REPORT NO. R-26

MOVING TOWARDS PARTICIPATORY IRRIGATION MANAGEMENT

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PILOT PROJECT FOR FARMER-MANAGED IRRIGATED AGRICULTURE UNDER THE LEFT BANK OUTFALL DRAIN STAGE I PROJECT, PAKISTAN

PHASE-II REPORT

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FOREWORD

For the past three years, the top research priority in the Pakistan National Program of IIMI has been "learning how to organize farmers at the secondary canal level". This effort has been particularly difficult because there are no distributary command areas in Pakistan where a Water Users Federation has been established and made functional so that farmers could visit and learn from the experience of organized farmers.

During December 1996, IIMI staff working in the Province of Sindh completed the establishment of a Water Users Federation on each of three pilot distributaries within the Left Bank Outfall Drain Stage-I Project area. Then, on 5 March 1997, the 25 members of the Water Users Federation for Hakra 4-R Distributary in Southeastern Punjab Province selected their leaders. This was a momentous occasion!

A field station was established at each of the pilot distributaries; the sincere efforts and long hours displayed by the IIMI field staff is greatly appreciated. The IIMI program leaders in both the Punjab and Sindh provinces are highly commended for their continued redirection as new obstacles occurred.

There has been extreme skepticism about being able to organize farmers at the distributary level because of the lack of success in organizing Water Users Associations at the tertiary watercourse level over the past twenty years. But, we have learned during these exercises that farmers want to be organized. Unfortunately, they are "at risk". At this time, they lack appropriate legal authority in terms of managing their portion of the system, a joint management agreement with the Provincial Irrigation Department, and the sharing of the irrigated crop land taxes (abiyana). Without these legal authorities, farmers are fearful of reprisals by Irrigation Department field staff.

All of us have the greatest respect for the thousands of farmers making their livelihoods from the irrigated croplands commanded by these four pilot distributaries. They have placed themselves at risk, but at the same time, they are the innovators who are leading a more farmer-oriented approach to irrigation management.

We have been asked many times -- why has the Pakistan National Program of IIMI attached so much importance to this particular research effort? The answer is quite simple. Agricultural productivity in the Indus Basin Irrigation System has become stagnant. There are a multitude of causes for this situation, but we cannot perceive being

able to progress further unless farmers play a much greater role. Thus, failure in being able to organize farmers at the distributary level would imply that the agricultural system would remain "stuck". Then, the long-term prognosis would be that many more millions of people would live in poverty, even during the near future.

We recognize that organizing farmers is only a beginning. There is a long journey ahead in making these organizations sustainable. Together with our national partners in the provincial agriculture and irrigation departments, we need to forge stronger supportive mechanisms that will allow these farmer organizations to flourish.

One thing is certain -- we cannot afford to fail!

Gaylord V. Skogerboe
Director, Pakistan National Program
International Irrigation Management Institute

Acknowledgements

This Phase II Report, while synthesizing the information already disseminated through Monthly Progress Reports of the Project, incorporates in it several comments received from the recipients of these MPRs. We are grateful to all those who provided these comments and particularly to the November 1996 Donors' Joint Review Mission led by Mr. Makwata J. Wambia of the World Bank. We take this opportunity to thank our donors, the World Bank and the Swiss Development Cooperation, who are jointly funding this pilot project.

All of the project staff mentioned in Annex-11, through their various outputs, contributed to the process of preparing this report. Their efforts are gratefully appreciated. Special thanks are due to the staff of the Agricultural Engineering and Water Management Directorate of the Government of Sindh, the client department for this pilot project on farmer managed irrigated agriculture.

The report benefited considerably from the valuable suggestions by Professor Gaylord Skogerboe, Director of IIMI's Pakistan National Program. His guidance was very useful in developing the process for organizing water users, that was adapted for use in the pilot project. The authors are grateful to Professor Skogerboe for this valuable support.

The secretarial assistance received from Mr. Manzoor Hussain for preparing the graphics and formatting this report is specially appreciated.

1. INTRODUCTION

1.1 Project Inception

In July 1995, the Department of Agricultural Engineering and Water Management of the Government of Sindh (GoS) commissioned the International Irrigation Management Institute (IIMI) to undertake an action research program for three pilot trials on water users organizations in the Left Bank Outfall Drain (LBOD) project area. The pilot project was to establish three Water Users Federations, which were to take over the whole or part of the operation and maintenance responsibility of three selected distributary or minor canals in the area. Basically, this initiative seemed to rest on the fact that the completion of LBOD Project facilities would drastically increase budget requirements for proper maintenance of the canal irrigation system in Sindh, and that it is likely that the involvement of water users in a participatory management approach could effectively improve the O&M management of both the irrigation and drainage systems.

Consequent to preliminary discussions between GoS authorities and the two donors, the World Bank and Swiss Development Cooperation, the Department of Agriculture prepared a Supplementary PC-I which was approved by the GoS in September 1994. Based on this project document, IIMI prepared a study proposal including the pilot project's implementation strategies. Finally, the consultancy contract between IIMI and the Department of Agriculture Engineering and Water Management of Sindh for the "Pilot Project for Farmer-Managed Irrigated Agriculture Under the Left Bank Outfall Drain, Stage I Project" was signed on 26 July 1995, but became retroactive to 1 July 1995.

The project was designed for three phases to be implemented during a period of 30 months from July 1995 to December 1997. According to the project profile, Phase I of the project covers the initial period of three months starting from 1 July 1995, whereas, Phase II covers the period from October 1995 to September 1996.

1.2 Phase II Report

As for reporting requirements, a phase summary was to be issued at the end of each phase, in addition to the monthly progress reports (MPRs). A detailed **Inception Report was issued by IIMI in October 1995** to describe the project objectives, concepts and methodologies, along with the plan of operations. The **Phase I Report was also issued in October 1995**. As agreed at the November 1996 Joint Review Mission, the Phase

II Report was to cover the period from 1 October 1995 to 31 December 1996, in order to include some important organizational activities leading to the formation of three distributary/minor level water users federations.

This Phase II Report is basically a recapitulation of the project information reported in the MPRs to describe the project's overall progress up to December 1996, but also analyses the issues, constraints and prospects related to the organizing of water users in the LBOD area as can be identified at this stage of the project.

2. PROJECT EXPECTATIONS

2.1 Objectives of Project Activities

The purpose of this pilot project is broadly two-fold:

(1) to test the viability of farmers' managing parts of the irrigation and drainage systems so that more efficient and equitable allocation of water can be achieved; and

(2) to make recommendations for policies on future extensions of this work.

More specifically, the pilot project has aimed, through its activities so far accomplished, to assist in establishing water users organizations in three selected distributary/minor canal command areas, one in each of the three LBOD districts: Mirpurkhas, Nawabshah, and Sanghar. In each pilot area, Water Users Associations (WUAs) were to be established at the watercourse level, which would then be integrated appropriately to form Water Users Federations (WUFs) at the distributary or minor canal level[1]. Another specific objective was to promote the maximum involvement of the water users and their organizations in the operation and maintenance of distributary/minor canals, without much intervention from the governmental agencies, but with their institutional support, particularly in the early stages of the pilot projects. Later, the legislative requirements and institutional processes would be identified for effectively organizing and strengthening water users organizations on a wider scale.

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[1] In this paper, the terms WUAs and WUFs are referred to in the generic term of water users organizations (WUOs).

2.2 Concepts on Project Outcomes

The broad concept underlying these pilot efforts is that, with an adequate policy support forthcoming, the existing institutional framework for distributary/minor level operation, maintenance and water allocation responsibilities will be restructured. Within this institutional restructuring, the WUFs will eventually be accountable for the water received at the head of their distributary or minor canals, responsible for distribution of water among the member water users associations (WUAs) at the watercourse level according to their own agreed allocation rules, and also responsible for managing groundwater levels in their respective command areas. The WUFs will reach an agreement with their WUA members, as well as with the water delivery agencies, for appropriate water charges and operation and maintenance (O&M) costs of irrigation and drainage facilities in their distributary/minor command areas. They will undertake the collection of water/drainage charges, improve water management practices, and other activities related to water, including the maintenance of irrigation and drainage facilities.

In the realization of these outcomes, the project design further conceptualized that the WUFs will be able to develop and enforce internal by-laws, which will be binding on their members, and resolve any water-related disputes that may arise among them. Internal rule application is inherent in any form of collective action, and it is envisaged that the members of new organizations will derive the necessary inspiration from local community experiences to be able to agree upon a set of rules, rights and responsibilities.

2.3 Assumptions

Several assumptions underlie these conceptual project expectations. One is that the operating agencies will be ready to empower the new water users organizations, and cooperate with them to ensure uninterrupted operation and maintenance of the physical systems. The requirement for government agencies' commitment is not reflected in any of the project documents; nor has this commitment been realized in any of the project activities so far conducted. Without adequate support from the water delivery agencies, the pilot projects cannot proceed far into the organizational action phase. To enforce internal rules, the WUFs will need adequate support from an enabling legal environment, which has to give them the necessary recognition. This requirement is another important assumption at this stage, as an enhanced legal framework needs to be established for this purpose, and in any case, the general law and order situation needs to be improved

for effective enforcement. The necessary institutional support, therefore, remains an inevitable assumption.

Another assumption is that the individual water users will derive some economic gain out of being organized and taking over the additional responsibility through collective action. There is little empirical evidence in the form of organized information from any of the trial efforts conducted so far, which gives the extent of profitability or individual economic gain from collective action of water users organizations. However, the water users often question the potential of such gain. At this stage, this is a major assumption, although many non-economic arguments support the idea.

The biggest assumption is related to the ability of the organized water users to cope with the existing social pressure that is fashioned by political and feudalistic forces, and proceed with their intended collective actions to improve equity in water distribution. Presumably, the mechanisms introduced through the pilot project to safeguard and sustain the democratic processes of social organization and reduce free-riding behavior will survive beyond the project period.

3. IMPLEMENTATION HIGHLIGHTS

3.1 Current Status of Project Implementation

The project implementation has so far proceeded as planned and has been satisfactory and compatible with project objectives and concepts. Annex-1 gives a list of the main project activities accomplished during this period.

There are good indications that, if the momentum so far generated can be maintained and the necessary institutional support is forthcoming, the pilot trials will have a good potential of being able, by the end of 1997, to demonstrate viable organized responsibility for distributary/minor level O&M management. However, to proceed from now onwards, to plan and implement a joint-management action plan during 1997, the support of the Provincial Irrigation Department is absolutely essential.

The satisfactory progress up to this stage was greatly supported by three main enabling factors:

(1) selection of appropriate pilot sites;

(1) efforts in planning the project processes; and

(2) appropriateness of methodologies adopted in the project.

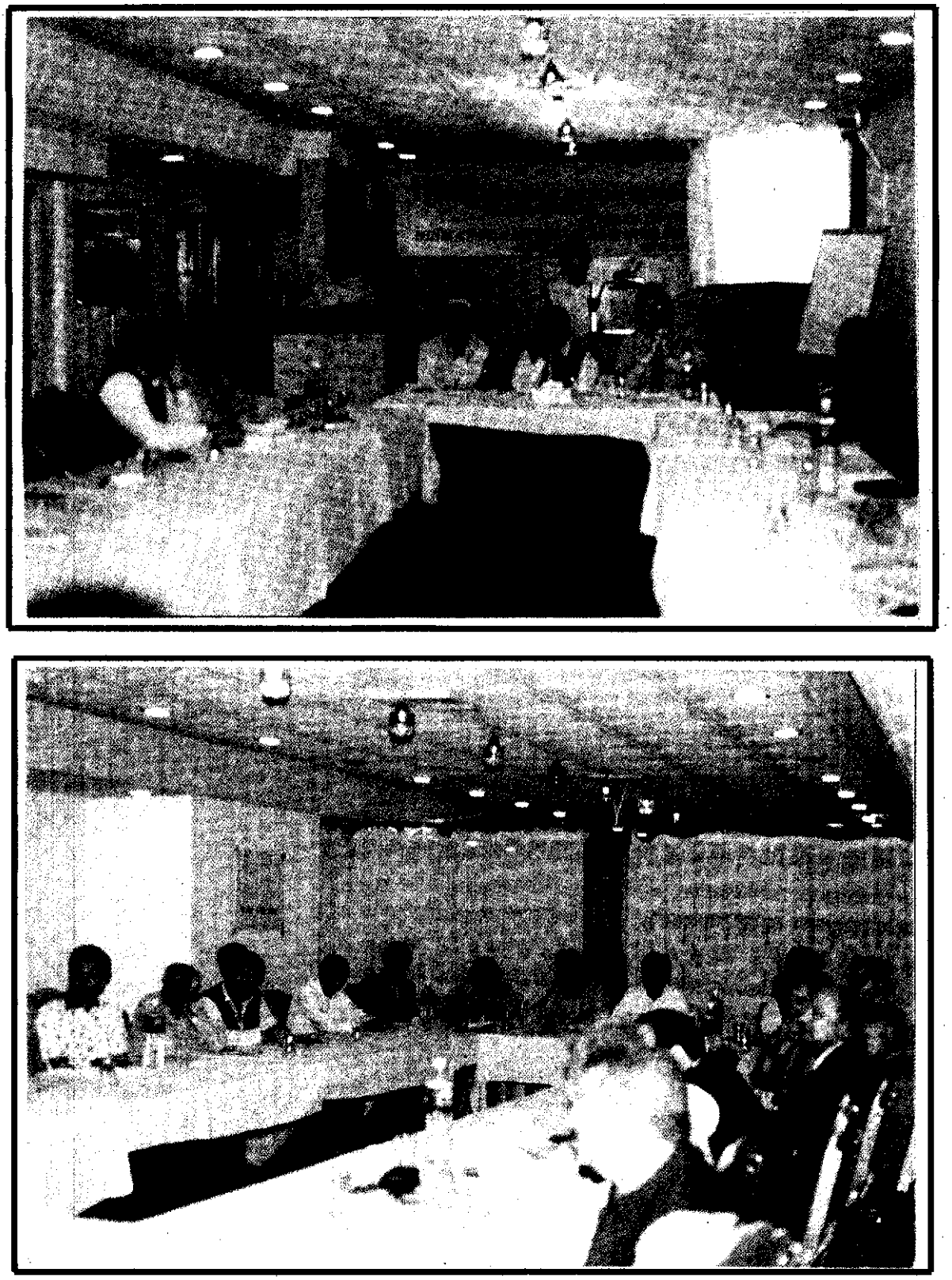
3.2 Appropriate Pilot Sites

The effort put into this activity paid dividends. A fair amount of time was spent in collecting field information regarding a number of possible sites (initially nine distributaries or minors from each of the three LBOD districts, which were then short-listed to three in each district). The project staff sought the assistance of representatives from operating agencies and carefully considered an agreed set of criteria for the short-listing of nine sites. The following criteria were adopted in short-listing the distributaries/minors:

* Number of land holders and their distribution according to size of landholding;
* Extent of political influence;
* Availability of drainage system;
* Number of lined watercourses;
* Law and order situation; and
* Distance of head and tail distributary/minor from the field station.

The details of the three short-listed distributaries in each district are given in Annex-2.

Photograph - 1



Workshop for Site Selection

Finally, a workshop held on 26 November 1995, attended by a number of senior officials from Provincial Irrigation and Agriculture Departments and the representatives of Project Consultants participated in selecting one pilot site from each of the three districts. Table 1 gives some details of the three selected pilot sites: Bareji Distributary in Mirpurkhas, Dhoro Naro Minor in Nawabshah, and Heran Distributary in Sanghar. Figure 1 gives the location map of the project area, and Figures 2, 3 and 4 give the schematic diagrams showing the layout of each of the three pilot sites.

Table 1: Information on Three Selected Distributaries/Minors.

Name of Distributary/Minor	No. of Outlets	CCA Hectares	No. of Land Owners			No. of Villages	No. of House holds	Population
			Total	Owning >40 ha	Owning <10 ha			
Bareji Distributary (Mirpurkhas)	24	5,728	197	20	109	79	1,703	10,580
Dhoro Naro Minor (Nawabshah)	25	5,353	421	17	336	147	2,468	19,822
Heran Disty Main Stream (Sanghar)	24	4,935	435	-	100	30	2,053	15,687
Khadwari Minor (Sanghar)	7	1,230	104	1	33	14	1,097	11,130
Heran Disty Total (Sanghar)	31	6,164	539	1	133	44	3,150	26,817

(Data collected by IIMI Field Teams during project inception stage)

Each of the three pilot sites was of intermediate size, having between 20 to 30 watercourses and a command area of about 5,000 to 6,000 hectares, with a manageable number of people, the total population in each pilot command area ranging from 10,000 to 25,000. The Heran Distributary in Sanghar, which has one minor (Khadwari)[2], offtakes from the Nara Canal at RD[3] 129, whereas, the Baraeji Distributary in Mirpurkhas offtakes from Nara's Branch, Jamrao East, at RD 408. The arrangements underway to remodel the Nara canal system supported the decision to select these distributaries as pilot sites. The Dhoro Naro Minor[4] in Nawabshah offtakes from a different canal system, the Gajrah Branch of the Rohri Canal, at RD 91.

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2 For data collection purposes, the Khadwari Minor is treated as a separate site.

3 Reduced distance is the distance in measures of 1000 feet of any point on the center line of a canal from the head of the canal (RD 24 = 2,4000 ft from the head of the canal).

4 The term minor is often used in the Province of Sindh to mean a small distributary, but Khadwari Minor is appropriately named because it offtakes from Heran Distributary.

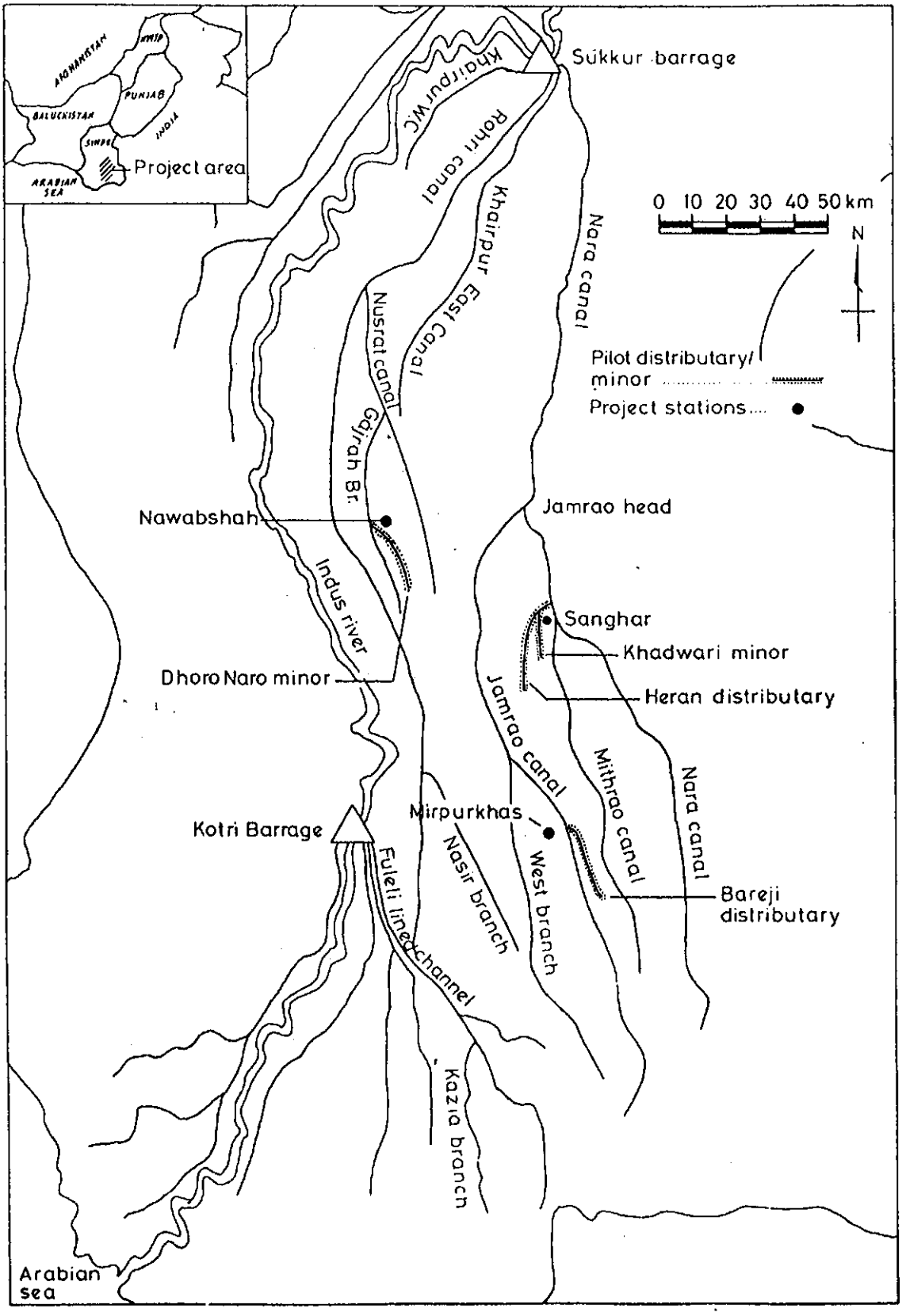

Fig.1. Location map of IIMI project area.

