INSTITUTIONAL ISSUES IN FARMERS' PARTICIPATION IN IRRIGATION AND DRAINAGE MANAGEMENT

A Synthesis of IIMI's Social Organization Pilot Project Experiences in Pakistan[1]

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1. Introduction

Recent initiatives by the Government of Pakistan to introduce institutional reforms in the country's irrigated agriculture sector basically aim at restructuring the management of its irrigation and drainage systems. The primary objective of these policy initiatives is to improve the productivity of the sector in an environmentally sustainable manner, and the major strategy is largely to involve the farmers in the management of operation and maintenance of the physical systems. The introduction of end users' participation in water resources management into an administration, which has long been highly centralized, is a very complex task. It involves a number of institutional[2] factors that are related to the country's socio-economic environment, its existing legal framework, and its political and organizational culture. The inevitable interactions among these factors can be seen when they are confronted with some prospects for change. Attempts to introduce even the mildest change in the status quo tend to generate an initial resistance to change, and any space for progress depends on the ability to address these institutional issues effectively.

This paper highlights some of the institutional issues identified during the implementation of a series of pilot efforts on social organization by the International Irrigation management Institute (IIMI) in two provinces of Pakistan, the Punjab and the Sindh. Necessarily, these issues need to be viewed in the context of pilot projects' field experiences, and for this purpose, the paper also gives a brief description of the pilot projects and the related activities.

The first pilot site to be started in this study program was the Hakra 4-R Distributary in the Fordwah Eastern Sadiqia (FES) irrigation and drainage system in south-eastern Punjab. The action research activity at this pilot site is part of the institutional

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[1] **Paper presented at the One Day National Experts Consultation Meeting on farmers participation in drainage in Pakistan, organized by the International Waterlogging and Salinity Research Institute, Lahore, and held on 10 July 1997, at International Irrigation Management Institute, Pakistan, Lahore.**

[2] **In this paper, the word "institution" is not restricted to mean only organizations, and is given a wider meaning to include formal and informal rules, traditions and norms.**

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development component of an on-going IIMI project, "Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan", funded by the Royal Netherlands Government. In the Sindh, a pilot project on "Farmer-Managed Irrigated Agriculture" is under way at three different locations in three Left Bank Outfall Drain (LBOD) districts, the Dhoro Naro Minor in Nawabshah, the Heran Distributary in Sanghar and the Bareji Distributary in Mirpurkhas. This action research is funded as part of the LBOD Stage I Project by the World Bank and the Swiss Development Cooperation. IIMI is also engaged in a similar activity in collaboration with the Water Resources Research Institute (WRRI) of the National Agriculture Research Centre, at two small dams, Mirwal and Shahpur, which are situated near the Fateh Jang town in northern Punjab. This activity is financially supported by the Department for International Development (DfID, formerly known as ODA) of UK.

The major objectives of all of these pilot projects were to test the viability of social organization in the context of a strong and well established irrigation culture, and the viability of organized water users' managing parts of the irrigation systems so that more efficient and equitable allocation and use of water can be achieved in that context. Recommendations were to be made for future extensions based on the results of the pilot projects towards adopting improved management strategies for both reducing environmental hazards as well as increasing agricultural production.

To achieve these objectives, IIMI was basically engaged in a number of project activities, of which the major items were: 1) to gain an understanding of the ground situation in the pilot distributaries/dams by way of collecting baseline data on physical, socio-economic and institutional aspects relating to the existing systems in operation; 2) to use this knowledge to cordially interact with the water users in the pilot distributary/dam command area with a view to discussing with them the possible management strategies for improved productivity and sustainability of irrigated agriculture in the area; 3) to mobilize the necessary institutional support for assisting the water users in selected pilot distributaries/dams and catalyzing their interest to establish appropriate water users organizations; 4) to facilitate interactions between water users and operating agencies; and 5) to assist in setting in motion a series of institutional development activities to support these newly established water users organizations to undertake responsibility for maintenance and operation of secondary and tertiary level of the canal irrigation system and small dams for improved water distribution.

Although action research pilot projects try to introduce change in a limited way, without the support of broad-based policy, they are usually unable to achieve wider acceptance of change. However, the pilot projects can surface the issues related to intended change for future policy guidance. Based on the preliminary results from these pilot project experiences, the paper raises the following main issues:

* Linkage between physical characteristics of irrigation and drainage systems and institutional requirements for their O&M management;

* Impact of community characteristics on the potential for social organization;

* Motivation for farmers' participation in O&M management;

* Institutional support for sustainable farmers' participation in O&M management; and

* Implications for Farmers' Participation in Drainage Management.

