irrigation Systems. Sri Lanka: IIMI.

International Fund for Agricultural Development (IFAD). 1986. Pakistan: Chitral Area Development Project, Preparation Report. Rome.

Ministry of Water Resources. 1989. Irrigation sector policy for the fulfillment of basic needs. Kathmandu: Ministry of Water Resources.

Pradhan, N.C., Robert Yoder. 1989. Improving irrigation system management through farmer-to-farmer training: examples from Nepal. IIMI working paper no. 12. Sri Lanka: IIMI.

Pradhan, Prachanda, R. Yoder and U. Pradhan. 1987. Guidelines for rapid appraisal of irrigation systems: Experiences from Nepal. In Irrigation Management In Nepal: Research Papers from a National Seminar. Nepal: IIMI.

Pradhan, Prachanda and Robert Yoder. 1988. Irrigation development, management and use in the mountains of Nepal. Kathmandu: International Center for Integrated Mountain Development (ICIMOD).

Pradhan, Prachanda. Irrigation development in Bhutan. IIMI working paper no. 13. Colombo, Sri Lanka: IIMI.

Pradhan, Prachanda. 1989. Patterns of irrigation organizations, comparative study of 21 farmer-managed irrigation systems. Colombo, Sri Lanka: IIMI.

Vander Velde, E.J. 1989. Irrigation management in Pakistan mountain environments. Colombo, Sri Lanka: IIMI.

Yoder, Robert and S.B. Upadhaya. 1987. Reconnaissance/inventory study of irrigation systems in the Indrawati basin of Nepal. In Irrigation Management in Nepal: Research Papers from a National Seminar. Kathmandu, Nepal: IIMI.

Yoder, Robert. 1989. Assistance to farmer-managed irrigation systems: Results and recommendations from the action research project. In The Fifth IIMI Internal Program Review, Vol. I. Sri Lanka, Colombo: IIMI.