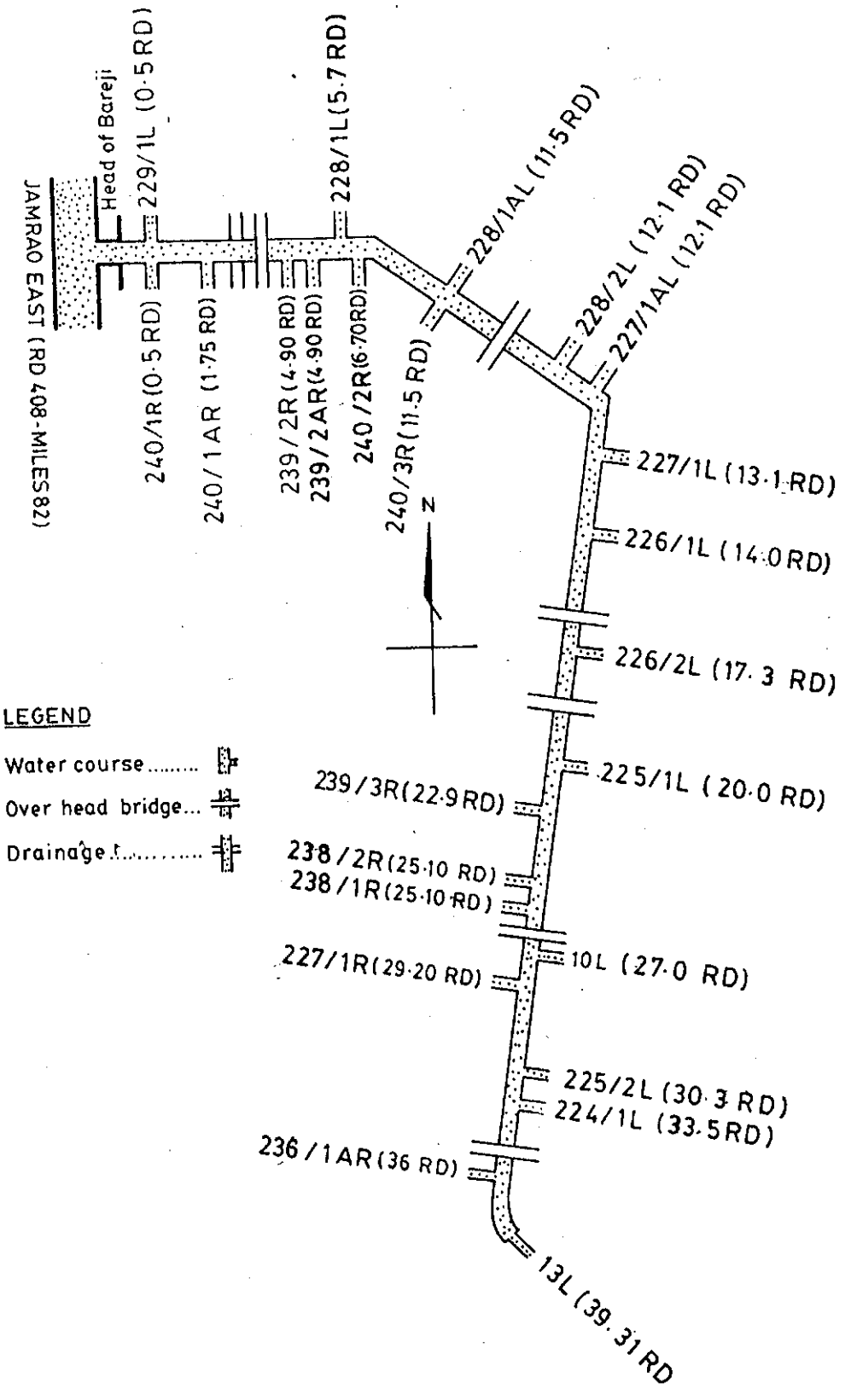

Fig. 2. Schematic diagram of Bareji Distributary

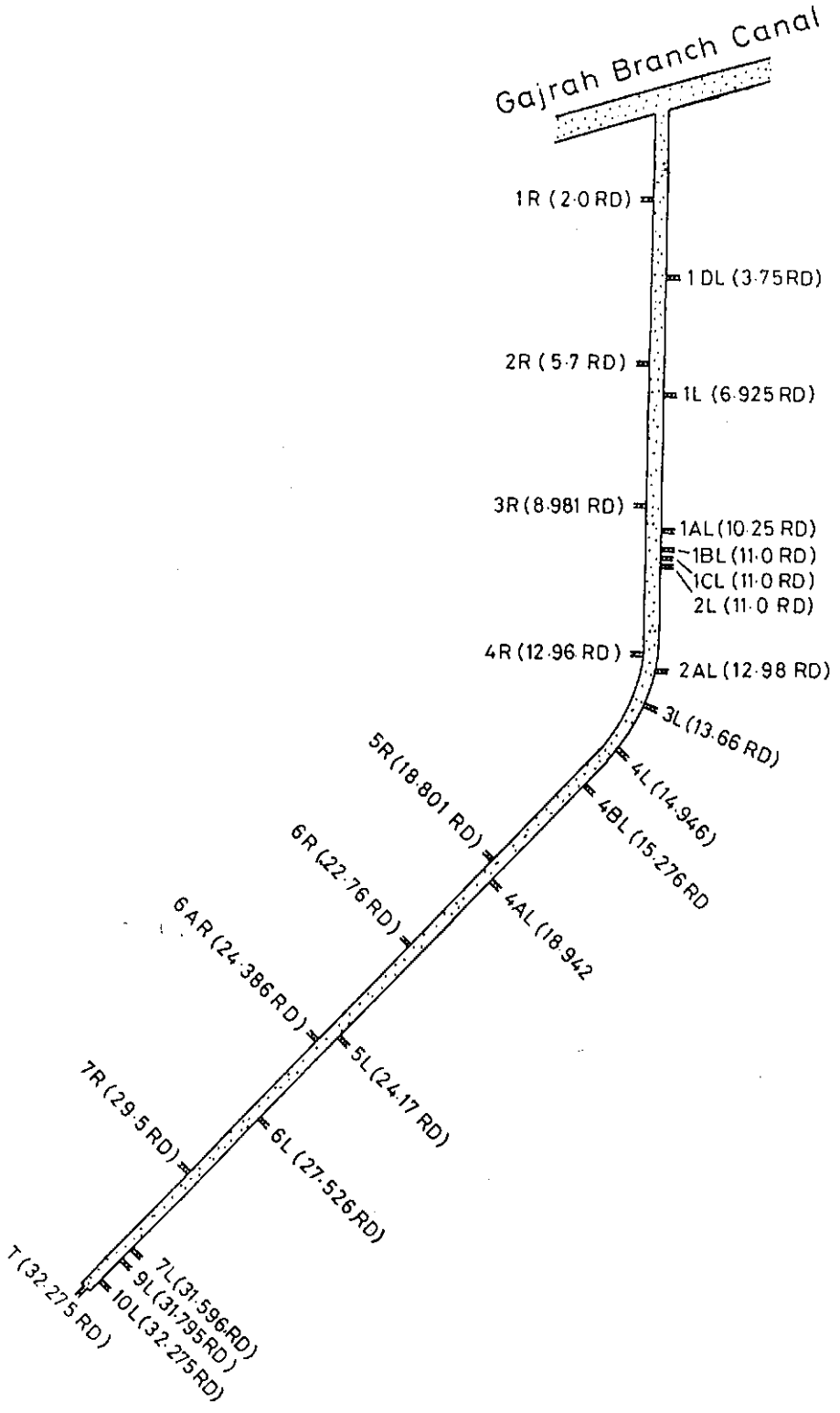

Fig. 3. Schematic Diagram of Dhoro Naro Minor

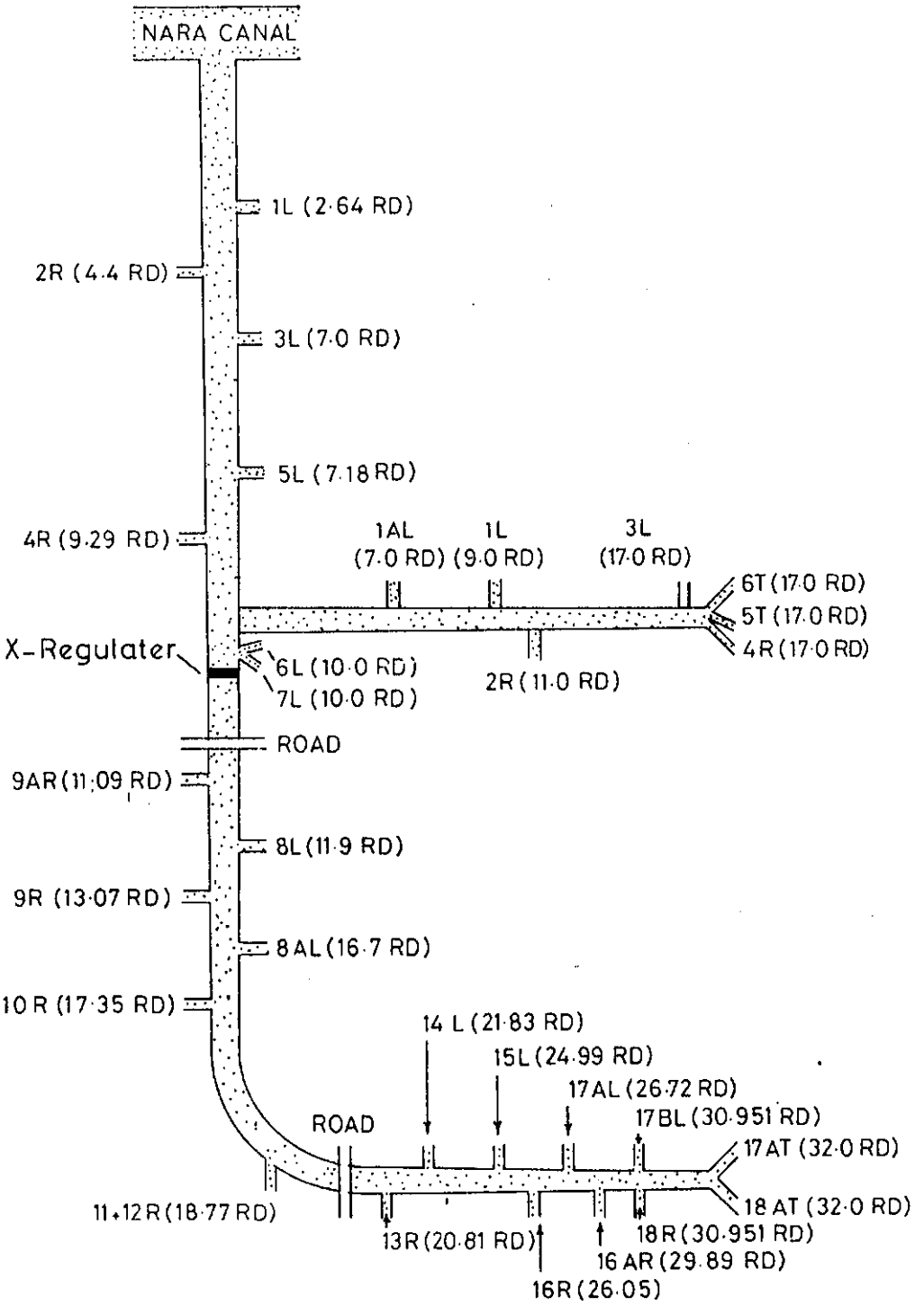

Fig. 4. Schematic Diagram of Heran Distributary.

From the perspective of community characteristics, the Bareji Distributary in Mirpurkhas was seen to be markedly different from the other two sites. According to information at this stage, it was conspicuous in its social structure; it had a high percentage of non-muslims, and a high proportion of tenants to landowners (Mirpurkhas - 787/354; Nawabshah - 190/504; Sanghar - 409/667). This peculiarity was also supported by a relatively high proportion of large landowners. Bareji command area had 10% of its landowners owning more than 40 hectares, whereas this ratio in the Dhoro Naro was 4% and the Heran command area had only one person in this category. In the overall, the selection of pilot sites turned out to be appropriate for the planned action research program. The three sites together provided an adequate representativeness that is required for a pilot project, and also sufficient variability for research purposes.

Some basic information of the three pilot sites collected by the three Field Teams in October 1996 is given in Annex-3.

3.3 Planning for a Difficult Task

Initial efforts in planning: Organizing farmers in Pakistan to undertake an economic activity in irrigated agriculture on a sustained basis was unchartered territory. Lessons needed to be drawn from experiences of other countries, and from Pakistan's own efforts in the past, including that of the On-Farm Water Management Program's water users associations and the Agha Khan Rural Support Program's village organizations.

The key members of the project staff participated in the on-going debate on participatory irrigation management in Pakistan, and attended most of the promotional events associated with it, including two EDI-sponsored seminars held in Islamabad and Murree. The initial efforts spent on understanding the context, assessing past experiences and undertaking literature reviews turned out to be very productive during project implementation[5].

Involvement of field teams in planning: Social organization in a context such as Pakistan requires that, for more effective communication, the facilitators having direct contact with the community should be the local people rather than the international

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[5] The outputs from these initial efforts, as listed in the Phase I Report, are documented in a number of project reports and seminar papers (Bandaragoda, 1994; Bandaragoda and Skogerboe, 1994 and 1995; Bandaragoda, 1995; and Ganewatte and Pradhan, 1995).

consultants. Those with "direct contact" with the community needed to be fully appraised about all aspects of the project. The success of the project depended on these intimate facilitators, and not necessarily on the conceptual framework or other project documents. A clear objective orientation among the field team members was considered essential as the water users were likely to ask them many questions in the field, which needed to be answered promptly in order to establish trust and confidence between the two groups.

To give effect to this idea, the planning activity was extended to a training phase, in which all of the field team members and their supervisors participated in planning for project activities while a number of training sessions:

* The orientation program conducted in early September 1995 provided an opportunity for the staff to clarify project objectives;

* The ten-day training at the Aga Khan Rural Support Program (AKRSP) in Gilgit was a novel social organization experience for the Field Teams' young graduates from the Sindh Province;

* The two-day training program by the Water Resources Research Institute (WRRI) of the National Agriculture Research Center (NARC) in Islamabad, provided a fair understanding of the technical and institutional implications of irrigated agriculture;

* An initial training in hydraulics initiated the three field teams in the principles of water measurement;

* On-the-job-training as a follow up of the initial training related to hydraulics, measurement devices and field calibration of moghas was successful in imparting practical skills in field calibration of canal outlets and estimating seepage losses through inflow-outflow tests;

* Training on field surveys to emphasize on the concepts of sample survey design, basic principles of research methodology, organization of field work, collecting information on questionnaire through interviews, checking the questionnaires, accuracy of the data, supervision of the data collection work etc., prepared the field teams for conducting the baseline socio-economic survey; and

* Computer training provided them with the basics of different computer software to write reports, analyze data and other office and field work.

These training efforts helped the planning process as the project staff became aware of project objectives and the methods to be used for implementation. They suggested

changes which were adopted in the implementation strategies. They became active members of IIMI's broad-based social organization team.

Consultation for planning: Some individuals from the community itself, as well as from the agency staff, were consulted in planning project activities. A genuine effort was made to adopt a participatory approach in social organization, with the water users groups being consulted on each step. At times to their dislike, the water users were involved in taking difficult decisions. The selection of pilot sites was greatly assisted by the participation of agency staff, whose intimate local knowledge had to be relied upon by the project staff initially. Additionally, the involvement of the agency staff was considered essential in making this project a truly collaborative effort[6].

Dynamic planning process: The Inception Report, which became the project's main planning document, served as a framework for a continued planning process, and was constantly used as a guide in clarifying basic project concepts and preparing detailed work plans. The methodologies for social organization developed during the initial panning stage were tested, and modified where necessary, as the project progressed.

3.4 Appropriate Methodologies

3.4.1 Small Field Teams

Dictated by available project resources, the field teams at the three locations were kept at a minimum level in size. In the final analysis, this methodology paid dividends, although some difficulties were experienced in conducting project activities to meet the various time targets. Some of the main features of this strategy are mentioned below.

Strenuous, concentrated effort: At times, the five-member teams could hardly cope with the numerous field activities assigned to them. The high intensity of field activity was caused by the progressive step-wise processes (described below), which required a cumulative effort as each new step was taken while consolidating the earlier steps, and a mutually reinforcing dichotomy of both social and technical components had to be

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[6] Initial expectations on this aspect remain unfulfilled. Lack of genuine participation by the agency officials in this pilot project is one of the most serious project constraints experienced so far.

maintained throughout. Each of the three field teams consisting of two Engineer members and two Social Organizers had to assist one another in an integrated package of field work under the guidance of a Supervisory Social Organizer. The package included field interviews, organizing and conducting small group meetings among the water users, interactions with agency staff, field measurements, keeping field notes and records, process documentation and writing reports to Headquarters at Hyderabad. All of these activities had to be done in the context of strict water delivery and cultivation schedules. When the work piled up, some priorities had to be made.

Another problem of having a small team and a tight work program was that when a member of the team went on leave, or fell sick, or left the organization, it was difficult to return to the normal work pattern quickly enough to ensure that the program of work was not disrupted. IIMI's training given to field staff and the experience they gained in the field also made them good candidates for other positions elsewhere. During the past twelve months, 6 persons out of the 15 field team members who joined the project at its inception left for other jobs, either looking for permanent government positions or for jobs in the urban sector. In all of these instances, there was a considerable time lag before the replacements could be secured.

Advantages of small field teams: In the overall, notwithstanding these difficulties, the small teams have demonstrated that:

* once the critical activities are identified through these pilot trials, the replicability of this effort is assured with the deployment of similar, or yet smaller, field teams;

* the required intensity of interest is more easily obtained through a small group working together in one place, thus avoiding the usual inter-personal and social constraints experienced when large groups of agency staff are mobilized;

* The administrative cost of mobilizing a small group, such as a five-member team, can be kept at a level that can be sustained easily; and

* Even a small group can reach a large community, provided they are able to mobilize community support for their work.

All of the above mentioned advantages of deploying a small field team for social organization auger well for the replicability of this effort on a wider scale in the future. A small Institutional Development Unit located in an appropriate provincial organization involved in providing advisory services for irrigated agriculture should be able to monitor

a broad-based program of promoting water users organizations. The use of local volunteers is considered as an essential accompanying element of this strategy.

3.4.2 Local Volunteers for Social Organization

A major methodological feature to be adopted in this action research was the deployment of community-based volunteers, referred to as "contact farmers" (Hassan et al, 1996). This was part of a strategy to assist the small field teams to reach the water users community extensively.

Selection of volunteers: The project's Inception Report conceptualized the following main criteria for selecting persons as contact farmers:

"* *The person is well informed about the area, its people, traditions, geographical details, water and land resources and generally about its irrigated agriculture;*

* *The person is non-controversial, is not known to be a trouble maker or an exploiter, nor an anti-social person in any way;*

* *The person should be able and willing to communicate freely with all sections of the local community, and also with the outsiders who come to collaborate with the local people in community development activities;*

* *The person should be motivated to help others and should see value in collective behavior for the common good;*

* *The person should have the potential for acquiring some basic training to become a community-based social organizer, and be part of our extended field team; and*

* *The person having an ability for public speaking would be an added advantage."*

Also, it was envisaged that the contact farmer should not necessarily be a "farmer leader", a "big landowner", or even a person to "represent" the water users, or a potential office bearer in any of the proposed water users organizations[7].

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[7] The idea of deploying volunteers is derived from an earlier experience in some preliminary social organization activities conducted by an IIMI field team in the Hakra 6-R Distributary in the Punjab. This study tested the use of key informants to obtain an understanding of the existing organizational status in the area, and to collect basic socio-economic data from a sample of watercourses. The results suggested that the method could be adapted

Deployment of contact farmers: This strategy, by and large, paid off. The effort in selecting them using a carefully considered criteria was a major factor in the success of this methodology. The contact farmers were identified with the help of the community itself. During the initial series of familiarization meetings, the people were asked about suitable persons to be deployed as volunteers. By the end of July 1996, field teams selected 160 contact farmers through 52 small-group meetings and individual interactions. The field teams had several formal and informal meetings with the selected contact farmers to understand each other and to collectively appreciate the project objectives and planned activities. Since the IIMI field teams had already found that it was very difficult to have direct contact with all of the water users in a command area during a short span of time, they adopted the contact farmers as an extension of their own team. Annex-4 gives the profile of the contact farmers selected from each distributary or minor command area, in terms of their education, age and tenancy status.

Higher percentage of landowners among contact farmers: There is a fair distribution of contact farmers into various categories among each of these parameters, and in terms of their location relative to the distributary and watercourse, and their age. However, in all of the three sites, the landowners form a larger proportion of the total selected contact farmers, relative to the owner-cultivators and tenants. The selection was based on the recommendations of a large number of water users who were met during the initial familiarization meetings and the baseline survey. Considering the popular choice for the selected individuals, the possible reasons for many landowners being selected as Contact Farmers, as explained in Section 4.4 of this report, are attributable to the established patterns of rural leadership.

Training for contact farmers: The training workshops organized for the Contact Farmers in each pilot area during August 1996 served the following main objectives:

i) motivate the Contact Farmers by clarifying the objectives of their roles;

ii) share with them some basic concepts of motivation, community participation and organization; and

iii) discuss the structure of the Water Users' Associations (WUAs) at the watercourse level and Water Users' Federations (WUFs) at the distributary/minor level.

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to use contact farmers for extension messages (more details in Zaman and Bandaragoda, 1996).

In all of the three pilot sites, the selected contact farmers showed up in good numbers for this training, and their attendance at this very first event was very encouraging (Mirpurkhas - 90%; Nawabshah - 80%; Sanghar - 97%). Their overall enthusiasm in the project was a pleasant surprise.

Contact farmers express their initial perceptions: The training workshops provided an opportunity to obtain the contact farmers' views on some of the project elements. Their main concerns expressed during general discussion sessions centered on the future of these proposed organizations, not on their ability or willingness to get organized. The main concerns of the Contact Farmers are summarized below.

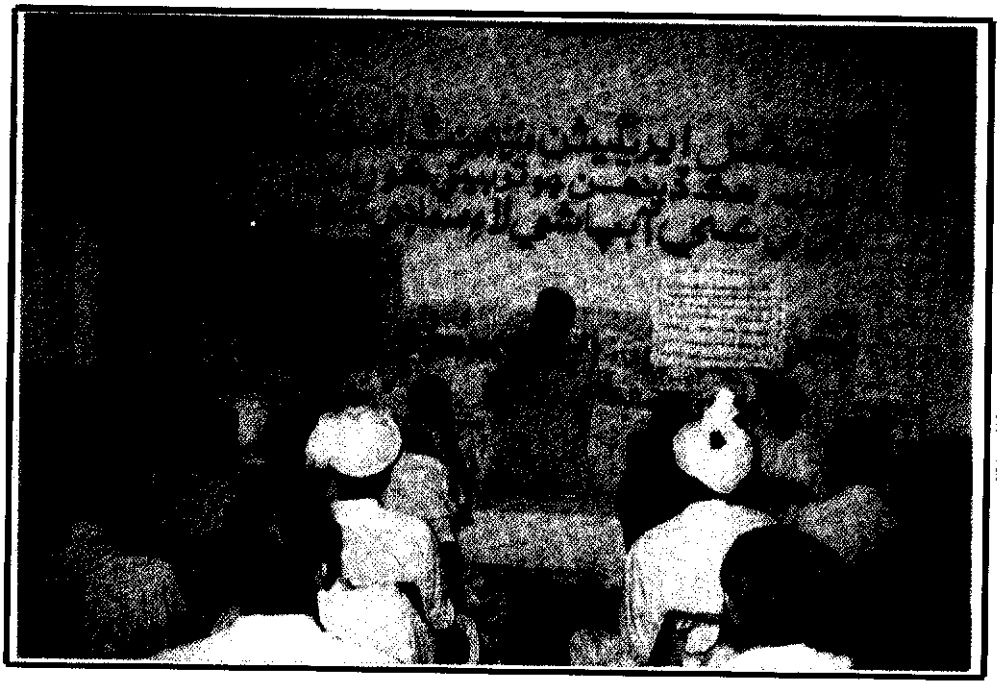
* "As water users, we have very little 'power' as compared with the bludgeoning force of the feudal lords, politicians and government officials, and therefore, trying to forge a sustainable WUF will be like taking a huge barrel uphill".