2. Institutional Implications of Physical Characteristics

All of the six pilot sites, irrespective of their size and complexity as irrigation systems, are operated and maintained by the Provincial Irrigation Department (PID). However, depending on a number of factors, including the physical characteristics (see Annex-1), a distinction can be seen in the farmer-bureaucracy interactions in each of the five systems.

Of the four canal irrigation pilot sites, the Hakra 4-R Distributary is a very large secondary canal, having a 36 km long main stream, and two minors offtaking from it -- 1-RA Labsingh and 1-R Badruwala -- 7 km and 15 km long, respectively. With a discharge of 5.46 cubic meters per second (193 cusecs) at the head, it serves a command area of about 17,570 hectares belonging to 4,690 landowners, through 123 irrigation watercourses or tertiary level channels. The three secondary canal systems selected in the Sindh Province are relatively small, the average length being only 12 km and average discharge being merely 1.3 cubic meter per second (48 cusecs). All three of them have a total command area of about 17,250 hectares belonging to 1,150 landowners, served by a total of 80 watercourses. The other two pilot sites are on two independent small reservoir systems located in the Attock District, outside the Indus basin, each serving on the average about 450 hectares belonging to about 125 water users, through small gravity canals of about 0.3 cumecs discharge.

These varying physical characteristics have a significant impact on the institutional arrangements for the operation and maintenance. Primarily, the canal irrigation systems have a greater institutional involvement than the two small dam systems. The reason for this bias is that the PIDs in the two provinces are basically identified with the culture of canal irrigation, which has been fashioned by the long association with a legal framework of three main enactments: the Canal and Drainage Act of 1873, the Sindh Irrigation Act of 1879 and the Punjab Minor Canals Act of 1905. The operation, maintenance and water allocation rules are all administered under these laws, and the small dams receive only a tangential treatment arising from this major pre-occupation on canal irrigation. For instance, the PID's attention during the initial construction phase of the small dams has not been sustained during their post-construction activities, or for establishing appropriate water allocation rules for them. Perhaps, the small dams are seen as peripheral to the main irrigation laws, and institutionally, they were not reckoned as typical irrigation systems. The relatively complex O&M needs of large canals when compared with the insignificant size of small dam irrigation in Pakistan also would determine the comparative advantage related to PIDs' emphasis on canal irrigation.

The same canal irrigation culture pervades the rural life in canal command areas. Their major source of employment is irrigated agriculture, and their knowledge and skills are closely linked with it. They speak an "irrigation language". Most of their disputes and litigation efforts are also related to irrigation. Their habitats are generally identified in terms of hydraulic boundaries. To that extent, their participation in irrigation related management activities can be more easily obtained than in the case of people living in the small dam areas, who are generally interested in many other things than irrigated agriculture.

Interestingly, from the perspective of water users, many attributes related to irrigation water, such as adequacy, reliability and equitable distribution, are more easily and better understood by them in the case of the small dams than in canal irrigation systems. The main reason for this is the proximity to the source of water in the small dams; the water users of a distributary command, unlike those of a small reservoir, cannot fully perceive the actual source of their water and the uncertainties associated with it. This is an important area in which the physical characteristics of the system impact on its institutional features.

Inadequacy and lack of reliability of the water supply in the canal irrigation systems, make the water users depend more on having clear water rights established. This dependence on formal rules contrasts with the casual manner in which small dam water users attend to their water allocation practices. Among the four canal pilot sites themselves, there is a noticeable variation in this regard. The three secondary canal sites in the Sindh Province, the application of warabandi method has become very flexible, mostly due to the relative abundance of water during certain periods of time, contrasting with a more rigorous approach to warabandi in the Hakra 4-R Distributary where water scarcity is more pronounced.

Thus, the physical characteristics can play a significant role in the development of the related institutional mechanisms. This is an important issue when participatory management approaches are designed, particularly involving the O&M of drainage facilities. This issue will be further discussed later in the paper.