* "Similarly, IIMI does not seem to have any power either, what will IIMI do if we will fall into trouble?"

* "Who will give us the technical assistance for our work? Will it be the Irrigation Department or any other government agency?"

* "This pilot project will be a success only if bribery and corruption can be eliminated."

However, at the end, almost all of the participating Contact Farmers decided to cooperate with IIMI field teams and give this project their best try. Another clearly articulated consensus was that the tenants and short-term lessees could not be members of these proposed water users organizations because of their temporary tenurial status. The outcome of the three training workshops and their group activities are outlined in Annex-5.



Training Workshop for Contact Farmers

3.4.3 A Participatory Learning Process

This pilot project has no illusions about blueprint models in organizing farmers, and a set of pre-determined goals in this given context. For the project staff, their collaborating partners, as well as the participating water users, it was a continuous learning process. The project staff were often asked by external evaluators and observers about the social organization models being used in this instance, and also about the probability of reaching a satisfactory final outcome. A common reply was that both of these aspects would be part of the project's research outputs. All of the partners in this pilot project have now understood one of the project's important methodological features in adopting a participatory approach to learn how the water users can be organized in the context of traditionally known, and newly emerging, socio-economic constraints in the LBOD area. There is no blueprint to follow, but the project follows a "building block" process, in which the effects of going through one step enriches the knowledge and skills for taking the next step.

Sometimes, the water users have shown some frustration in this approach, and shown a preference for IIMI's field teams to take decisions and "tell them what they should do". It is understandable that a society which has been long subjected to all types of pressure from above finds some difficulty in adjusting to independent decision-making, or even to sharing of responsibility for decisions.

3.4.4 Four Phases of Organizational Development

At the initial project planning stage, the WUAs formed during OFWM efforts in the LBOD area were assumed to be able to form a federation at the distributary/minor level (see Project Proposal). The assumption was also that a federation of these WUAs would eventually be able to undertake the responsibility for operation and maintenance of distributaries/minors, interceptor drains and tubewells, as well as for cost recovery related to such functions.

However, preliminary field investigations indicated that the approach to organize water users federations at the distributary level was not going to be as easy as anticipated. Only some of the watercourses in the pilot area had experienced the formation of WUAs

sponsored by the OFWMD, and these WUAs were already defunct. Additionally, the current expectations and demands of water users in the LBOD areas seemed to exceed the externally sponsored plans to develop institutional mechanisms, such as WUFs.

People in the area appeared to be overwhelmed by problems and their own definitions of the problems they were facing, and showed little patience for listening to possible long-term solutions. In this scenario, what was considered as a prudent strategy was to take certain preliminary steps to assess the potential for changes, identify their feasible scope and content, and determine the time frame for their successful introduction. All of these were to be done collectively in close consultation with the water users.

Thus, the project chose a gradual approach, including a step-wise process to be adopted for the activity of organizing water users. The process of organization of water users was designed to be in four phases:

1. Support mobilization;
2. Initial organization;
3. Organization consolidation; and
4. Organizational action.

A flow chart of this four-phase process[8], which was provided in the Inception Report, is reproduced in Annex-6 of this report. By the end of December 1996, the project had just completed the first two phases of this iterative process. The project's experiences prompt some changes to be incorporated in this process, and a revised version of the flow chart will be prepared by the end of the project.

3.4.5 Five Dialogic Steps

Another important aspect of this iterative process was the progressively enhanced interactions in a series of meetings with the water users, which culminated in forming water users federations in the pilot areas. Adopting a step-wise approach, and building on the steps already taken, the process advances towards the group behaving on mutual trust, sharing information, consulting for consensus, developing options and

[8] This four-phase process for water users organization activities in Pakistan was adapted from the M & O guidelines given in Skogerboe et al (1993).

implementing an appropriate organization design. Since the interactions were initially between the catalysts and the water users, the stages of this iterative process of social organization was named "Dialogic Steps".

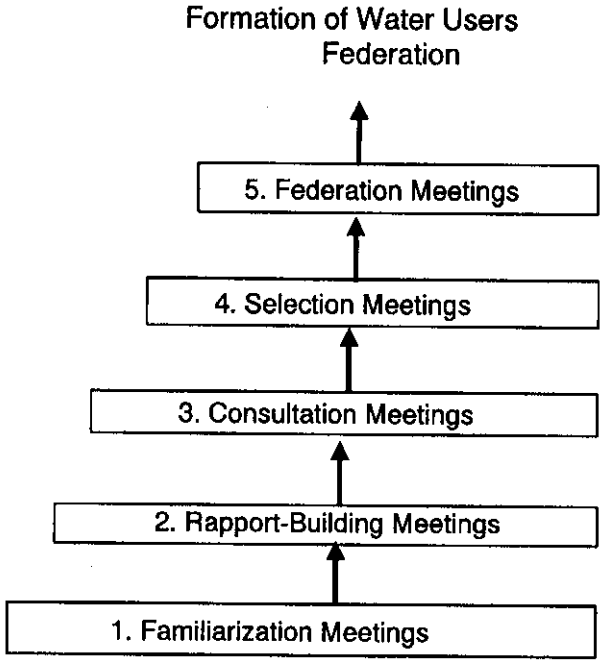


Figure 5. Five Dialogic Steps in the Iterative Process for the Social Organization of Farmers.

First, as an entry point, the field teams started the **"familiarization meetings"** to get to know the area and the people in general, and to introduce the purpose of their visit to whomsoever they met in the command areas, the idea of the pilot project and its proposed activities. Information for preparing the population frame for the base-line survey was also collected during these visits, and peoples' recommendations for the selection of volunteers (Contact Farmers) were also obtained during these initial interactions.

As a **second step**, a series of **"rapport-building meetings"** were conducted, to meet with the identified Contact Farmers and other water users in small groups. The main purpose was to explain the objectives, status and programs of IIMI and build up fellowship with Contact Farmers and their colleagues. These meetings helped in clarifying the project objectives and testing the initial community reactions regarding the

need to have organizations. A total of 61 meetings were held for this purpose (Mirpurkhas - 27; Nawabshah - 18; Sanghar - 16).

The **third step** in social organization was to conduct a series of **"consultation meetings"** (a total of 79 meetings were held: Mirpurkhas - 24; Nawabshah - 25; Sanghar - 30). The main purpose of these meetings was to consult the water users for developing tentative plans for establishing water users organizations. The meetings were to be in groups larger than those used for "rapport-building" meetings. At these consultation meetings, an understanding was reached regarding the next series of meetings to identify organizational leaders (office bearers).

Among the series of meetings with the water users, the consultation or planning meetings formed a crucial step in the social organization process. In following an iterative "building-block" process, with one step leading to the other generally, the consultation meetings were limited to the purpose mentioned above, but as consultation with the water users required that they knew the project objectives clearly, these meetings were also used as a follow up of earlier rapport building meetings to clarify any doubts or misunderstandings among the people regarding the program. To ensure better participation, IIMI staff and the respective Contact Farmers had planned to convene these meetings at each watercourse separately.

The agenda for the consultation meetings was usually divided into three broad phases:

Introduction of objectives for the meeting by IIMI staff;

Discussion where the water users were encouraged to play a dominant role, and IIMI staff played a facilitating role; and

Conclusion where IIMI staff clarified the emerging issues in terms of the pilot project's objectives.

Consultation proved to be an essential element of a participatory action research approach. The meetings were conducted in such a way that the water users had enough opportunity to give their views and suggestions. **In this methodology, the participant was treated as an active subject, not a passive object of research.**

These meetings were useful for the participants in realizing of project objectives and were generally productive, as they tackled only a few topics of direct relevance to the

main purpose of consultation. The main topics that were discussed and negotiated at these meetings were:

* Membership of WUAs and WUFs;
* Organizational structure; and
* Procedure for identifying organizational leaders (office bearers).

At these consultation meetings, IIMI's field teams contributed by highlighting, as desirable features of a procedure for election or selection of office bearers, the importance of ensuring equal opportunity for participation, and that there could be a negotiation process, which should necessarily be done in a democratic style.

These meetings also served as a useful follow up of earlier rapport building meetings; many questions were asked and clarifications made regarding the program and its objectives. The meetings were held as per a schedule agreed with the Contact Farmers, but, at some watercourses, more than one consultation meeting had to be convened to ensure the maximum participation and understanding among the water users. During the consultation meetings, the water users identified the following main concerns:

- After the formation of WUAs, water users may get only the sanctioned discharge, and not the existing discharge from the distributary/minor.

- Water rates may increase.

- Due to increase in population, everyone tries to cultivate all of the available land, and therefore, the farmers do not observe the cropping intensities designed at the time of construction of Sukkur Barrage (1932).

- Some of the farmers are irrigating their lands using lift machines because the bed level of the distributary/minor is lower than the mogha and the fields. There are other similar acts against the normal operational rules. What will be the situation after formation of WUAs?

The consultation meetings also proposed a structure for the WUAs at the watercourse level and the federation at the distributary/minor level. Almost all of the meetings came up with a similar structure for the WUAs and their federations. The Contact Farmers, who had initially consolidated their ideas at the training workshops, led the discussions.

In the **fourth step**, a series of **"selection meetings"** were conducted for the purpose of discussing the process for selecting or electing organizational leaders at the watercourse level. After clarifying the elements of a democratic method for this purpose, a series of meetings were held for each watercourse to select the organizational leaders.

The water users at each watercourse met separately to elect or select the organizational leaders for the WUAs, on the basis of one WUA for each watercourse. While IIMI field staff acted as facilitators, these meetings were convened by the Contact Farmers, and the minutes of the meetings were recorded by appropriately selected WUA officials. This process was completed in October 1996. In all, 80 Water User Associations (WUAs) were formed (24 in Mirpurkhas, 25 in Nawabshah and 31 in Sanghar).

The positive role played by the Contact Farmers in organizing these meetings was commendable; they informed water users about the meetings going from door-to-door, or by announcing through the village mosque's loudspeakers. The time and venue of these meetings were decided to suit the convenience of water users. Mostly, they preferred the meetings after sunset. A representative from the OFWM Directorate participated in almost all of the meetings.

At some places, field teams faced the problem of non-availability of an adequate number of water users at the assigned time for the meeting in the first instance, in which case the meeting was postponed for another time. The field teams also had to confront some negative propaganda against the program by some unknown persons. The probability of these developments being linked to the competition among water users for offices can be high. Table 2 indicates the level of participation in various organization activities, which shows that there has been a progressive improvement in the participation rates.

Table 2. Participation Rates in Various Activities.

Pilot Site	Total No. of Water Users	At Rapport Building Meetings	At Consultation Meetings	At Selection Meetings
Mirpurkhas	354	103 (29%)	206 (58%)	256 (72%)
Nawabshah	504	71 (14%)	253 (50%)	266 (53%)
Sanghar	1076*	133 (12%)	552 (51%)	686 (64%)

* Includes some tenants whose names appeared in the recently constructed warabandi lists.

As a final and **fifth step** in social organization, the **"federation meetings"** were held to initiate the identification of office bearers for the pilot WUFs. During these interactions, they were encouraged to select the watercourse nominees, who would form the general body of the federation in each pilot area. Generally, each watercourse nominated two representatives (mostly from among their respective WUA office bearers) for the WUF.

Once the watercourse nominees were all identified in the pilot area, opportunities were given for them to meet and get to know one another well. Finally, meetings of these nominees were held for each pilot site to select the office bearers for the WUF.

By this stage, all who assembled at their respective meeting places knew fairly well the purpose of their organizational effort, and the tasks ahead of them, and the selection of WUF office bearers was relatively an easier task than selecting WUA office bearers. However, the enthusiasm among the participants had risen to such great heights that the genuineness of their participation was quite visible at these meetings. Table 3 gives some information on the nomination process.

Table 3. Nomination of Members for the Assembly of WUFs.

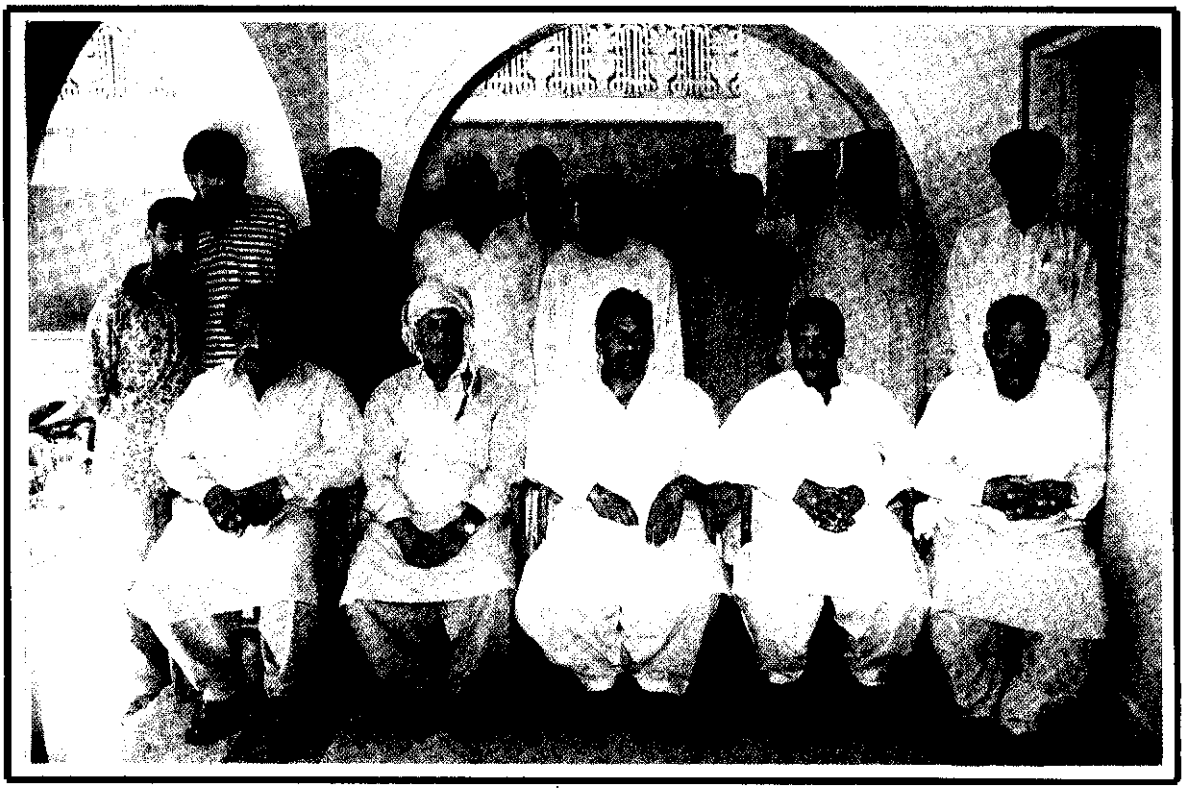
Particulars	Distributary/Minor		
	Bareji Distributary (Mirpurkhas)	Dhoro Naro Minor (Nawabshah)	Heran Distributary (Sanghar)
No of Watercourses	24	25	31
Members of Executive Committee of WUAs	116	195	239
Meetings Conducted for Nomination	24	25	31
Members Participated in the Nomination Meetings	82 (71%)	102 (52%)	161 (67%)

Information regarding the selected WUA nominees for WUFs is given in Annex-7. and an analysis of their background is detailed in Annex-8.

The nominees met together to select the office bearers of the three WUFs. The meetings were meticulously planned in consultation with members of the WUFs and the Contact Farmers. The nominated WUF members of the Sanghar pilot site met on 26 November 1996. In an unprecedented enthusiasm, out of 62 members, 60 (96%) participated in this meeting. This was followed by the other two pilot sites, which met in December 1996, and all of the three sites were able to successfully complete the formation of WUFs as planned.

Oath Taking By
New Office Bearers of Dhoro Naro and Bareji WUFs

Photograph - 4



Office Bearers of
Heran Distributary WUF with IIMI's Field Team

3.4.6 Collaborative Activities

A series of activities, mostly designed to bring some extension services to the water users community, helped to build their trust in the field teams and also to keep their motivation at a high level. This effort was basically to catalyze the social organization process, and included a number of activities that involved government service delivery organizations, such as agriculture extension, health, veterinary science and forestry, and also private sector input suppliers.

The social organization process described above is depicted in the diagram givenbelow.

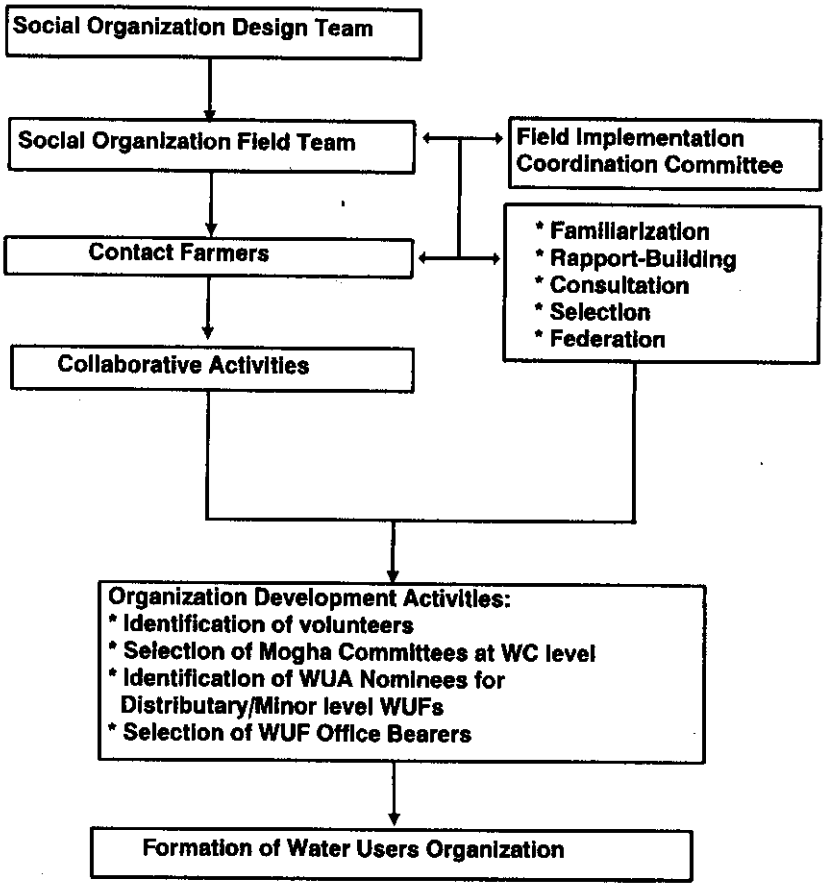


Figure 6. Social Organization Process for Establishing Water Users Organizations.

4. THE SOCIAL CONTEXT OF PILOT EFFORTS

The social organization action research activities outlined in Section 3 above need to be considered in the social context in which they were accomplished. For this purpose, the project provides data from the following different sources:

(1) Reconnaissance surveys conducted by the three Field Teams during October/November 1995 for the purpose of selecting pilot sites;

(2) Socio-economic baseline survey conducted during February-April 1996;

(3) Background information on the selected contact farmers, collected during rapport-building meetings in June-July 1996; and

(4) Background information on the selected organizational leaders, collected November/December 1996.

The information from the first source was already outlined in Section 3.2, and some details are given in Annex-2 and Annex-3. Similarly, a brief reference was made to the third source in Section 3.4.2, and details are given in Annex-4. A more detailed analysis of the important social characteristics emerging from items (2) and (4) seems useful at this stage.

In terms of methodology, it is important to emphasize that the socio-economic baseline survey results and the subsequent background information on the selected organizational leaders are derived from two different samples of water users in the pilot areas. The first sample was drawn from the actual irrigators, irrespective of their tenurial status, whereas, the second sample was from among the persons who were identified by the water users as their representatives for holding organizational positions in the WUOs. The latter group included only a few tenants, as the general consensus was that the tenants, because of their temporary tenurial status, were not suitable to hold office in the WUOs.

4.1 The Average Water User

For the baseline survey, the sample of water users (526 in number) were randomly selected from 30 out of a total of 80 watercourses from all three pilot sites[9]. The water users for the purpose of this survey were the persons engaged in the actual use of irrigation water as indicated in recently developed agreed warabandi lists prepared by the field staff, and therefore, included the land owners (who were also actual irrigators), lessees and tenants. According to this survey, the average water user in the pilot area can be identified with the following features:

* The average water user in the pilot areas is about 40 years old (the mean age being 37, 43, 47 and 43 years at Bareji Distributary, Dhoro Naro Minor, Heran Distributary and Khadwari Minor, respectively), and has over 20 years of experience in irrigated agriculture;

* Only 7.4% of them are single persons, and the mean number of family members per household is generally high (7.5 at Bareji Distributary, 12.8 at Dhoro Naro Minor, 9.5 at Heran Distributary and 12.9 at Khadwari Minor);

* The majority of water users (64%) are illiterate, but there are a few water users (5.5%), who had proceeded to the college level [in the Mirpurkhas and Nawabshah sites, only a few members in the family are the school going children, the number per family being 0.8 (11%) at Bareji Distributary and 1.7 (13%) at Dhoro Naro Minor, whereas the proportion in Sanghar is more, 2.5 (26%) at Heran Distributary and 2.6 (20%) at Khadwari Minor];

* In the Nawabshah and Sanghar sites, almost all of the water users are Muslims, but at Bareji Distributary in Mirpurkhas, 56 percent are Non-Muslims (these are mostly the Hindu tenants);

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[9] Although there are only three pilot sites, Bareji Distributary in Mirpurkhas, Dhoro Naro Minor in Nawabshah and Heran Distributary in Sanghar, the baseline survey analysis was done in terms of four sites considering the Khadwari Minor which offtakes from the Heran Distributary as a separate site for this purpose.

* The water users' behavior leads to an increasing equity in water distribution as the evaluation shifts from the branch canal through the distributary/minor to the watercourse. Many do not know much about the situation within the branch (inequity between the distributaries), but generally acknowledge the problem of higher inequity within the distributary (between the watercourses), compared with the situation within the watercourses;

* A large majority (about 90 percent) of the water users neither purchase nor sell water turns in both the seasons (similarly, the practice of stealing water from the watercourse during somebody else's water turn is rare);

* The organizational behavior among the water users is found to be satisfactory at all three pilot sites, particularly as reflected in their contribution towards the maintenance of watercourses;

* Only at the Sanghar sites did the respondents refer to the previously established WUAs (about 88 percent of the water users in the Heran Distributary area and 30% in its Khadwari Minor area acknowledged the existence of WUAs), but the peculiarity in the Heran Distributary is understandable as 22 out of its 24 watercourses are lined by the OFWM program;

* While most of the water users acknowledge that there is no association of any kind in their villages, they agree to have a Water Users Association at their watercourse and show their willingness to contribute for operation and maintenance at the distributary level;

* The majority of the water users have some knowledge regarding the need for organization towards development work and are willing to work with the people for community development;

* In Bareji Distributary, Dhoro Naro Minor and Heran Distributary, the majority of the actual water users are tenants, whereas at Khadwari Minor, the majority are owner operators;

* The size of the operating holding of the average water users is 3.0 hectares at Bareji Distributary, 5 hectares at Dhoro Naro Minor, 7 hectares at Heran Distributary, and 8 hectares at Khadwari Minor; and

* The average water user owns 2 hectares at Bareji Distributary, 3.5 hectares at Dhoro Naro Minor, 3.6 hectares at Heran Distributary, and 6 hectares at Khadwari Minor.

4.2 The Average WUA Executive Committee Member

All of the water users in each watercourse participated in the process of selecting office bearers for the watercourse level water users associations (WUAs). In all, 550 persons were selected as members of executive committees of 80 WUAS. This number includes 80 Presidents, 79 Vice Presidents, 80 General Secretaries, 53 Joint Secretaries, 80 Finance Secretaries and 178 Committee Members, who represent a total of 1525 shareholders in the three pilot sites. Details of the 550 office bearers are given in Annex-9.

- The average individual landholding of the 550 office bearers is about 34 acres (standard deviation - 52 acres; minimum - 1 acre; maximum - 560 acres). The average landholdings of office bearers in each of the three pilot sites Bareji Distributary, Dhoro Naro Minor, Heran Distributary are 46, 40 and 23 acres, respectively.

- Of the 550 office bearers of WUAs, 157 (29%) possess their land at the head reach of the watercourse command area, 204 (37%) at the middle reach, and 189 (34%) at the tail reach. Of course, among the 550 persons, there are representatives from each of the total 80 watercourses of the three pilot distributaries/minors.

- In terms of the tenancy status of the 550 office bearers, 269 (49%) are landowners, 198 (35%) owner-operators, 14 (3%) lessees, 41 (8%) tenants and 28 (5%) kamdars (managers appointed by the landowners).

- For all cases, the mean age of the office bearers of WUAs is 40 years (std. dev - 12 yrs; min - 16; max - 70), whereas for Bareji Distributary, Dhoro Naro Minor and Heran Distributary separately, the mean age is 40, 39 and 42 years, respectively.

- The mean family size of all office bearers is 11 (std. dev.- 8). The mean number of family members in the Mirpurkhas site is 8.7; in Nawabshah, the mean family size is 10.6; in Sanghar, the Heran main distributary site has a mean family size

of 8.9, whereas the value for its Khadwari Minor is 15. This item of information will be further studied in view of the high maximum numbers in each site, as the reported number could include, in some cases, all members of an extended family.

- Of the 550 office bearers, 142 (26%) are volunteer social organizers (contact farmers) already identified by the water users for assisting the project.

- About 32 percent of office bearers in all three pilot areas have completed their primary education; 27 percent have gone up to matriculation education; 24 percent have achieved either the Intermediate level or above. Only 17 percent of the office bearers are illiterate.

- The mean annual income of 548 office bearers (2 did not respond) is Rs. 89,917 (minimum - Rs. 5,000; maximum - Rs. 3,500,000). The data further shows that about 30 percent of the office bearers are receiving an income between Rs. 5000-25,000, whereas another 34 percent of office bearers are in the income group of Rs. 26,000 to Rs. 50,000. About 16% receive Rs. 100,000 to Rs. 350,000.

- Data were analyzed with regard to incomes of various position-holders with a view to ascertaining whether richer persons were selected for more important positions. The mean annual income of 79 persons selected as Presidents was found to be Rs.219,683, a very much higher income compared with the overall mean income of Rs. 89,917 for 548 office bearers of all positions. The 57 landowners gaining the position of President have a mean income of Rs. 261,614, and 1 lessee selected as a President has an income of Rs.1,500,000, whereas the 16 owner-operators, 4 kamdars and 1 tenant, who were selected as Presidents, have a mean income of Rs. 42,375, Rs. 61,250 and Rs. 20,000, respectively. Only 32% of all 79 persons selected as Presidents are in the highest income group of over Rs 100,000.

- As expected, the majority of the selected Presidents (about 70%) are landowners. The majority of the landowners who become Presidents, Vice Presidents and Finance Secretaries are within the income of Rs.100,000 - 500,000, whereas the majority of the landowners who hold the positions of General and Joint Secretaries are in the Rs.26,000 - 50,000 income bracket.

- The Presidents who are landowners, on the average per person, own 62 acres of land; owner-operators have a mean holding size of 19 acres, and the lessee (only one case) has 312 acres of land. The tenant who is a President has no land, although some of the tenants holding other different positions do possess some land at another distributary/minor.

4.3 The Average Nominee for WUF Membership

The WUA office bearers, in consultation with the general membership, nominated two water users from each of the 80 watercourses to be members of the three water users federations (WUFs) for the three pilot distributaries/minors. Since these nominees formed the general body for each WUF, and from among them the WUF office bearers were selected, it was useful to study the background of the persons being nominated. A few items of a profile of these nominees are given below. More details are given in Annex-8.

- A large majority (95 percent) of these nominees for WUFs have their schooling of five years and more. About 37 percent have a college education.

- More than 40 percent of the nominees have an average annual income up to Rs.50,000, whereas 30 percent have an average annual income more than Rs.100,000.

- The overall mean age of the nominees is 39 years.

- The overall mean number of years of experience in irrigated agriculture of the nominees is 16 years.

- Most of the nominees are holding various positions in their own watercourse WUAs, whereas only nine percent hold no position in the executive body of their respective watercourses.

- The majority (69 percent) of the nominees are landowners in the command area and 22 percent of nominees are owner-operators, whereas only 3 percent of nominees are tenants, 3 percent are lessees and another 3 percent are managers (Kamdar).

- The overall mean landholding by the nominees are 53 acres of land.

- The data show that half of the nominees have been associated with IIMI as Contact Farmer volunteers, identified during the first quarter of 1996.

- The overall mean number of family members per household of these nominees was found to be 12.

The project's participatory approach encouraged the water users to give consideration to many aspects of a fair distribution of power, and the election or selection process was totally democratic and was finalized on a consensus basis. Despite the apprehensions of many at the beginning, the selection of office bearers was completed without any serious obstacle from traditional social problems. Background information on the selected WUF office bearers and the members indicates that the individuals chosen by the water users as office bearers appear to have been selected mostly on the basis of their social behavior, instead of their status in terms of land-ownership and political influence.

Water Users Show a Positive Response to Queries by a Visiting Donor Mission

5. EMERGING ISSUES ON SOCIAL ORGANIZATION

5.1 Community Perceptions

Misinformation: Project activities were plagued by intermittent rumors and misinformation, sources of which were never clearly identified. The activities involving calibration of outlets and other structures served to cement some of these rumors that IIMI is a foreign company, which has taken over management contracts for three distributaries in the LBOD area under the sponsorship of the World Bank. Fortunately, persistent interactions with the water users by the field teams helped to dispel some of these misconceptions. The task of completing the trust-building process now depends on a counter move to use farmer-to-farmer information exchange.

Uncertainty: The conspicuous absence of the Provincial Irrigation Department representatives in participatory activities launched by the project caused a daunting fear and uncertainty among the water users. Will the WUFs ever be able to gain access to the distributary level management of O&M as envisaged in the project? As a result of their participation in these pilot efforts, will the water users in the pilot areas be penalized in some way by the PID officials? Particularly, they were very worried about the possibility that the PID would reduce the present discharges to the three distributaries or minors. Valiant attempts by IIMI to bring PID on board were not fully successful during Phase II of the project. These attempts are continuing and pursued with vigor. Both the PID staff, as well as the water users, are aware of the developing uncertainties due to proposed institutional reforms being promoted by the Federal Government and the donors. Although PIDA laws have been drafted (now promulgated), no serious action has so far been taken to implement them, and this apparent lack of clear commitment at the Provincial level adds to the uncertainty among the people.

Coalition of interests: Meanwhile, new alliances appear to be getting established between some large landowners and agency staff. Often, the role of the rural-based PID staff, such as the Patwaris, has been to foster these alliances. The pilot project addressed this issue directly at some of the grass-root level meetings, suggesting that the project interventions are limited to the pilot trials on users organizations, and not involved in PID-PIDA reforms. However, the rationale for long-term institutional solutions to chronic field level problems was explained during these meetings. This issue on the lack of institutional support for the on-going pilot efforts on farmer-managed irrigated agriculture needs careful consideration.

5.2 Water Rights and WUO Membership

Among many factors that should combine to make irrigation systems functional, water rights play a very important role (Perry, 1995; Merrey, 1993). In all of the three pilot areas, a clearly defined system of water rights does not seem to exist. Although warabandi schedules would have been in practice some time ago, at least during the past couple of decades, the water users have not strictly applied an equitable warabandi water allocation pattern. The project staff, with the assistance of the volunteers and WUA office bearers, have started to construct warabandi schedules as practiced today, on the basis of information provided by the water users themselves.

Closely connected with the water rights is the issue of legal membership for the proposed water users organizations (WUAs and WUFs). **The present "Sind Irrigation Water Users Associations Ordinance (1982) allows any water user to be a member of the WUA, and defines the water user as "a person who enjoys the facility of irrigation water from a watercourse for the agricultural land owned or possessed by him, in case more than one person jointly own or possess the land, any one of them authorized by the others to act on their behalf".** This definition is so wide that it includes absentee landlords, non-cultivator landowners, owner-cultivators, managers (kamdars), lessees and tenants. The status of tenants calls for a more precise definition of WUA membership which arises in Sec.4.3 below.

5.3 Status of Tenants

During the project's consultation meetings, a wide cross-section of the various groups of water users unanimously decided that the tenants could not be members of these organizations. The reasons adduced for this strong view were that the tenants were deployed on a very temporary basis in the Sindh Province, they could not take effective decisions on irrigation or agricultural production and that they would be unable to effectively mobilize resources for the WUOs. As the tenants were basically acting like agricultural labor, the water users preferred to allow WUA membership only to the landowners or their managers (kamdars), and the owner-operators.

While the new WUAs and WUFs have been formed on the basis of this consensus, the project staff's attempts to explain the desirability of tenants' participation in the organizations resulted in some WUAs accepting the tenants as members and even co-opting them as Committee Members in the Executive Committees. Although the value

base underlying the pilot project was clearly in favor of bringing the tenants into the main stream of decision-making, the participatory approach adopted by the project prevented a normative model being forced on the water users.

As the November 1996 MPR reported, a major achievement of the project was the fact that the water users were gradually relaxing this rigid attitude towards the tenants as the dialogic interactions continued between them and the field teams. Table 4 shows the final outcome of the selection process in which at least a few tenants have been selected as WUA office bearers, covering every position.

Table 4. Tenancy Status of WUA Office Bearers.

	P	VP	GS	JS	FS	CM	Total(%)
Landowners	58	43	43	20	44	61	269(48.9)
Owner-Operators	16	32	26	27	25	72	198(36.0)
Lessees	1	1	4	0	2	6	14(2.6)
Tenants	1	1	3	3	2	31	41(7.5)
Kamdars	4	2	4	3	7	8	28(5.0)
Total	80	79	80	53	80	178	550(100)

P=President; VP=Vice President; GS=General Secretary; FS=Financial Secretary; JS=Joint Secretary; CM=Committee Members

5.4 Role of Landowners

Table 4 given above also shows that, predominantly, the landowners have been chosen as WUA office bearers. Interestingly, they have secured more of the positions of higher authority, such as President, General Secretary and Vice President (this is the order of value attached by the community, generally).

As mentioned earlier, the village leadership is already established. Consequently, most organizations in any village tend to offer leadership roles to the same group of people. It depends on the ability of some resourceful persons to gain general acceptance of the people. In some instances, some families have enjoyed this leadership for generations, and have their "follower banks". However, this traditional tendency seems to be polarizing a countervailing effect among an emerging group of rather radical people (mostly the youth), who wish to behave independently and hope to build up broad-based rural organizations. Although a small group, they present a logic in their arguments that seems to attract attention of an intermediary group. In open discussions and meetings

held according to democratic norms, the rigid role of the large landowners appears to be getting gradually softened. The greater voice heard during field meetings generally was clearly against officials' corruption and big landowners' exploitative behavior, and it is very likely that the notoriously anti-social elements have not been selected as WUA office bearers. The fact that the office bearers represent the overall population augers well for a progressive organizational development.

A profile of WUA office bearers prepared on the basis of information collected during November 1996, shows that very large landowners, or persons of the highest income bracket, are not necessarily selected for offices. It appears that the people have looked for other leadership qualities as well, and particularly for demonstrated honesty and a willingness to undertake community welfare work.

5.5 Gender Relations

During the last JRM meetings, the role of women in the proposed water users organizations was raised as an issue. It was pointed out that, while the project staff would take a very sympathetic view of this issue, the project had not been designed to exercise a positive discrimination for women's participation as members of these organizations at their very inception. Rather, the strategy was to encourage the new organizations to introduce programs tailor-made for women's participation in the organizations' action plans and to introduce women's organizations. This strategy was discussed in some meetings, but was not taken as a step of high priority when some sections of the community tended to see it as an erosion into their traditional value system. As the most difficult stage of social organization for distributary level irrigation management has now been passed, this issue will be taken more thoroughly during the next phase of organizational development.

5.6 Project's Approach to Avoid initial Controversies

While the project recognized the above mentioned issues and attempted to give effect to some expectations, it also had to endeavor to avoid precipitating direct conflicts between the project staff and the water users, and among the water users themselves. Emphasis was given to the most immediate task of organizing the water users to undertake O&M management. All sections of the water users community were involved in the iterative series of meetings in which the project objectives, the process of selecting organizational leaders, and the importance of selecting the most suitable persons as

organizational leaders were discussed. An effort was made to offer equal opportunity to all water users to select their leaders without bringing about an open conflict between these groups. Generally, a consensus selection process was preferred over an election by ballot. The cautious effort in "social engineering" was to avoid conflicts based on traditional family or political-party rivalries, and avoid treading on sensitive issues. With the final step of forming three federations, the experience of the pilot project suggests that the iterative process in developing relationships and having interactions with the community has been a very productive strategy. To clear initial cultural impediments, the field teams benefited by proceeding slowly, but steadily, in the process of trust-building, allowing sufficient time for farmers to air their views, understand the need for change, and identify the genuineness of outsiders interacting with them. The field teams played their catalytic role fairly well.

5.7 Institutional Support

The proper functioning of the water users organizations (WUAs and WUFs) will depend on the government's ability and willingness to provide adequate institutional support to these fledgling organizations. The project staff are endeavoring to have at least a tentative enabling legal environment established for the pilot projects. The leverage IIMI has in this regard is not sufficient to forge an early breakthrough in securing the needed policy and management support from the relevant authorities.

In most of the dialogic interactions with the water users, the field teams were questioned on the probability of securing an effective legal framework for the WUOs. In addition to some consultancy inputs from overseas, some legal advice seemed necessary in the adoption of by-laws by the WUOs. Failing to obtain assistance from a legal organization of the government, the project requested the University for help. Encouragingly, the Dean of the Faculty of Law, Punjab University obliged and agreed to study the existing legal framework and provide the necessary assistance to the WUOs.

6. TOWARDS AN ORGANIZATIONAL ACTION PLAN

6.1 Socio-Technical Linkage

The Inception Report referred to the essential linkage between the social and technical sub-systems in an irrigation system. The social sub-system always works in association with the physical or technical sub-system (obviously, the converse is also true). For instance, in a school system, the teachers and students interact with reference to a physical sub-system consisting of class rooms, labs, black boards, etc. In an irrigation system, the fields, canals, watercourses, structures, outlets, gates, etc., are essentially interlinked with the operators, water users and their organized groups. In fact, the primacy of the physical sub-system dominates the perceptions of various actors, including the farmers. This was easily evident during interviews held with the water users of this pilot project. Invariably, they showed greater enthusiasm about the physical aspects of the irrigation and drainage systems than about proposed organizations.

Considering this primacy of the physical sub-system, social organization cannot be effectively accomplished independently, or without reference to the technical aspects of irrigation management. The project experiences confirm that, normally, the rural people are not very much impressed by the outsiders who hasten to discuss their social issues. Therefore, as a strategy, the field teams tried to be well equipped with information on the technical aspects of the pilot areas, which the water users were readily willing to discuss initially. Collection of information about the water and the crop situation formed an important part of the field teams' strategy. These data collection efforts also became part of the training strategies. Walk-thru maintenance surveys, calibration of structures, and water measurement exercises were all used to train the field staff, as well as the office bearers of the water users organizations. This methodology provided a meaningful incentive to keep the water users motivated in the project, and filled a vacuum that otherwise existed due to the non-availability of substantial development funds in the project budget. More importantly, the preliminary information gathered will be useful in the third organizational development phase to prepare an Action Plan for the WUFs.

6.2 Field Calibration

As a preparatory step, a training on field measurement aspects was given to the field teams, which was also used as an opportunity to obtain some preliminary data. During

the initial monitoring of the distributaries and their outlets by the field teams, some outlets (moghas) were observed to have been damaged and the water was seen to flow through the sides and the bottom of outlet structures. Further, many other preliminary observations made during the calibration exercise hinted at the possibility that the involvement of water users in management would help them to realize the gravity of the anarchy that exists in today's irrigation environment. Given below are some of these observations.

* Almost all of the outlets were discharging more than their designed flow.

* The farmers were in the habit of opening and closing canal outlets at their own free will according to their perceived needs.

* The farmers were tampering and adjusting the outlets according to their seasonal requirements. During the summer season, they widen the outlets, and in the winter, they close the outlets by plugging the outlet structure. They requested the field teams to recalibrate the moghas accordingly.

* In an attempt to get extra water, the farmers usually lower the crest of the moghas, causing siltation problems. The farmers frequently unload the silt deposited in the head reaches of the watercourses without realizing the real cause of the problem. In a lined watercourse of the Heran Distributary, where the farmers had widened the outlet orifice, the silt accumulated was observed to be three-fourths of a foot in depth.

* Some of the moghas in the head reaches of one pilot distributary were kept closed during the night. The water would continue to flow downstream, thereby washing away the canal banks. This resulted in a considerable loss to crops and soils.

Some details of the calibration of outlets are summarized in Annex-10.

6.3 Walk-Thru Surveys

The preliminary "walk-thru" maintenance surveys of the pilot distributaries/minors and their watercourse outlet (mogha) structures were carried out during the annual canal

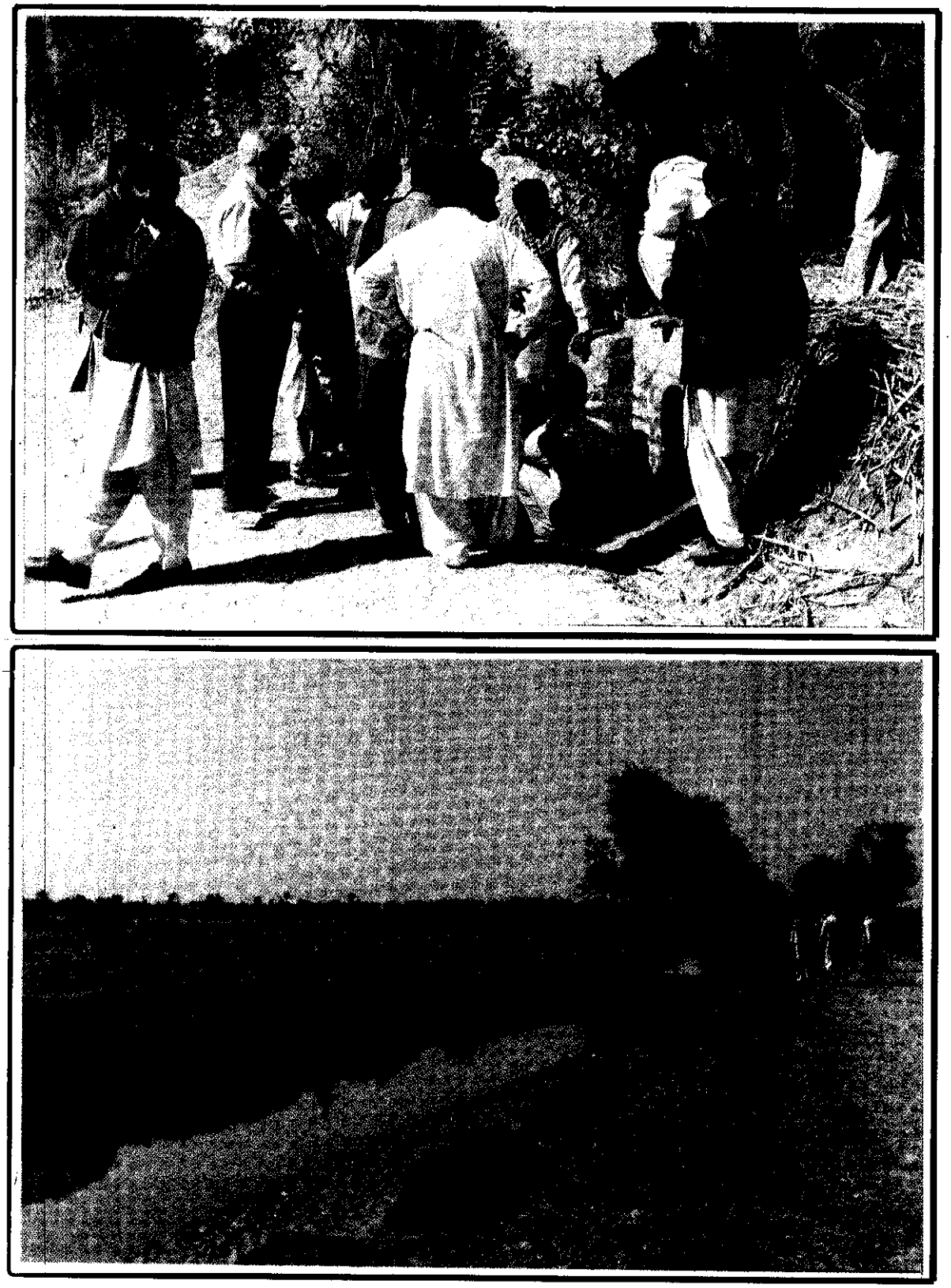
closure period in January 1996. The field teams collected information on this aspect to study the impact of maintenance problems on the desired flow conditions along the channels, as well as in the flow control structures. This information was to be used by the Field Teams and WUOs in developing their strategies for Essential Structural Maintenance (ESM) and Deferred Maintenance (DM) activities.

In the maintenance surveys, data related to permanent interruptions on the flow of water, such as leakage of water, damaged structures, and tampered outlet structures, as well as the problems which temporarily disturb the flow of water along the distributary/minor such as vegetative growth and deposition of sediment in the channels were observed and recorded. For field staff, as well as the water users, these surveys would provide a valuable maintenance and operations learning process, and would help in upgrading the maintenance of deteriorated systems and to improve the operation of these systems. Along with a similar walk-thru survey conducted in January 1997, and related monitoring of irrigation and drainage systems, the WUOs will be in a position to prepare an Action Plan to be implemented by themselves alone , or jointly with the PID. The pilot experience shows that walk-thru surveys are an excellent training strategy for all who participate in them; some learn the basics of irrigation, while others see the theory in a practical setting, and all learn about the site-specific local conditions.

6.4 Field Information on Present Water Supply and Cropping Intensities

The initial information collected by the project's Financial Analyst for the preparation of a business plan for the WUOs indicated surprisingly low cropping intensities for the Mirpurkhas pilot site, 37% for the kharif season and 25% for the rabi season. This information, which was derived from a sample of cultivators, was found to be compatible with more detailed cropping intensity data for the 1996 kharif season collected by the field staff for each watercourse in the pilot areas. The average cropping intensities for the three pilot sites are shown in Table 5.

Photograph - 6



Walk-Thru Survey

Table 5. Cropping Intensities for 1996 Kharif.

Distributary/Minor (Parent Canal)	CCA (Acres)	Cultivated Area (Acres)	Cropping Intensity (%)
Bareji, Mirpurkhas (Nara-Jamrao East)	14,381	4,399	30.7
Dhoro Naro, Nawabshah (Rohri)	13,382	7,368	55
Heran, Sanghar (Nara)	15,400	8425	54.7

The original design of these irrigation systems was for the cropping intensity to be higher in the rabi than in the kharif season. Table 4 was extracted from the Lower Indus Project documents, which indicates that there has been a tendency for the rabi cropping intensity to decline over the years with some corresponding increase in the kharif cropping intensity.

Table 6. Design and Actual Cropping Intensity.

Canal Command	Intensity (%)		Annual
	Rabi	Kharif	
Rohri	54 (43)	27 (37)	81 (80)
Nara	53 (28)	28 (34)	81 (62)

Source: LIP Report 1963/64; (Actual figures are shown in parentheses.)

The shift in intensity from rabi to kharif supports the findings of the sample survey results mentioned above. The important issue related to this field information is that the recently measured discharges in the three pilot distributaries/minors show a substantial increase over their respective design discharges (Table 7).

Table 7. Design and Measured Discharges.

Distributary/ Minor	Design Discharge (Cusecs)	Measured Discharge (Cusecs)			Culturable Command Area (CCA), Acres
Bareji (Mirpurkhas)	34.2	74.5 on (23.6.96)	84.1 on (4.8.96)	57.45 on (19.12.96)	14,318
Dhoro Naro (Nawabshah)	51.6	79.04 on (6.8.96)	75.30 on (31.7.96)	80.34 on (15.12.96)	13,382
Heran (Sanghar)	58.0	114.00 on (25.6.96)	125.00 on (16.7.96)	67.21 on (3.12.96)	12,336
Khadwari (Sanghar)	10.62	14.38 on (15.6.96)	15.00 on (26.6.96)	10.96 on (3.12.96)	3,074

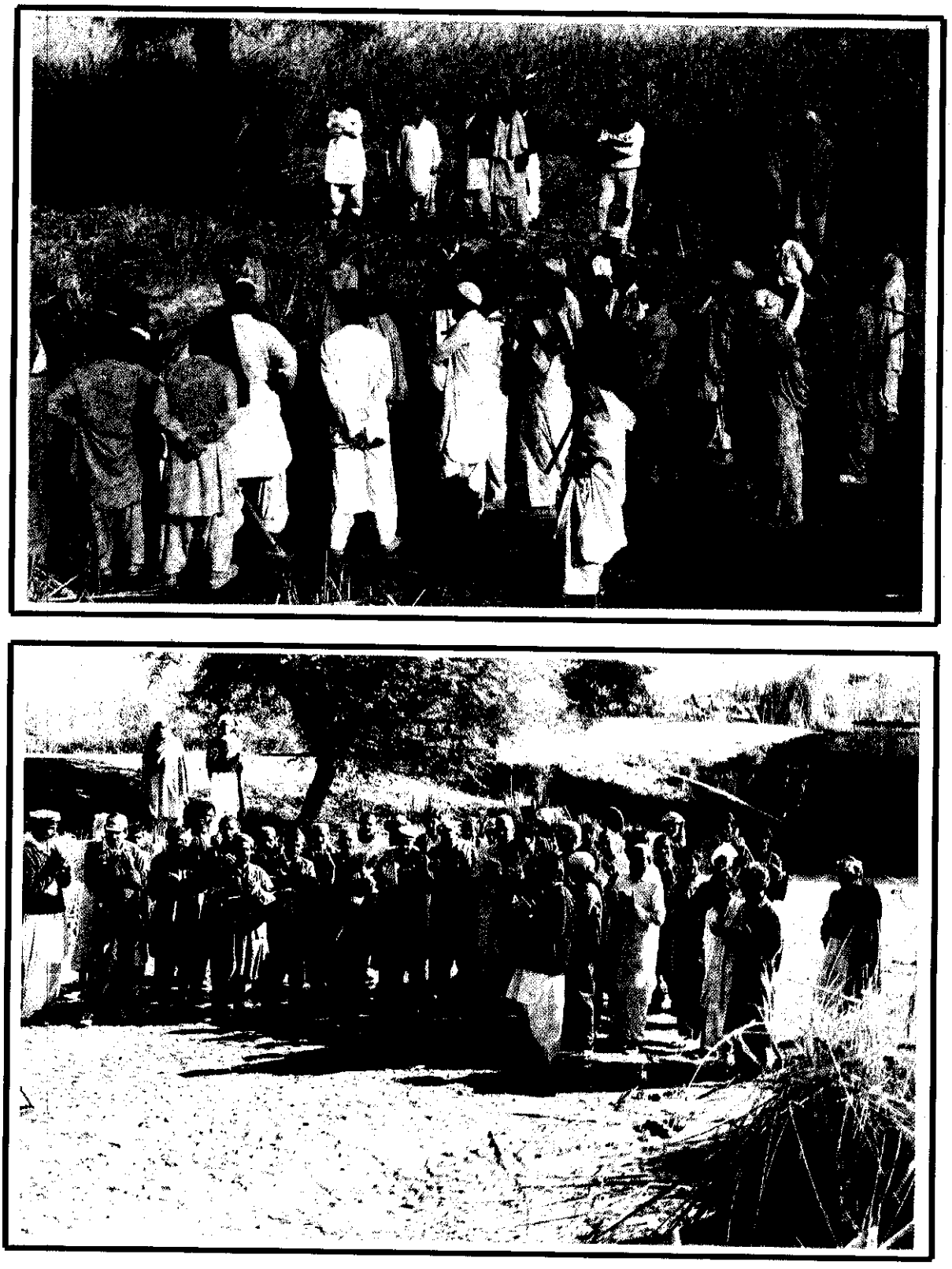
Field Teams are studying the implications of these findings, particularly in view of the consistent demands by the water users groups for additional water supplies. While the water supply into the distributary sub-systems have almost been doubled since the design stage (except in the Khadwari Minor), the field data reflect low cropping intensities, in some instances lower than even the design levels. The project will endeavor to find an explanation for this seemingly untenable field situation.

This will also be an important consideration in developing the Action Plan. In addition to the two objectives of improved equity in water distribution and improved maintenance, the WUOs can also aim at increasing cropping intensities within the available supplies through improved water management practices.

The potential for implementing an effective action plan was clearly demonstrated when the WUFs planned and executed a desilting operation during the canal closure period. The initiative was taken by the WUF office bearers, who were able to obtain the participation of most of the WUA members. The resources needed for this operation were mobilized by the WUFs on an equitable basis, depending on the areas to be desilted and their proximity to the respective watercourses.

Canal Desilting Conducted by the WUOs

Photograph - 8



Community Participation for Canal Clearance

7. CONCLUSIONS

The pilot project for farmer-managed irrigated agriculture in three selected distributaries in the Sindh Province has proved itself to be socially viable, in that the formation of water users organizations at the distributary level has successfully proceeded through the existing socio-cultural and political environment. They are now to be tested for their economic viability. For this, they need an enabling environment of institutional acceptance to start off a set of economic activities associated with distributary level O&M management. The major issue arising at this stage of pilot efforts in participatory irrigation management is that, for participation to be meaningful, there has to be an empowerment of those who are ready to participate. For farmer-managed irrigated agriculture to advance from the watercourse level to the distributary level, the authorities having management responsibilities for the distributaries will have to transfer their power to the water users.

Participation in this context connotes a situation in which the water users share responsibility with the government, and does not mean their total independence from the government. In the context of the prevailing social dynamics in Pakistan's rural areas, it is difficult to suggest the latter. At least during initial stages, the water users' collective actions need to be guided and monitored. In this sense, an important concept that should accompany participatory irrigation management is the accountability that is associated with this concept. Its relevance transcends beyond the pilot efforts already undertaken, and therefore, becomes an important policy consideration.

There is a good potential for improved water distribution by the WUOs. Field interviews clearly indicate that the water users are keen to undertake the responsibility for effective water distribution within a distributary or minor. Evidently, inequity is least within the watercourses, whereas, it is highest within the distributaries, and is at a medium level among the distributaries. Intimate knowledge about the watercourse and the existence of a form of collective action to monitor water distribution within a watercourse are the main factors that seem to account for this greater equity within the watercourse. An extension of this collective behavior to the distributary level is likely to reduce the inequity in the distributary or minor as well.

The potential of WUOs in effectively handling distributary maintenance is less clear. The major issue is regarding the capacity for resource mobilization. Supported by a wide-spread public opinion, many water users perceive these institutional reforms, primarily,

as attempts by the government to unload its O&M burden. They are very apprehensive about the additional costs to them, which can be more clearly seen than their additional gains. A hypothesis can be developed only after obtaining a reliable cost-benefit analysis of WUOs' functioning on a pilot basis, in an agreed program of action.

Even if the economic viability is proved, the danger of WUO office bearers becoming vulnerable to the endemic social disease of corruption cannot be easily discounted. It is in this regard that the need exists for some effective monitoring by an appropriately designed accountability mechanism. Many water users have voiced the need for government support to the new WUOs if they were to successfully counter the problem of "free-riding" and rent-seeking behavior.

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MAJOR ITEMS OF WORK ACCOMPLISHED IN PHASE-II

S. NO.	ITEM	COMPLETED BY
1.	Reconnaissance survey of nine distributaries/minors in pilot project area; short-listing three distributaries/minors in each district	Oct/Nov 1996
2.	One-day workshop to select three distributaries/minors for the pilot project and related documentation.	Nov 1995
3.	Selection of three distributaries/minors in the LBOD project areas (one in each district: Bareji Distributary (Mirpurkhas), Dhoronaro Minor (Nawabshah) and Heran Distributary (Sanghar).	Nov 1995
4.	Training of field staff in discharge measurement by Cutthroat Flume and current meter, calibration of moghas, seepage losses determination by inflow-outflow method, socio-economic baseline survey and microcomputer software.	Dec 1995
5.	Calibration of moghas (outlets) to determine actual discharge of each watercourse and distributary minor of the pilot project areas.	Dec/Jan 1996
6.	Walk-thru survey for observing the physical conditions of distributaries/minors of all pilot project areas, pretesting of questionnaire and selection of samples for socio-economic baseline survey.	Jan Feb 1996
7.	Recalibration of moghas and seepage losses measurement by inflow-outflow method of the three distributaries.	March-May, 1996
8.	Distribution of information brochure (Sindhi & Urdu languages) regarding pilot projects among the water users.	May/June, 1996
9.	Socio-economic baseline survey.	June 1996
10.	Identification of Contact Farmers at each watercourse level. Two from each watercourse, a total of 160 contact farmers identified.	June 1996
11.	Formation of Field Implementation Coordination Committees (FICC) in all three districts. The committee members are from the related agencies (LBOD, OFWM, Irrigation Department, Agriculture. Extension, Rade Consultants, NRSP, IIMI and Contact Farmers).	June 1996
12.	Rapport building meetings with contact farmers and other water users to create awareness and trust.	July 1996

13.	Profile of Contact Farmers with regard to their education, land ownership, and other social and economic aspects.	July 1996
14.	Data analysis of socio-economic baseline survey: preliminary results.	Aug 1996
15.	Profile of the drainage system in each pilot area.	Aug 1996
16.	One-day training workshop in each pilot area for Contact Farmers.	August 1'996
17.	Data Collection for Plan of Action for the WUO Business Plan.	Aug 1996
18.	Consultation meetings with water users at each watercourse.	Sep 1996
19.	Selection meetings and formation of 80 water users associations (WUA) in the three pilot project areas.	Oct 1996
20.	Collaborative activities undertaken for the benefit of water users associations with OFWM, Livestock, Forestry, Agriculture extension.	Oct 1996
21.	Federation Meetings; WUA executive members hold meetings at each watercourse.	Nov 1996
22.	Nomination of members for the Water Users Federation (2 nominees from each WUA)	Nov 1996
23.	Meetings of WUAs office bearers with Donors Supervision Mission.	Nov 1996
24.	Formation of water user federation at each of the three distributaries/minors	Nov/Dec 1996
25.	Completion of financial investigation for the Business Plan.	Nov/Dec 1996

Annex-2

Details of Nine Short-Listed Distributaries

INFORMATION OF THREE SHORT LISTED DISTRIBUTARIES IN SANGHAR DISTRICT															
Name of Disty	Minors	Distance in KM from Office		Length of Disty (KM)	Discharge in cusecs	No. of Outlets	No. of Outlets Lined	CCA Acres	No. of Land owners			Drainage	No. of Villages	No. of house holds	Population
		Head	Tail						Total	>100 Ac	< 25 Ac				
HERAN	-	16	10	10.6	58	24	22	12336	435	-	100	Yes	30	2053	15,687
	KADWARI	12	9	3.20	10.62	7	4	3074	104	1	33	Yes	14	1097	11,130
RAWTIANI	-	19	15	9	29.23	19	14	9026	288	9	178	Yes	13	1044	14404
TOORI	-	8	9	7	46.84	26	6	15263	655	21	500	Yes	48	7021	16365

INFORMATION OF THREE SHORT LISTED DISTRIBUTARIES IN MIRPURKHAS DISTRICT															
Name of Disty	Minors	Distance in KM from Office		Length of Distry (KM)	Discharge in cusecs	No. of Outlets	No. of Outlets Lined	CCA Acres	No. of Land owners			Drainage	No. of Villages	No. of house holds	Population
		Head	Tail						Total	>100 Ac	< 25 Ac				
BAREJI	-	15	16	12.5	34.2	24	06	14318	197	20	109	Yes	79	1703	10580
SANHRO	-	14	24	11.04	47.89	16	0	9445	249	7	128	Yes	43	885	5870
	SANHRO	-	-	1.74	19.23	9	2	6562	144	5	89	-	21	751	6495
DAULATPUR	-	15	15	10.91	49	28	15	10793	342	20	274	Yes	59	1318	8500

INFORMATION OF THREE SHORT LISTED DISTRIBUTARIES IN NAWABSHAH DISTRICT															
Name of Disty	Minors	Distance in KM from Office		Length of Distry (KM)	Discharge in cusecs	No. of Outlets	No. of Outlets Lined	CCA Acres	No. of Land owners			Drainage	No. of Villages	No. of house holds	Population
		Head	Tail						Total	>100 Ac	< 25 Ac				
KHYAROON	-	5	12.42	7.42	22.03	16	04	6083	347	0	203	Yes	39	1591	13709
DHORO NARO	-	5	20	10.39	51.62	26	11	13382	421	17	336	Yes	147	2468	19822
CHODIKO	-	15	13	11.54	43.46	21	05	10958	200	19	78	Yes	39	1005	14573
	JAM LAGHARI	15	10	4.84	12.29	8	01	3924	105	10	50	Yes	8	780	7240

Source: Data collected by IIMI Field Teams during project inception stage.

SOME BASIC INFORMATION ON THE THREE PILOT SITES

1. BAREJI DISTRIBUTARY

Physical and Technical Features

◊	Number of Outlets	24
◊	Lined watercourses	07
◊	Unlined watercourses	17
◊	Length of distributary	12 km
◊	Design discharge	34.2 cfs
◊	Cultivable command area	14,300 acres
◊	Drainage	Tile Drainage
◊	Canal	Jamrao (East) (R.D 408)
◊	Total number of sump houses	14
◊	Length of spinal drain	10 km
◊	Length of disposal channels	7.40 km

Social Features

◊	Land Owners	178
◊	Owner Cultivators	155
◊	Tenants	787*
◊	Lessees	10
◊	Managers/Kamdars	11
◊	Number of major communities	07
◊	Number of villages/hamlets	40

* Majority of tenants are scheduled caste Hindus

CROPPING PATTERN

Kharif Season
Cotton, Rice, Chillies & Sugarcane

Rabi Season
Wheat, Sugarcane & Onion

MAJOR PROBLEMS OF THE PROJECT AREAS

Technical

- Sudden closure of distributary
- Tampering of outlets
- There is no gravitational flow in a few watercourses
- Inadequate maintenance of distributary
- Non-functioning of drainage systems
- No escapes to divert excess discharge during rainy season

Social

- Majority of land owners are Muslim and the majority of tenants are non-Muslim
- Absentee land owners
- Illiteracy
- Community disputes
- Only head of family is represented at the meetings
- Reluctance to visit *otaque* of other communities
- Feudal social order

2. DHORO NARO MINOR

Physical and Technical Features

1.	Number of outlets	25
2.	Lined watercourses	16
3.	Unlined watercourses	09
4.	Length of distributary	10.4 km

5.	Design discharge	51.62 cusecs
6.	Culturable command area	13382 acres
7.	Grass command area	15067 acres
8.	Off take RD	91.40 (Gajrah Branch off RohtiCanal)
9.	Number of private tubewells	14

Drainage

1.	Number of saline tubewells	09
2.	No. of disposal/sub-disposal channels	08
3.	No. of inlets with Dhoro Naro command area	05
4.	Sub-drain 1 (WN IR total length with CCA of Dhoro Naro Minor 5.18 km)	
5.	Branch drain 1 (Gujrah Branch Drain total length with CCA of Dhoro Naro Minor = 8.53 km)	

MAJOR PROBLEMS OF THE PROJECT AREA

Technical

1. Fault in head regulator
2. Siltation in minor/watercourses
3. Tampering of outlets
4. Absence of inspection path
5. Weak banks
6. Breaches
7. Fluctuation in water delivery
8. Excavation at improper time

9. Un-scheduled closure of minor
10. Free grazing and bathing of animals
11. Natural steep slope in the minor
12. Elevated bed of some watercourses
13. Installation of Dikkas (obstacles) during sowing season

Socio-Cultural

1. Unawareness
2. Intra- and inter-community grievances
3. Uncertain and doubtful attitude
4. Corruption culture
5. Poverty

Social Features

1.	Number of potential water users	504
2.	Tenants (share croppers)	694
3.	No. of villages/hamlets	147
4.	No. of households	2468
5.	Population	19822
6.	Major communities	09
7.	Languages of the area	Sindhi, Siraiki, Punjabi, Balochi & Brahvi

CROPPING PATTERN

Kharif Season

Cotton, Sugarcane & Fodder

Rabi Season

Wheat, Sugarcane, Oil Seed (Brasicca), Vegetables & Fodder

3 (a) HERAN DISTRIBUTARY

Physical & Technical Features

1.	Number of outlets	24	
2.	Lined W/Cs	23	
3.	Unlined W/Cs	1	
4.	Length of distributary	10.6 km	
5.	Design discharge	58 cfs	
6.	Cultivable command area	12,336 Acres	
7.	Drainage	Surface drainage	
8.	Canal	Nara (RD 129)	
9.	No. of tubewells	8 Drainage	
10.	No. of surface drains	3	
11.	Length of surface drains	MBD MIR MIRA	20.73 km 23.29 km 7.10 km

3 (b) KHADWARI MINOR

Physical & Technical Features

1.	Number of outlets	7
2.	Lined W/Cs	4
3.	Unlined W/Cs	3
4.	Length of minor	5.12 km
5.	Design discharge	10.62 cfs
6.	Cultivable command area	3,074 Acres
7.	Drainage	Surface Drainage
8.	Canal	Heran Distributary (RD 10)
9.	No. of Tubewells	16 (Scavenger)
10.	No. of surface drains	1
11.	Length of surface drains	11.21 km

Major Problems

1. Sudden closure of distributary
2. Insertion of obstructions
3. Tampering of outlets
4. Breaches in the distributary
5. Wallowing of animals in distributary/minor
6. Vegetation on the banks of distributary
7. Improper cleaning of the drains
8. Repair of distributary head regulator

Social

1. Competition for leadership roles
2. Lack of communication between communities

Social Features

1.	Land owners	338
2.	Owner cultivators	289
3.	Tenants	433
4.	Lessees	91
5.	No. of major communities	2
6.	No. of villages/hamlets	44
7.	No. of households	3,150
8.	Population	26,817 (approx)

Cropping Pattern

Kharif Season

Cotton, Rice, Sugarcane, Fodder and Ground Nut

Rabi Season

Wheat, Sugarcane & Fodder

BACKGROUND INFORMATION ON CONTACT FARMERS

EDUCATIONAL STATUS OF CONTACT FARMERS

	BAREJI DISTRIBUTARY (MIRPURKHAS)				DHORONARO MINOR (NAWABSHAH)				HERAN DISTRIBUTARY (SANGHAR)			
	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL
Illiterate	4	3	1	8(17)	3	9	5	17(34)	1	3	2	6(10)
Primary	5	3	8	16(33)	5	2	4	11(22)	2	5	1	8(13
Middle	2	1	2	15(10)	5	1	1	7(14)	1	4	2	7(11)
Matric	2	4	2	8(17)	2	2	1	5(10)	2	9	3	14(23)
FA/FSc	3	2	2	7(15)	2	1	3	6(12)	3	6	4	13(2)
BA/BSc	3	0	0	3(6)	1	0	2	3(6)	5	5	2	12(19)
MA/MSc	0	1	0	1(2)	0	0	1	1(2)	0	2	0	2(3)
Total	19 (40)	14 (29)	15 (31)	48 (100)	18 (36)	15 (30)	17 (34)	50 (100)	14 (29)	28 (58)	6 (13)	62 (100)

AGE DISTRIBUTION OF CONTACT FARMERS

	BAREJI DISTRIBUTARY (MIRPURKHAS)				DHORONARO MINOR (NAWABSHAH)				HERAN DISTRIBUTARY (SANGHAR)			
Age group	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL
18-34	9	7	6	22(46)	5	7	7	19(38)	1	5	2	8(13)
35-49	6	5	8	19(40)	7	6	5	18(36)	6	17	5	28(45)
50-76	4	2	1	7(15)	6	2	5	13(26)	7	12	7	26(42)
Total	19 (40)	14 (29)	15 (31)	48 (100)	18 (36)	15 (30)	17 (34)	50 (100)	14 (29)	28 (58)	6 (13)	62 (100)

TENANCY STATUS OF CONTACT FARMERS

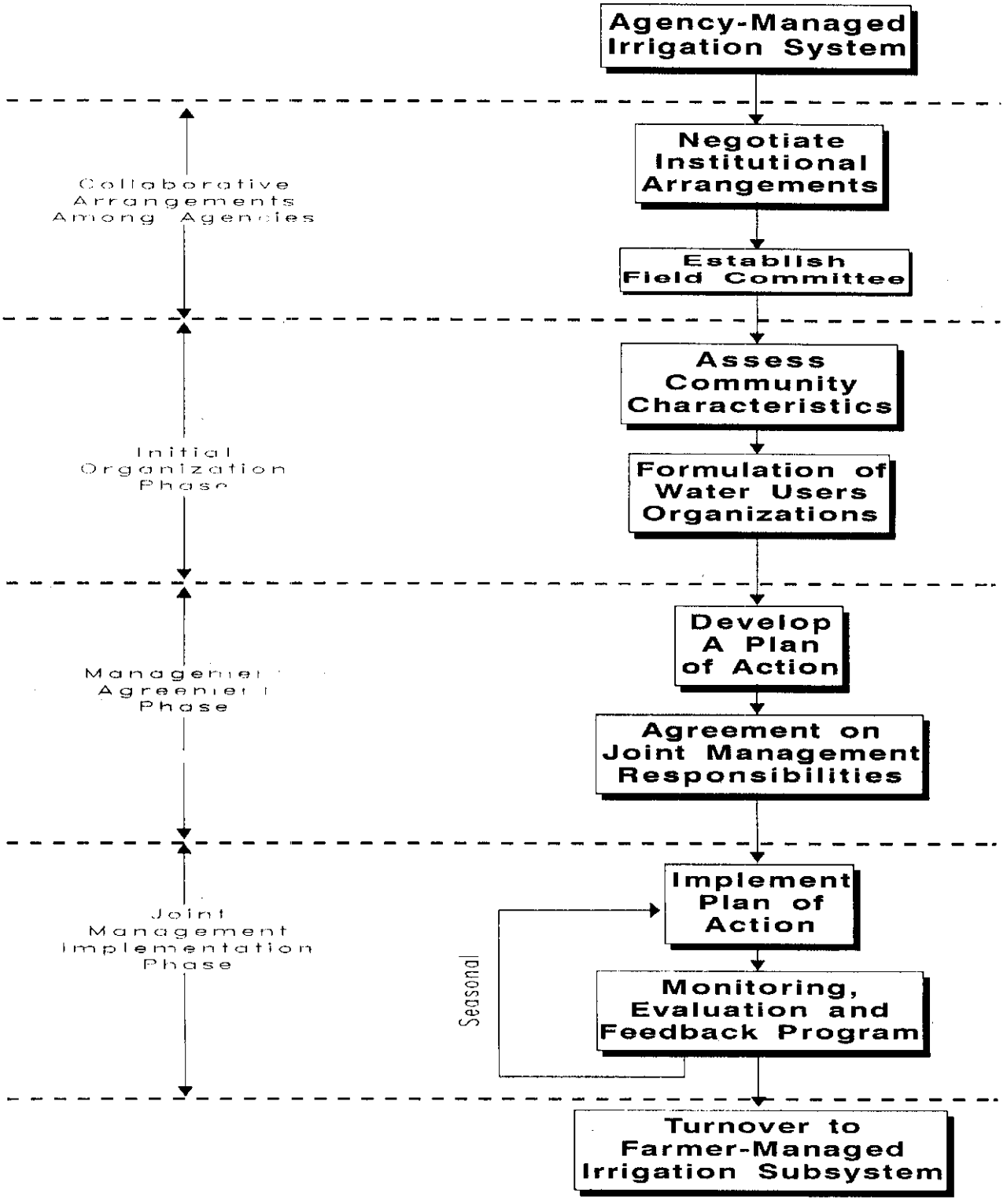
	BAREJI DISTRIBUTARY (MIRPURKHAS)				DHORONARO MINOR (NAWABSHAH)				HERAN DISTRIBUTARY (SANGHAR)			
	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL	HEAD	MIDDLE	TAIL	TOTAL
Landowner	10	14	6	30(63)	13	8	8	29(58)	14	25	7	46(74)
Owner-Cultivator	3	0	5	8(17)	3	3	4	10(20)	0	9	16	15(24)
Kamdar	5	0	4	9(19)	2	2	3	7(14)	0	0	0	0
Tenant	1	0	0	1(2)	0	2	2	4(8)	0	0	1	1(2)
Total	19 (40)	14 (29)	15 (31)	48 (100)	18 (36)	15 (30)	17 (34)	50 (100)	14 (29)	28 (58)	6 (13)	62 (100)

Training Workshops for Contact Farmers

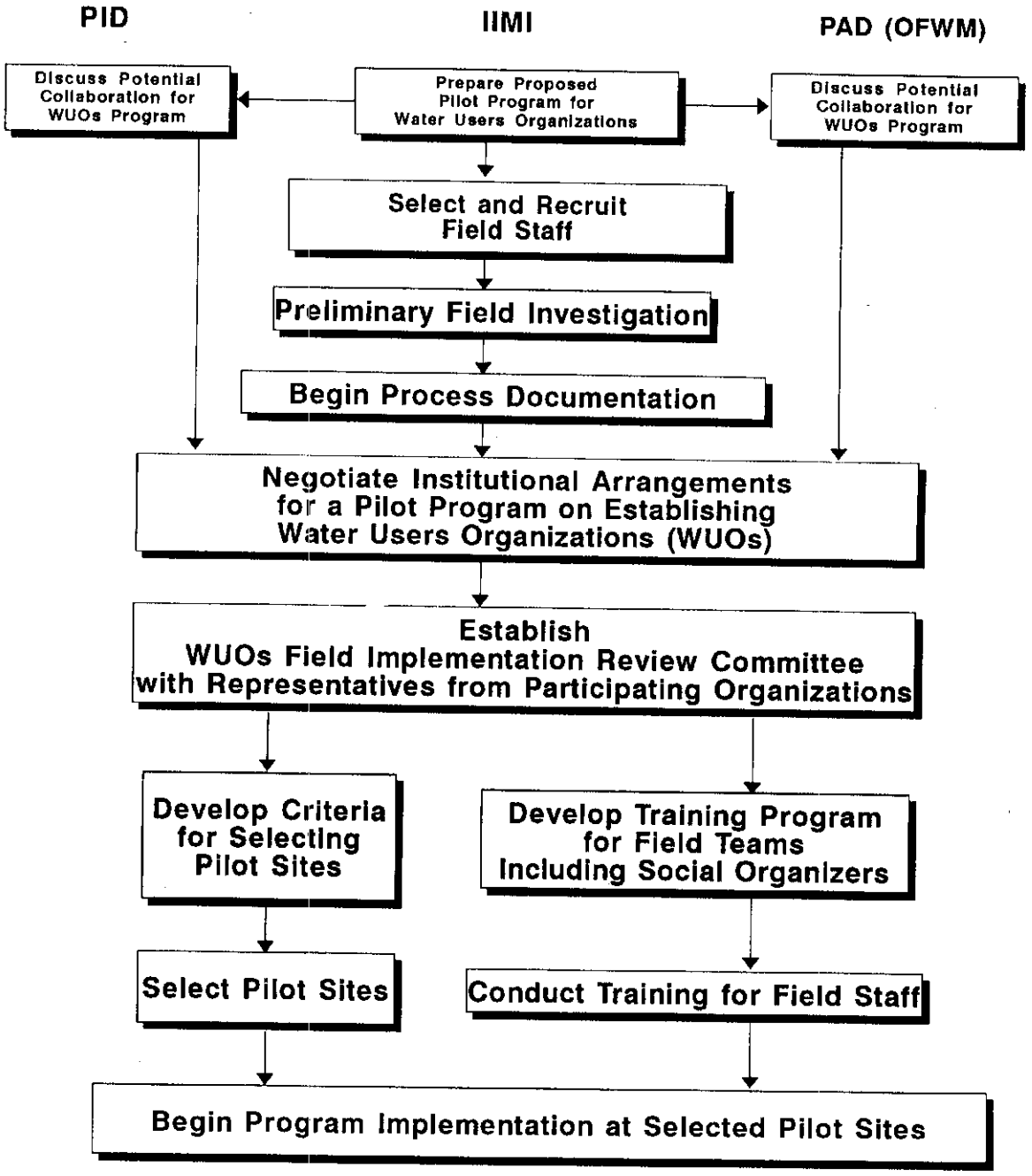
Subject	Field Stations		
	Mirpurkhas 25-08-1996	Nawabshah 27-08-1996	Sanghar 21-08-1996
Participation	43 out of 48 (90%)	40 out of 50 (80%)	60 out of 62 (97%)
Motivation	At the beginning, people were not keen but later on, they were very active.	People were keen motivated through out and curious to learn from the workshop.	Almost all the contact farmers were motivated to participate and keen to listen to the resource persons.
Benefits from formation of Organization and willingness to form organization	Everybody discussed the benefits of organization and agreed to form WUAs and WUFs.	Everybody participated in discussion on the benefits of organization and agreed to form WUAs and WUFs.	Almost everybody participated in discussion on the benefits of organizations and agreed to form WUAs and WUFs.
Concerns and Interests	-What can IIMI give to WUAs? -IIMI has taken over the Bareji distributary on contract. -Distributary is often closed without information to the water users. -If bribery is eliminated, and if WUAs and WUFs are formed, then the bigger landowners may get less share of water than what they are getting now. -Large families, therefore, more land is needed to be cultivated, hence more water is required. -LBOD drainage facilities are not functional yet.	- Distributary has silt problems even after desilting. -Gate of the Minor needs to be re-designed. -Economically, the growers of the minor are in worst situation. - Acute shortage of water at tail end and also less water in the middle reach.	-Authority/Power is necessary for Associations. -Technical problems of water distribution -Privatization of distributary -Bribery if eliminated, and if WUAs, and WUFs formed then the people may get less water than now because water flow will be reduced upstream. -Large families therefore, more land is needed to be cultivated, hence more water required. -What can IIMI give them as physical incentives.
Membership of WUAs	All groups agreed that landowners should be the members of Associations, whereas Haris or Tenants are not accepted as members due to their temporary status and not owning the land. The tenants and Haris can be fired by landowners any time if they are not productive.	All groups agreed that landowners should be the members of Association. One of the groups suggested that with permission of landowners, the longstanding haries can become members.	All groups agreed that landowners should be the members of Association. Haris or Tenants are not accepted as members due to their temporary status and since they don't own land.

Organizational Structure suggested by Groups	President, Vice President, General Secretary, Joint Secretary and Finance Secretary.	President, Vice President, General Secretary, Joint Secretary and Finance Secretary.	President, Vice President, General Secretary, Joint Secretary and Finance Secretary.
Selection Method	By consensus selection.	By consensus selection.	By consensus selection
Benefits from WUAs suggested by group	-Benefits of water distribution (Equity). -No bribes will be necessary. -Desilting of distributary will be ensured. -Proper water management will be made by ourselves. -Problems will be transmitted to PID by Organized Groups.	-Benefits of water distribution (Equity). -No bribe will be given. -Desilting of distributary will be ensured and -Proper water management will be made.	-Benefits of water distribution (Equity). -No bribes will be given. -Desilting of distributary will be ensured. -Proper water management.
Costs for functioning of WUAs	-Abiyana, Usher go to WUAs instead of government. -Government provides some money to WUA for maintenance of distributary.	- Abiyana, Usher go to WUAs instead of government. - Government provides some money to WUA for maintenance of distributary. - Rs. 100/- from growers as a contribution for WUAs.	-Abiyana & other taxes will be collected by the Association. -One group suggested every land owner having 16 acres pay Rs. 250/- per year to Association. While others suggested that Rs. 100/member. -Some Government funds are still required.

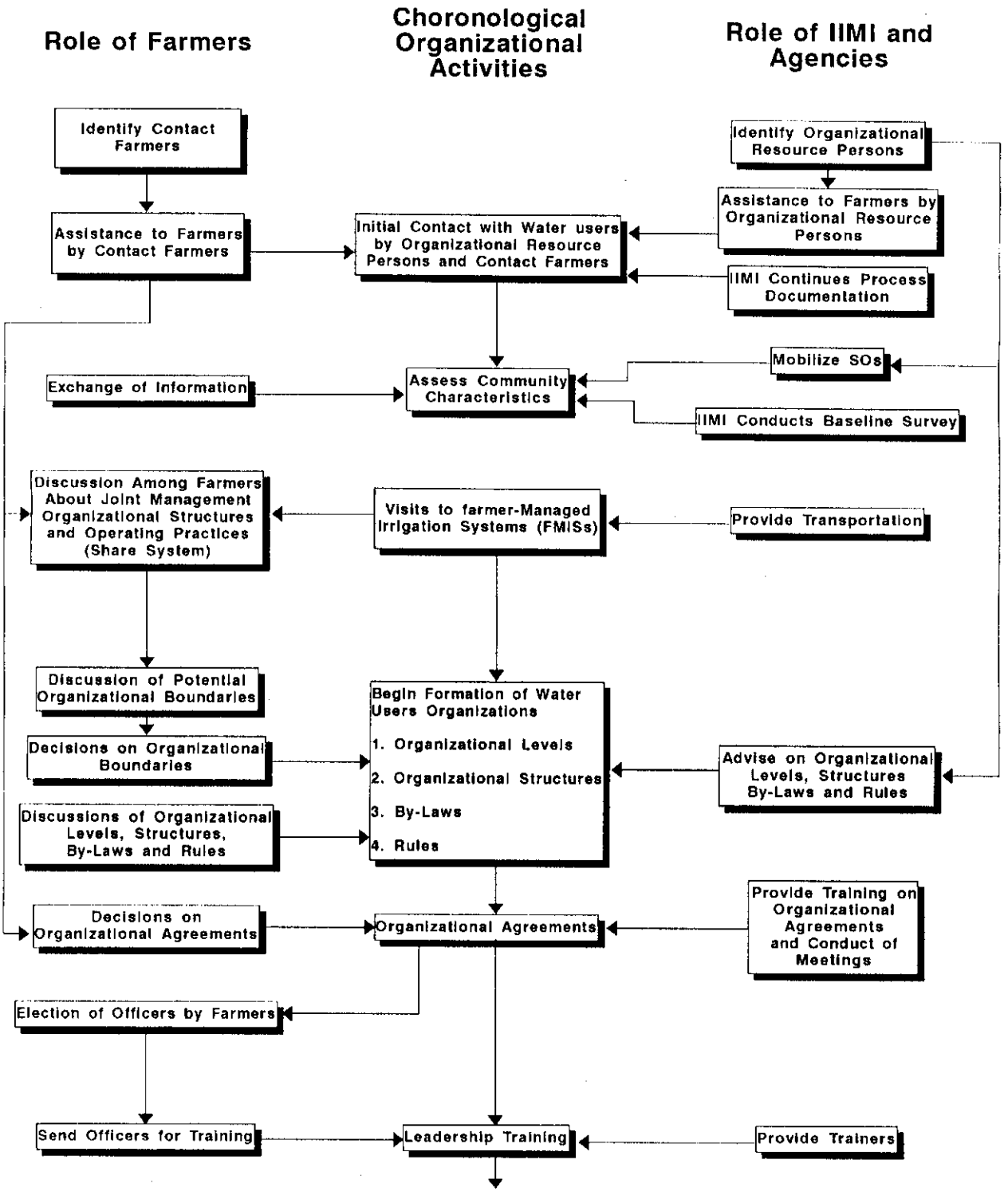
PROPOSED PROCESS FOR CREATING SUSTAINABLE WATER USERS ORGANIZATIONS IN PAKISTAN



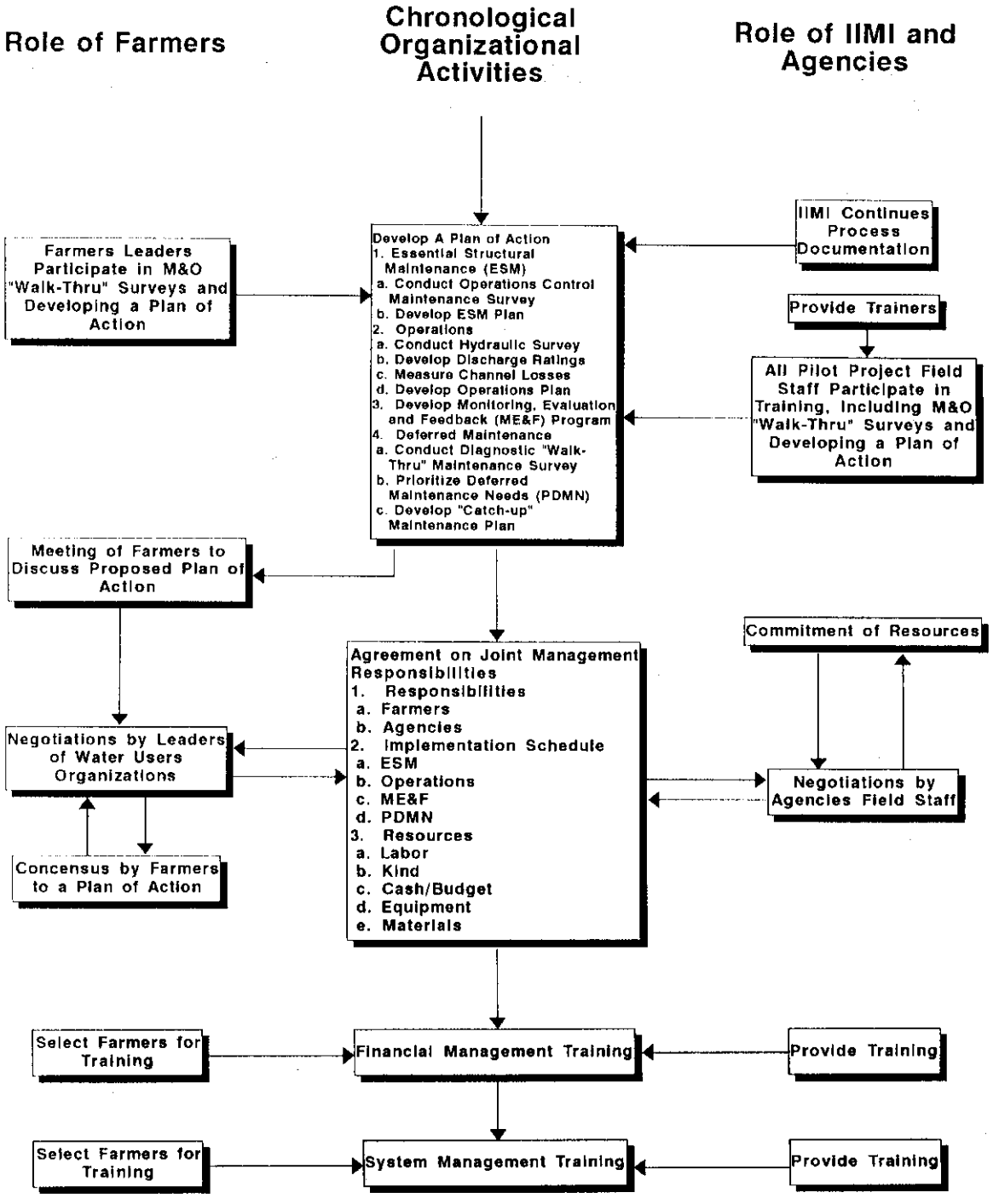
Phase I: COLLABORATIVE ARRANGEMENTS AMONG AGENCIES



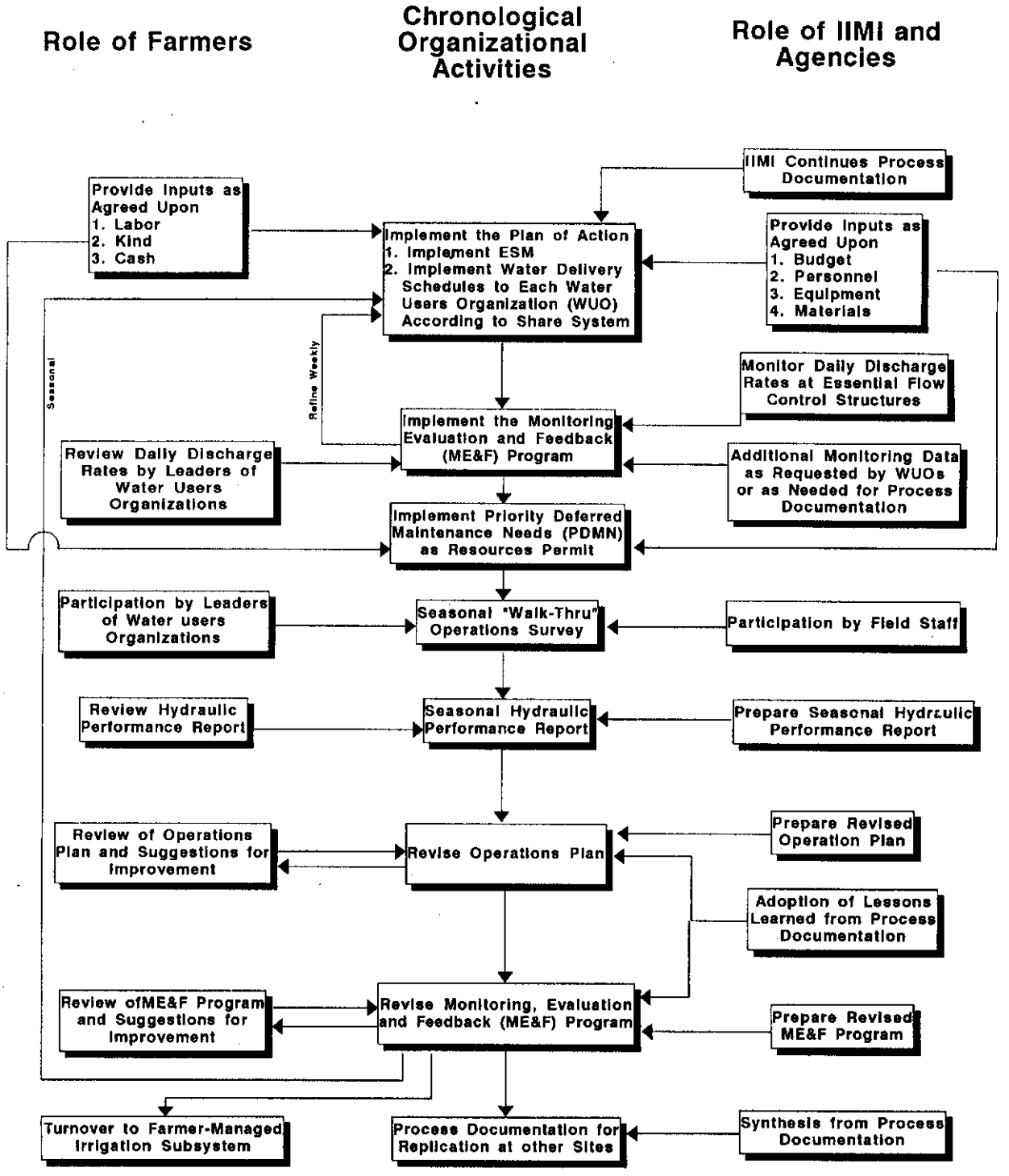
Phase II: INITIAL ORGANIZATION



Phase III: JOINT MANAGEMENT AGREEMENT



Phase IV: JOINT MANAGEMENT IMPLEMENTATION



WUA NOMINEES FOR WUF MEMBERSHIP
BAREJI DISTRIBUTARY - MIRPURKHAS

S#	W/C No	Total Executive Committee Members	Members Present in the Meetings		Meeting Date	Names of Nominated Members
			No.	%		
1	1L	5	4	80	27-10-1996	1. Ch. Arif Bashir 2. Gh. Mustafa Leghari
2	2L	5	4	80	21-11-1996	1. H. Daem Chandio 2. Imtiaz Panhawer
3	3L	5	5	100	30-10-1996	1. Hajan Sahito 2. Faqir Usman Mangrio
4	4L	4	3	75	23-10-1996	1. Ramzan Rajar 2. Allah Jurio Rajar
5	5L	8	4	50	20-11-1996	1. Inayat Hussain Shah 2. Seetal Das
6	6L	6	4	67	18-11-1996	1. Yar Mohd Makrani 2. Khan Mohd Makrani
7	7L	6	5	83	23-10-1996	1. Banhon Khan Lashari 2. H.Imam Bux Mehar
8	8L	5	3	60	24-10-1996	1. Gh. Rasool Lashari 2. Khalik Ahmed Shar
9	9L	5	4	80	23-10-1996	1.H. Gh.Hussain Lashari 2.Gul Mohd Jhulan
10	10L	4	3	75	27-10-1996	1. M.Yousif Bhanger 2. Ghulam Dal
11	11L	4	3	75	26-10-1996	1. Gh.Hyder Lashari 2. Imdad Ali Lashari
12	12L	4	2	50	2-11-1996	1. Manjhi Khan Lashari 2. Mohd Saleh
13	13L	5	3	60	10-11-1996	1.M.Saleem Panhanwar 2. Mohd Hassan Lashari
14	1R	4	2	50	2-10-1996	1. A. Ghafoor Mehar 2. Ali Akber Sodho
15	2R	4	3	75	22-10-1996	1.H.M.Iqbal Siddiqui 2.Arif Iqbal
16	3R	4	4	100	26-10-1996	1. A. Aziz Makrani 2. A.Hameed Makrani
17	4R	4	4	100	24-10-1996	1. Masoom Rajput 2. Teekam Das
18	5R	5	3	60	22-10-1996	1. Mocharo Mangrio 2. Faiz Mohd Mangrio

19	6R	5	3	60	18-11-1996	1. Mehar Ali Lashari 2. Sajjan Rajar
20	7R	4	3	75	28-10-1996	1. Mohammad Halepoto 2. Mohd Jaffar Jhulan
21	8R	5	3	60	26-10-1996	1. Sher Khan Shar 2. Ch. Javeed
22	9R	5	3	60	21-10-1996	1. Misri Khan Shar 2. Ch. Saeed
23	10R	4	3	75	22-10-1996	1. Mohd Soomro Dal 2. Ch. Abdul Rashid
24	11R	6	4	67	3-11-1996	1. Jamal Khan Lashari 2. Ghulam Rasool Mehr

DHORO NARO MINOR - NAWABSHAH

S#	W/C No	Total Executive Committee Members	Members Present in the Meetings		Meeting Date	Names of Nominated Member
			No.	%		
1	1-R	8	6	75	26.10.96	1. Ch. Arshad 2. Tarique Mehmood
2	2-R	8	5	63	26.10.96	1. M. Ramzan Kerio 2. Ali Hassan Jamali
3	3-R	8	4	50	4.11.96	1. Ali Mohd Jamali 2. Qadir Bux Jamali
4	4-R	8	4	50	2.11.96	1. Abad Ali Arain 2. Ghazi Khan Brohi
5	5-R	7	3	40	4.11.96	1. Sain Bux Khaskeli 2. Abdullah Girwah
6	6-R	8	3	38	23.11.96	1. Gul Hassan Brohi 2. Umed Ali Sher
7	6-AR	7	4	57	5.11.96	1. Muharim Rind 2. More Siyal
8	7-R	8	7	88	16.11.96	1. Abdul Raheem Rind 2. Imam Bux
9	1-DL	8		63	30.11.96	1.Rasheed Ahmed Shaik 2. Shahnawaz Khaskeli
10	1-L	8	4	50	13.11.96	1. Mohd Rafique 2. Ali Bux Jamali
11	1-AL	8	4	50	6.11.96	1. Ch. Ahsan Ali 2. Zulfiqar Jamali
12	1-BL	8	4	50	7.11.96	1. Ch. Ahmed Iqbal 2. Mohd Saleh Bangwar
13	1-CL	8	5	63	28.11.96	1. Zulfiqar Magsi 2. Mohd Nawaz Brohi
14	2-L	8	6	75	X.11.96	1. H. Khushal Zardari 2. Muhammad Hussain
15	2-AL	8	3	38	7.11.96	1. Fateh Ali 2. Bahadur Zardari
16	3-L	8	4	50	6.11.96	1. Khan Zardar 2. Anwar Khan Zardari
17	4-L	8	4	50	17.11.96	1. Imdad Ali Kerio 2. M. Raheem Zardari
18	4-BL	7	3	43	27.11.96	1. Noor H. Shah 2. Jumo Gerwa

19	4-AL	6	3	50	5.11.96	1. Hazar Khan Bhangwar 2. A. Hakeem Bhangwar
20	5-L	8	3	38	24.11.96	1. Himat Shar 2. Pir Mehdi Shah
21	6-L	8	3	38	19.11.96	1. Amir Bux 2. Luquman Rind
22	7-L	8	6	75	23.10.96	1. Rabnawaz Khaskheli 2. Shahbazi Khaskheli
23	9-L	8	4	50	14.11.96	1. Allah Rakhio 2. Nazar Mohd Gupchani
24	10-L	8	2	25	6.11.96	1.Haji Mureed Gupchani 2.Matloob Rajput
25	11-L	8	3	38	7.11.96	1. Mohd Bux Khaskheli 2. Shah Nawaz Jamali

HERAN DISTRIBUTARY and KHADWARI MINOR - SANGHAR

S#	W/C No	Total Executive Committee Members	Members Present in the Meetings		Meeting Date	Names of Nominated Member
			No.	%		
1	1L	8	6	75	2.11.96	1. Haji Ahsan 2. Mohd Sultan
2	2-R	8	5	63	2.11.96	1. Anwar 2. Maqbool
3	3-L	8	5	63	2.11.96	1. M. Yaqoob 2. M. Yousif
4	4-R	8	7	88	3.11.96	1. Haji Khushi Mohd 2. M. Afzal
5	5-L	8	6	75	2.11.96	1. M. Akhtar 2. Amir Sultan
6	6-L	8	5	63	3.11.96	1. M. Nazeer 2. M. Yaya
7	7-L	8	5	63	3.11.96	1. A. Majeed 2. Zafar Iqbal
8	9-AR	8	7	88	4.11.96	1. Shokat Ali 2. Altaf Hussain
9	8-L	8	4	50	4.11.96	1. Sher Gul 2. Malik Sarfaraz
10	9-R	8	5	63	4.11.96	1. Saleem Akhtar 2. Mazar Hussain
11	8-AL	8	4	50	4.11.96	1. Haji Ashraf 2. Malik M.Aijaz

12	10-R	8	7	88	5.11.96	1. Arshad Mehmood 2. M. Ayoob
13	11-R	8	6	75	5.11.96	1. Nizakat Ali 2. Rabnawaz
14	12-R	8	7	88	5.11.96	1. Zafar Iqbal 2. Mushtaque
15	13-R	8	8	100	5.11.96	1. Sultan Ali 2. M. Hussain
16	14-L	8	7	88	4.11.96	1. Main A. Razak 2. H. Bashir
17	15-L	8	7	88	6.11.96	1. Abdullah 2. Khalil
18	16-R	8	5	63	6.11.96	1. Zafar Baloch 2. Akhtar Kayani
19	17-AL	8	5	63	6.11.96	1. Gazanfar Ali 2. Abdul Wahab
20	16-R	8	6	75	7.11.96	1. Mamtaz 2. Khalid Pervaz
21	17-BL	5	3	60	10.11.96	1. Habib 2. A. Majeed
22	18-R	8	4	50	6.11.96	1. Nawaz Wariech 2. Haji Ashraf
23	17-AT	8	4	50	10.11.96	1. Malik Fiaz 2. Mazarul Haq
24	18-AT	8	4	50	6.11.96	1. Haji Noor Ahmed 2. Mohd Shoukat
25	1-AL	3	2	67	5.11.96	1. Col. Sarwar 2. Raja Sadiq
26	1-L	7	4	57	6.11.96	1. Ali Bux Jamali 2. Abdul Karim
27	2-R	8	5	63	6.11.96	1. Ali Khan Jamali 2. M. Moosa
28	3-L	8	5	63	7.11.96	1.Gh. Nabi Mirbar 2. Atta M. Mirbar
29	4-R	8	4	50	7.11.96	1. Sajid Ahmed 2. A. Qadir
30	5-T	8	4	50	7.11.96	1. Gulzar Ahmed 2. Javeed Akhtar
31	6-T	8	5	63	8.11.96	1. Mushtaque 2. Mir Mohd

SOME PRELIMINARY RESULTS OF NOMINEE PROFILES FOR WUFs

Particulars		Bareji Distributary (Mirpurkhas) N=48		Dhoro Naro Minor (Nawabshah) N=50		Heran Distributary (Sanghar) N=62		Overall N=160	
		No.	%	No.	%	No.	%	No.	%
Location of Nominees at Watercourse Level	Head	19	43	12	24	16	26	47	30
	Middle	11	24	23	46	30	48	64	41
	Tail	15	33	15	30	16	28	46	29
Three nominees did not have land									
Age of Nominees	< 30 years	12	25	19	38	11	18	42	26
	31-60 years	35	73	31	62	48	77	114	71
	> 60 years	1	2	-	-	3	5	4	3
	Mean (STD)	38 (10.8)		36 (8.8)		42 (11.0)		39(10.5)	
Years of Experience in Irrigation Agriculture	< 20 years	39	81	39	78	43	69	121	76
	21-40 years	8	17	11	22	16	26	35	22
	> 41 years	1	2	-	-	3	5	4	3
	Mean (STD)	14 (9.7)		14 (9.7)		18 (10.6)		16(10.1)	
Educational Level of Nominees	Illiterate	3	6	3	6	2	3	8	5
	Primary	17	36	20	40	7	11	44	28
	Matric	14	29	12	24	22	36	48	30
	College	14	29	15	30	31	50	60	37
Annual Income	8000-25000	1	2	8	16	22	36	31	19
	25001-50000	5	10	17	34	13	21	35	22
	50001-75000	5	10	7	14	8	13	20	13
	75001-100000	6	13	8	16	12	19	26	16
	100001-3500,000	31	65	10	20	7	11	48	30
Position of Nominees at Watercourse	President	21	44	17	34	22	36	60	38
	Vice President	8	17	6	12	7	11	21	13
	General Secretary	9	19	11	22	15	24	35	22
	Joint Secretary	-	-	2	4	3	5	5	3
	Finance Secretary	5	10	6	12	4	7	15	9
	Executive Committee Member	5	10	2	4	3	5	10	6
	No Position	-	-	6	12	8	13	14	9

Tenancy Status	Landowner	37	77	34	68	41	66	112	69
	Owner-Operator	5	11	12	24	19	30	36	22
	Lessee	3	6	-	-	1	2	4	3
	Tenant	1	2	3	6	-	-	4	3
	Manager	2	4	1	2	1	2	4	3
Worked as Contact Farmer	Yes	22	46	28	56	32	52	87	51
	No	26	54	22	44	30	48	78	49
Family Member	1-10 Member	33	69	22	44	41	66	96	60
	11-20 Member	13	27	13	26	16	26	42	26
	21-30 Members	2	4	8	16	5	8	15	9
	31+ Members	-	-	7	14	-	-	7	5
	Mean (S+D)	9.3(4.9)		16.7 (12.2)		10.4 (5.9)		12 (8.8)	
Land Holding	0-25 Acres	22	46	25	50	30	48	77	48
	26-50 Acres	7	15	7	14	26	42	40	25
	51-75 Acres	8	17	2	4	3	5	13	8
	76-100 Acres	1	2	4	8	2	3	7	4
	101-250 Acres	8	17	10	20	1	2	19	12
	251-600 Acres	2	4	2	4	-	-	4	3
	Mean (std)	60 (69)		73.8 (103)		30.8 (33.6)		53 (74)	

PROFILE OF OFFICE BEARERS-OVERALL RESULTS

Indicators	POSITION						
	President N=80	Vice President N=79	General Secretary N=80	Joint Secretary N=53	Finance Secretary N=80	Committee Member N=178	Total N=550
Land Distribution (Acres)							
0-25	34	42	52	37	57	131	353(64.2)
26-50	20	25	20	14	14	38	131(23.8)
51-75	11	5	2	1	5	3	27(4.9)
76-100	4	2	2	1	0	1	10(1.8)
101+	11	5	4	0	4	5	29(5.3)
Total	80	79	80	53	80	178	550(100)
Mean Land=34.03, Std.Dev.=52.0, Min.=1.0, Max. 560, Mode=32.0							
Location of Land Holdings							
Head	27	28	22	13	26	41	157(28.5)
Middle	28	20	29	20	35	72	204(37.1)
Tail	25	31	29	20	19	65	189(34.4)
Total	80	79	80	53	80	178	550(100)
Tenancy Status							
Landowners	58	43	43	20	44	61	269(48.9)
Owner-Operators	16	32	26	27	25	72	198(36.0)
Lessees	1	1	4	0	2	6	14(2.6)
Tenants	1	1	3	3	2	31	41(7.5)
Kamdars	4	2	4	3	7	8	28(5.0)
Total	80	79	80	53	80	178	550(100)
Educational Status							
Illitrate	6	16	0	13	8	52	95(17.3)
Primary	28	26	18	13	26	63	174(31.6)
Matric	17	17	35	14	22	45	150(27.3)
Intermediate & Above	29	20	27	13	24	18	131(23.8)
Total	8	29	80	53	80	178	550(100)

Age Distribution(Years)							
16-29	8	10	18	10	20	28	94(17.1)
30-45	42	40	43	29	43	100	297(54.0)
46-59	24	18	12	12	11	36	113(20.5)
60+	6	11	7	2	6	14	46(8.4)
Total	80	79	80	53	80	178	550(100)
Mean Age=40.2, Std.Dev.=11.6, Min.=16.0, Max.=75.0, Mode=40.0							
Family Members(Numbers)							
1-5	13	10	20	8	16	24	91(16.6)
6-10	35	39	27	21	38	86	246(45.0)
11-15	16	14	17	13	13	43	116(21.2)
16-20	4	6	5	2	7	13	37(6.8)
21-100	11	9	11	9	5	12	57(10.4)
Total	79	78	80	53	79	178	547(100)
Mean Family Members=11.4, Std.Dev.8.1, Min.=1.0, Max.=70.0, Mode=8.0, Missing=3							
Income Distribution(Rupees)							
5,000-25,000	14	18	20	17	24	71	164(29.9)
26,000-50,000	13	23	31	25	23	70	185(33.8)
51,000-75,000	14	6	10	5	8	16	59(10.8)
76,000-100,000	12	13	6	2	8	11	52(9.5)
101,000-500,000	20	18	11	4	16	10	79(14.4)
501000-3500,000	6	1	2	0	0	0	9(1.6)
Total	79	79	80	53	79	178	548(100)
Mean Income=89,917.00, Std.Dev.=217,667.00, Min.=5,000.0, Max.=3500,000.00, Mode=50,000.00, Missing=2							
Contact Farmers Selected as Office Bearers				Yes 142 26%		No 408 74%	
Note: Percentages are given in parantheses							

PROFILE OF OFFICE BEARERS OF WUAs BAREJI DISTRIBUTARY - MIRPURKHAS (NUMBERS)

Indicators	POSITION						
	President N=24	Vice President N=24	General Secretary N=24	Finance Secretary N=24	Joint Secretary N=0	Committee Member N=20	Total No=116
Land Distribution (Acres)							
0-25	9	12	17	17	0	17	72
26-50	1	6	4	2	0	2	15
51-75	5	4	1	3	0	0	13
76-100	2	1	0	0	0	0	3
101+	7	1	2	2	0	1	13
Total	24	24	24	24	0	20	116
Mean Land=45.9, Std.Dev=57.7, Min=2.0, Max=312.0, Mode=16.0							
Location of Land Holdings							
Head	10	10	10	13	0	6	49
Middle	5	5	8	6	0	3	27
Tail	9	9	6	5	0	11	27
Total	24	24	24	24	0	20	116
Tenancy Status							
Landowners	22	17	13	14	0	78	73
Owner-Operators	0	6	5	3	0	10	24
Lessees	1	0	3	1	0	0	5
Tenants	0	0	1	1	0	1	3
Kamdars	1	1	2	5	0	2	11
Total	24	24	24	24	0	20	116
Educational Status							
Illiterate	1	6	0	5	0	5	17
Primary	12	11	8	12	0	10	53
Matric	4	3	10	2	0	3	22
Inter & Above	7	4	6	5	0	2	24
Total	24	24	24	24	0	20	116
Age Distribution(Years)							
16-29	3	3	9	8	0	2	25
30-45	12	13	11	12	0	14	62
46-59	7	5	4	1	0	3	20
60 +	2	3	0	3	0	1	9
Total	24	24	24	24	0	20	116
Mean Age=39.5, Std.Dev.=11.9, Min=16.0, Max=75.0, Mode=35.0							
Family Members (Numbers)							
1-5	6	3	10	5	0	0	24
6-10	10	14	11	14	0	15	64
11-15	5	4	3	3	0	5	20
16-20	1	1	0	1	0	0	3

21+	2	1	0	0	0	0	3
Total	24	23	24	23	0	20	114
Mean Family Members=8.7, Std.Dev.=4.1, Min=2.0, Max=25.0, Mode=8.0, Missing=2							
Income Distribution (Rupees)							
5,000-25,000	0	0	6	5	0	5	16
26,000-50,000	1	4	5	4	0	0	14
51,000-75000	2	2	3	2	0	3	12
76,000-100000	2	8	1	1	0	5	17
101,000-500,000	13	9	7	11	0	7	47
500,000-3,500,000	6	1	2	0	0	0	9
Total	24	24	24	23	0	20	115
Mean Income=237,652.0, Std.Dev.=434,009.0, Min=10,000, Max=3,500,000.00, Mode=100,00.00,Missing=1							

PROFILE OF OFFICE BEARERS OF WUAs DHORONARO MINOR - NAWABSHAH (NUMBERS)

Indicators	POSITION						
	President N=25	Vice President N=25	General Secretary N=25	Finance Secretary N=25	Joint Secretary N=24	Committee Members N=71	Total N=195
Land Distribution (Acres)							
0-25	12	14	21	19	18	52	136
26-50	5	6	1	4	5	13	34
51-75	4	1	1	1	0	2	9
76-100	1	0	0	0	1	0	2
101+	3	4	2	1	0	4	14
Total	25	25	25	25	24	71	195
Mean Land=39.9, Std.Dev.=71.5, Min=1.0, Max=560.0, Mode=8.0							
Location of Land of Holdings							
Head	9	8	4	6	5	16	48
Middle	7	6	10	13	8	32	76
Tail	9	11	11	6	11	23	71
Total	25	25	25	25	24	71	195
Tenancy Status							
Landowners	17	13	14	14	10	26	94
Owner-Operators	5	9	7	8	10	29	68
Lessees	0	1	1	0	0	2	4
Tenants	1	1	1	1	1	8	13
Kamdars	2	1	2	2	3	6	16
Total	25	25	25	25	24	71	195
Educational Status							
Illiterate	4	6	0	1	9	23	43
Primary	10	10	7	10	11	31	79
Matric	3	4	12	7	3	14	43
Inter and Above	8	5	6	7	1	3	30
Total	25	25	25	25	24	71	195
Age Distribution (Years)							
16-29	2	3	5	9	3	13	35
30-45	14	17	14	13	15	37	110

46-59	6	3	3	2	4	16	34
60+	3	2	3	1	2	5	16
Total	25	25	25	25	24	71	195
Mean Age=38.9, Std.Dev.=11.84, Min.=17.0, Max=70.0, Mode=40.0							
Family Members (Numbers)							
1-5	3	2	4	4	1	8	22
6-10	9	12	5	9	7	28	70
11-15	3	3	7	5	10	18	46
16-20	2	3	2	3	2	6	18
21-100	8	5	7	4	4	11	39
Total	25	25	25	25	24	71	195
Mean=14.4, Std.Dev.=10.6, Min=1.0, Max=70.0, Mode=10.0							
Income Distribution (Rupees)							
5,000-25,000	4	7	5	7	8	31	62
26,000-50,000	7	8	15	11	13	32	86
51,000-75,000	7	1	2	2	0	5	17
76,000-100,000	3	2	2	3	0	1	11
101,000-500,000	4	7	1	2	3	2	19
Total	25	25	25	25	24	71	195
Mean Income=54,466.00, Std.Dev.=64.244, Min=6,000.00, Max=500,000.00, Mode=5000.00							

PROFILE OF OFFICE BEARERS OF WUAs HERAN DISTRIBUTARY - SANGHAR (NUMBERS)

Indicators	**POSITION**						
	President N=24	**Vice President N=24**	**General Secretary N=24**	**Finance Secretary N=24**	**Joint Secretary N=24**	**Committee Member N=69**	**Total N=189**
Land Distribution (Acres)							
0-25	9	11	11	16	15	47	109
26-50	13	12	12	7	9	20	73
51-75	2	0	0	1	0	1	4
76-100	0	1	1	0	0	1	3
101+	0	0	0	0	0	0	0
Total	24	24	24	24	24	69	189

Mean=23.4, Std.Dev.15.9, Min.2.0, Max.96.0, Mode=32.0							
Location of Land Holdings							
Head	7	6	7	6	6	16	48
Middle	11	8	9	12	10	30	80
Tail	6	10	8	6	8	23	61
Total	24	24	24	24	24	69	189
Tenancy Status							
Landowners	17	11	14	14	10	23	89
Owner-Operators	7	13	10	9	12	24	75
Lessees	0	0	0	1	0	4	5
Tenants	0	0	0	0	2	18	20
Kamdars	0	0	0	0	0	0	0
Total	24	24	24	24	24	69	189
Educational Status							
Illiterate	0	2	0	1	4	21	28
Primary	3	3	1	2	1	14	24
Matric	9	10	10	9	8	22	68
Inter and Above	12	9	13	12	11	12	69
Total	24	24	24	24	24	69	189
Age Distribution (Years)							
16-29	2	4	3	1	5	9	24
30-45	11	8	13	15	13	39	97
46-59	10	10	5	6	6	14	51
60+	1	4	3	2	0	7	17
Total	24	24	24	24	24	69	189
Mean Age=41.9, Std.Dev=11.4, Min=17.0, Max=70.0, Mode=30.0							
Family Members (Numbers)							
1-5	4	5	6	6	7	15	43
6-10	14	11	8	12	13	37	95
11-15	5	6	6	5	3	15	40
16-20	1	0	2	1	0	2	6
21-100	0	2	2	0	1	0	5
Total	24	24	24	24	24	69	189

Mean Family Members=8.9, Std.Dev.=4.8, Min=1.0, Max=30.0, Mode=8.0							
Income Distribution (Rupees)							
5,000-25,000	7	9	5	9	9	29	68
26,000-50,000	5	9	11	7	10	29	71
51,000-75000	4	2	2	3	3	7	21
76,000-100000	5	3	3	3	2	3	19
101000+	3	1	3	2	0	1	10
Total	24	24	24	24	24	69	189
Mean Income=46,343.00, Std.Dev.=41,006.00, Min=6000.00, Max.=350,000.00, Mode=30,000.00							

PROFILE OF OFFICE BEARERS OF WUAs KHADWARI MINOR - SANGHAR (NUMBERS)

Indicators	**POSITION**						
	President N=7	**Vice President N=6**	**General Secretary N=7**	**Finance Secretary N=7**	**Joint Secretary N=5**	**Committee Member N=18**	**Total N=50**
Land Distribution (Acres)							
0-25	4	5	3	5	4	15	36
26-50	1	1	3	1	0	3	9
51-75	0	0	0	0	1	0	1
76-100	1	0	1	0	0	0	2
101+	1	0	0	1	0	0	2
Total	7	6	7	7	5	18	50
Mean Land=23.4, Std.Dev.=15.9, Min=2.0, Max=96.0, Mode=32.0							
Location of Land Holdings							
Head	1	4	1	1	2	3	12
Middle	5	1	2	4	2	7	21
Tail	1	1	4	2	1	8	17
Total	7	6	7	7	5	18	50
Tenancy Status							
Landowners	2	2	2	2	0	5	13
Owner- Operators	4	4	4	5	5	9	31
Lessees	0	0	0	0	0	0	0
Tenants	0	0	1	0	0	4	5
Kamdars	1	0	0	0	0	0	1
Total	7	6	7	7	5	18	50

Educational Status							
Illiterate	1	2	0	1	0	3	7
Primary	3	2	2	2	1	8	18
Matric	1	0	3	4	3	6	17
Inter and Above	2	2	2	0	1	1	8
Total	7	6	7	7	5	18	50
Age Distribution (Years)							
16-29	1	0	1	2	2	4	10
30-45	5	4	5	3	1	10	28
46-59	1	0	0	2	2	3	8
60+	0	2	1	0	0	1	4
Total	7	6	7	7	5	18	50
Mean Age=40.0, Std.Dev.=12.2, Min.=22.0, Max=70.0, Mode=45.0							
Family Members (Numbers)							
1-5	0	0	0	1	0	1	2
6-10	2	2	3	3	1	6	17
11-15	3	1	1	0	0	5	10
16-20	0	2	1	2	0	5	10
21-100	1	1	2	1	4	1	10
Total	6	6	7	7	5	18	49
Mean Family Members=15.06, Std.Dev.=8.6, Min=5.0, Max=45.0, Mode=10.0							
Income Distribution (Rupees)							
5,000-25,000	3	2	4	3	0	6	18
26,000-50,000	0	2	0	1	2	9	14
51,000-75000	1	1	3	1	2	1	9
76,000-100000	2	0	0	1	0	2	5
101000+	0	1	0	1	1	0	3
Total	6	6	7	7	5	18	49
Mean Income=52,346.00, Std.Dev.=54,602.00, Min=5000.00, Max=300,000.00, Mode=30,000.00							

INCOME DISTRIBUTION BY POSITION AND TENANCY STATUS OF OFFICE BEARERS(RUPEES)

S#	POSITION	TENANCY	MEAN	STD.DEV.	CASES
1	President	Overall	219,683	474,572	79
		Landowners	261,614	474,572	57
		Owner- Operators	42,375	27,290	16
		Lessees	1500,000	-	1
		Tenants	20,000	-	1
		Kamadars	61,250	22,500	4
2	Vice President	Overall	92,822	110,935	79
		Landowners	136,860	133,911	43
		Owner- Operators	39,062	25,238	32
		Lessees	100,000	-	1
		Tenants	20,000	-	1
		Kamdars	39,000	1414	2
3	General Secretary	Overall	95075	232,123	80
		Landowners	80,883	65509	43
		Owner-Operator	48,576	58,878	26
		Lessees	666,250	928,559	4
		Tenants	40,666	25,716	3
		Kamdars	19,500	7141	4
4	Joint Secretary	Overall	49,018	49,134	53
		Landowners	59,350	49,043	20
		Lessees	-	-	-
		Tenants	17,666	11239	3
		Kamdars	26,333	3214	3
5	Finance Secretary	Overall	81,556	97,715	79
		Landowners	112,255	114,742	43
		Owner-Operators	40,720	46,897	25
		Lessees	175,000	106,066	2
		Tenants	20,000	14,142	2
		Kamdars	29,714	15,808	7
6	Committee Members	Overall	44,606	51,520	61
		Landowners	54,000	52,909	61
		Owner-Operators	39,500	28,636	72
		Lessees	50,000	30,983	6
		Tenants	42,451	86,987	31
		Kamdars	23,250	9,361	8
	Entire Population		89,917	217667	548

INCOME BY POSITION AND TENANCY STATUS (NUMBERS)

S #	Position	Tenancy Status	Income Groups (Rupees)					
			5000-25000	26000-50,000	51,000-75000	76,000 - 100,000	101,000 - 500,000	501,000-3,500,000
1	President	Landowner	7	7	9	9	20	5
		Owner-Operators	6	5	3	2	0	0
		Lessees	0	0	0	0	0	1
		Tenants	1	0	0	0	0	0
		Kamadars	0	1	2	1	0	0
2	Vice Presient	Landowner	5	10	0	9	18	1
		Owner-Operators	12	11	6	3	0	0
		Lessees	0	0	0	1	0	0
		Tenants	1	0	0	0	0	0
		Kamdars	0	2	0	0	0	0
3	General Secretary	Landowner	4	18	6	6	9	0
		Owner-Operators	10	11	3	0	2	0
		Lessees	1	1	0	0	0	2
		Tenants	1	1	1	0	0	0
		Kamdars	4	0	0	0	0	0
4	Joint Secretary	Landowner	5	9	1	2	3	0
		Owner-Operators	8	14	4	0	1	0
		Lessees	0	0	0	0	0	0
		Tenants	2	1	0	0	0	0
		Kamdars	2	1	0	0	0	0
5	Finance Secretary	Landowner	7	10	5	7	14	0
		Owner-Operators	12	10	2	0	1	0
		Lessees	0	0	0	1	1	0
		Tenants	1	1	0	0	0	0
		Kamadars	4	2	1	0	0	0
6	Committee Members	Landowners	16	30	4	5	6	0
		Owner-Operators	30	26	9	4	3	0
		Lessees	1	2	2	1	0	0
		Tenants	20	8	1	1	1	0
		Kamdars	4	4	0	0	0	0

LAND HOLDINGS BY POSITION AND TENANCY STATUS (ACRES)

S#	POSITION	TENANCY	MEAN	STD.DEV.	CASES
1	President	Overall	53	64	80
		Landowners	62	62	58
		Owner-Operators	19	15	16
		Lessees	312	-	1
		Tenants	-	-	1
		Kamadars	19	38	4
2	Vice President	Overall	37	60	79
		Landowners	46	55	43
		Owner-Operator	18	16	1
		Lessees	400	-	1
		Tenants	-	-	1
		Kamdars	-	-	2
3	General Secretary	Overall	29	40	80
		Landowners	34	43	43
		Owner-Operators	15	12	26
		Lessees	84	90	4
		Tenants	27	46	3
		Kamdars	-	-	4
4	Joint Secretary	Overall	2	18	53
		Landowners	27	21	20
		Owner-Operators	20	15	27
		Tenants	7	12	3
		Kamdars	-	-	3
5	Finance Secretary	Overall	31	69	80
		Landowners	47	90	44
		Owner-Operators	13	8	25
		Lessees	36	28	2
		Tenants	-	-	2
		Kamdars	-	-	7
6	Committee Members	Overall	21	33	178
		Landowners	36	49	61
		Owner-Operators	15	10	72
		Lessees	24	13	6
		Tenants	13	26	31
		Kamdars	-	-	8

AGE BY POSITION AND TENANCY STATUS (YEARS)

S#	POSITION	TENANCY	MEAN	STD.DEV.	CASES
1	President	Overall	43	11	80
		Landowners	43	12	58
		Owner-Operators	44	10	16
		Lessees	45	-	1
		Tenants	40	-	1
		Kamadars	44	9	4
2	Vice President	Overall	43	12	79
		Landowners	41	12	43
		Owner-Operators	45	14	32
		Lessees	40	-	1
		Tenants	35	-	1
		Kamdars	41	12	2
3	General Secretary	Overall	38	12	80
		Landowners	37	10	43
		Owner-Operators	38	15	26
		Lessees	46	10	4
		Tenants	39	10	3
		Kamdars	42	11	4
4	Joint Secretary	Overall	39	10	53
		Landowners	38	11	20
		Owner-Operators	39	10	27
		Tenants	35	10	3
		Kamdars	48	8	3
5	Finance Secretary	Overall	39	11	80
		Landowners	37	12	44
		Owner-Operators	41	10	25
		Lessees	31	1	2
		Tenants	30	7	2
		Kamdars	44	11	
6	Committee Members	Overall	40	11	178
		Landowners	39	11	61
		Owner-Operators	39	12	72
		Lessees	38	7	6
		Tenants	42	11	31
		Kamdars	47	9	8

Summary of Outlet Data and Results of Outlet Calibration
Bareji Distributary (Mirpurkhas)

WC. #	Type	Dimensions		Type of Flow	h_u (ft)	h_d (ft)	Q (ft^3/s)	C_d or K or C_s,C_f	Remarks
		B, ft	Y, ft						
1-R	APM	0.201 (area)	-	F.F	1.365	-	1.88	0.997	Ok
2-R	APM	T	-	F.F	2.83	-	2.83	1.960	Tampered
3-R	OF	0.667	-	S.F	2.68	2.635	3.50	0.398	OK
4-R	APM	T	-	S.F	2.815	2.255	1.767	2.361	Tampered
5-R	APM	T	-	F.F	2.203	-	4.087	2.75	Tampered
6-R	APM	T	-	S.F	2.123	1.323	4.856	5.431	Tampered
7-R	APM	T	-	S.F	1.598	1.06	1.877	2.56	Tampered
8-R	OF	0.895	-	S.F	1.685	1.654	1.954	0.517	OK
9-R	OF	0.429	-	S.F	1.451	1.113	1.980	0.521	OK
10-R	OF	1.0	-	S.F	1.858	1.758	2.487	0.424	OK
11-R	OF	0.633	-	S.F	2.125	2.111	1.857	0.354	OK
1-L	DAPM	T	-	F.F	1.348	-	5.335	4.595	Tampered
2-L	APM	T	-	F.F	2.087	-	4.778	3.306	Tampered
3-L	APM	T	-	S.F	2.343	0.926	5.822	4.108	Tampered
4-L	APM	T	-	F.F	2.209	-	1.752	1.179	Tampered
5-L	APM	T	-	S.F	2.765	1.442	6.747	5.865	Tampered
6-L	APM	T	-	F.F	1.397		4.390	3.714	Tampered
7-L	APM	T	-	S.F	2.571	1.354	4.315	3.911	Tampered
8-L	APM	T	-	S.F	2.180	1.314	2.830	3.089	Tampered
9-L	DOF	0.5	-	S.F	2.290	1.398	4.129	0.584	OK
10-L									
11-L	OF	0.364	-	S.F	2.581	2.484	3.383	0.431	OK
12-L	OF	-	-	F.F	2.916	-	2.748	0.551	Tampered
13-L									

Where, T = Tampered
APM = Adjustable proportionate module
OF = Open flume
FF = Free flow
SF = Submerged flow

Dhoronaro Minor (Nawabshah)

WC. #	Type	Dimensions		Type of Flow	h_u (ft)	h_d (ft)	Q (ft^3/s)	C_d or K or C_s,C_f	Remarks
		B, ft	Y, ft						
1-R	OF	0.213	-	F.F	2.788	-	1.930	0.915	OK
2-R	OF	T	-	S.F	2.937	2.509	2.337	0.223	Tampered
3-R	OF	T	-	F.F	1.864	-	1.490	0.585	Tampered
4-R	OF	T	-	S.F	0.73	0.68	2.279	1.467	Tampered
5-R	OF	T	-	F.F	1.487	-	2.033	1.121	Tampered
6-R	OF	T	-	S.F	1.903	1.821	1.276	0.254	Tampered
6-AR	OF	T	-	F.F	2.290	-	4.084	1.178	Tampered
7-R	OF	T	-	F.F	1.611	-	3.748	1.833	Tampered
1-DL	OF	T	-	F.F	1.975	-	2.724	0.981	Tampered
1-L	OF	T	-	F.F	2.447	-	3.313	0.865	OK
1-AL	OF	T	-	S.F	1.461	1.41	2.060	0.558	Tampered
1-BL	OF	T	-	F.F	1.423	1.352	3.910	0.951	Tampered
1-CL	OF	T	-	S.F	1.801	1.787	4.273	0.899	Tampered
2-L	OF	T	-	S.F	1.417	1.295	2.670	0.706	Tampered
2-AL	OF	T	-	S.F	1.961	1.909	2.370	0.397	Tampered
3-L	OF	T	-	F.F	1.283	-	4.279	2.944	Tampered
4-L	OF	T	-	S.F	2.577	2.485	1.781	0.201	Tampered
4-BL	OF	T	-	F.F	2.631	-	5.152	1.207	Tampered
4-AL	OF	T	-	F.F	0.496	-	2.200	6.295	Tampered
5-L	OF	T	-	F.F	2.001	1.548	3.153	1.113	Tampered
6-L	OF	T	-	F.F	1.769	-	2.456	1.043	Tampered
7-L	OF	T	-	S.F	1.804	1.755	1.351	0.280	Tampered
9-L	OF	T	-	F.F	1.890	1.80	4.930	0.910	Tampered
10-L	OF	T	-	S.F	1.380	1.27	3.110	0.821	Tampered
11-L	OF	0.558	-	S.F	1.715	1.68	2.940	0.652	OK

Where, T = Tampered
OF = Open flume
FF = Free flow
SF = Submerged flow

Heran Distributary (Sanghar)

WC. #	Type	Dimensions		Type of Flow	h_u (ft)	h_d (ft)	Q (ft^3/s)	C_d or K or C_s,C_f	Remarks
		B, ft	Y, ft						
2-R	APM	0.34	0.3	FF	1.288	-	0.6134	0.66	OK
4-R	APM	-	-	SF	4.386	4.274	4.280	1.60	Tampered
5-L	APM	-	-	SF	4.25	3.13	2.150	0.253	Tampered
6-L	APM	0.81	0.58	SF	1.96	1.10	1.897	0.54	OK
6-L	APM	1.12	0.29	SF	2.50	1.10	2.50	0.81	OK
9AR	APM	0.73	0.52	SF	1.53	0.9224	1.930	0.813	OK
8L	APM	1.22	0.32	FF	1.725	-	2.752	0.670	OK
1-L	APM	-	-	SF	4.27	4.083	0.757	0.218	Tempered
9R	APM	1.0	0.39	FF	1.767	-	2.995	0.72	OK
8AL	APM	1.16	0.29	FF	1.454	-	1.936	0.595	OK
10R	APM	0.669	0.38	SF	2.580	0.798	2.263	0.83	OK
(11+ 12)R	APM	1.180	0.95	FF	1.36	-	5.63	0.52	OK
13R	APM	1.34	0.33	FF	0.984	-	2.41	0.685	OK
14L	APM	-	-	FF	1.96	-	2.173	0.193	Tampered
15L	APM	0.80	0.26	FF	2.38		1.85	0.73	OK
16R	APM	1.90	0.38	SF	3.997	3.143	5.854	1.16	OK
17AL	APM	0.84	0.4	FF	2.555	-	2.50	0.58	OK
16AR	OF	0.78	-	SF	4.25	4.20	2.655	0.152	OK
18R	OF	0.64	-	SF	1.654	1.583	2.58	0.57	Tampered
17BL	APM	1.12	0.53	FF	1.258	-	3.31	0.62	OK
17AT	OF	0.81		SF	2.43	2.36	3.49	0.425	Tampered
18AT	OF	0.71		SF	2.004	1.746	5.418	0.528	OK

Where, T = Tampered
SF = Submerged flow
FF = Free flow
OF = Open flume

Khadwari Minor (Sanghar)

WC. #	Type	Dimensions		Type of Flow	h_u (ft)	h_d (ft)	Q (ft^3/s)	C_d or K or C_s,C_f	Remarks
		B, ft	Y, ft						
1AL	OF	0.4	-	FF	2.03	-	3.12	1.08	OK
1L	OF	0.44	-	FF	2.17	-	1.20	0.375	OK
2R	Orific e	1.62	0.38	FF	0.81	-	2.20	0.49	OK
3L	OF	0.38		SF	1.336	1.2	1.06	0.32	OK
4R	OF	-	-	SF	1.40	1.39	3.40	1.26	Tampered
5T	OF	-	-	SF	1.70	1.56	2.82	0.557	Tampered
6T	OF	0.29		FF	2.157	-	0.44	0.140	OK

Where, T = Tampered FF = Free flow OF = Open flume
SF = Submerged flow

IIMI's ACTION RESEARCH PILOT PROJECT ON FARMER MANAGED IRRIGATED AGRICULTURE UNDER LBOD STAGE I PROJECT

KEY PERSONNEL

PROJECT STAFF DURING PHASE-II

D. J. Bandaragoda	Irrigation Institutional Specialist (Project Leader)
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Dr. M.S. Shafique	M&E Specialist
Dr. Prachanda Pradhan	Irrigation Institutional Expert (Short Term Consultant)
Piyasena Ganewatte	Irrigaiton Institutional Expert (Short Term Consultant)
Laurence E. Smith	Financial Specialist (Short Term Consultant)
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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	IIMI-Pakistan	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 systems	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 - pulished as Research Report)	S.M.P. Smets	June 1996
R-5	Water Distribution at the Secondary Level in the Chishtian 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
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Report No.	Title	Author	Year
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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
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