3. Social Context and Methodologies of Social Organization

The major focus of IIMI's approach in mobilizing the social organization field teams was on the local social context. Initial investigations during baseline surveys indicated that the community in the Sindh pilot sites was characterized by a skewed land distribution and fairly deep rooted mistrust in the strangers. The skewed landownership pattern meant that a few influential farmers would assert in community decisions and a field team's ability to reach the people would be restricted. The small farmers and the large number of tenants also tended to be reluctant in providing information or in communicating with the outsiders. The Hakra 4-R Distributary was not acute in these two characteristics, but had a large water users community spread out in an extensive command area, making social interactions even among themselves very difficult. In this social context, IIMI decided to adopt a slow but more socially acceptable step-wise

approach, using a small field team at each site, and a number of local volunteers to supplement it.

3.1 Small Field Teams

Usually, the pilot projects are over-burdened with highly qualified and trained staff. Often, they have been found to be unable to reach the community deeply enough for better mutual understanding of project objectives and conditions. Also, such an approach with large staff and highly qualified staff being deployed in pilot projects has made the project findings less replicable. The field approach of IIMI involved the placing of social organizers in the community to interact with and slowly catalyze the farmers to identify their own problems, solutions, leaders, organization, financing, budgeting, and management. For each pilot command area, a Field Team of 3 to 5 members was deployed initially, consisting of one Team Leader, al being of either sociology or agricultural science background.

3.2. Community Based Volunteers

A distinctive feature of the methodology adopted in this action research program was the use of "contact farmers" or "social organization volunteers" (SOVs). The SOVs essentially served as a link between the small field team and the community, and in effect formed part of a social organization team. The following main criteria used for selecting the SOVs indicate the advantages that IIMI has sought to gain in adopting this methodology in achieving farmers' participation:

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

* The person should be non-controversial, not known to be trouble maker, an exploiter, an anti-social person 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 show sufficient motivation to help others and saw values in collective behavior for common good; and

* 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.

Based on these criteria, 158 SOVs were selected after consulting 486 water users from 39 villages in the Hakra 4-R Distributary command area, and 160 SOVs were selected through 52 small group meetings in the three pilot sites in the Sindh. The selected

persons were given a special training and were deployed to work along with the field team members.

The biggest advantage in having the SOVs was felt when they took upon themselves to explain the objectives of the project and the background of IIMI, at a very critical stage of the project. A few months after the field work was started, IIMI's interventions related to farmers' participation in O&M management were seen by some people, particularly those who had some vested interest in retaining the status quo, as part of a hidden agenda sponsored globally by aid agencies and countries associated with them. IIMI was projected by these people as an alien agency working for achieving conspiratory objectives detrimental to Pakistan. At this stage, no amount of discourses by IIMI staff could save the situation, and only the SOVs' voluntary actions managed to dispel such doubts and misconceptions. The community preferred to rely on assurances and explanations of their own opinion leaders than on the professional discourses by IIMI staff.

3.3 Phased Approach to Social Organization

A community, which is fairly suspicious about outsiders and outside interventions, needed to be approached cautiously. However noble the pilot project intentions were, the slightest suspicion by the community could form a social barrier to interventions, particularly when they were aimed at organizing people. This cautious approach was to gain entry into the community slowly through well-designed steps in interactions, each step meant to progressively establish mutual trust between the farmers and the field team members. In the gradual step-wise approach[3] chosen by the project, 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. The first two phases of this iterative process took relatively more time. The experiences prompted some changes to be incorporated into this process for each pilot site, depending on its special physical and community characteristics.

The support mobilization phase was a "get set" stage during which the field teams were mobilized and trained, initial collaborative arrangements were discussed with PID and OFWM staff, selection of the pilot sites was finalized, members for a Field Implementation Coordination Committee (FICC) were identified, and initial baseline information was collected.

Being a learning exercise, the training for the field staff was mostly derived from the experiences of social organization field research conducted already in the Hakra 6-R Distributary. This training included farmer interviews, use of key informants, process documentation, and some exposure to other social organization projects in the country.

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

Only the staff in Sindh pilot projects was provided with formal training by the AKRSP and for the rest of the field teams, it had been learning by doing.

In the next initial organization phase, some progressively advancing steps in interacting with the community were taken. Unlike many top-down government projects, in this pilot project, a consciously developed participatory approach was adopted. This approach itself made the field team's task so much more difficult than the "handed down" instructions, and the challenge was that each step taken collectively with the people had to be based on the popular agreement on the previous step's results. Gradually, the majority of the water users were convinced that the pilot projects were for their own benefit, but something they had to work hard to be built by themselves.

This effort was not so easy and not without misunderstandings and objections. The challenge itself provided a motivation to the field staff and the participating water users. It was a valuable experience for the field team members to see how some of the water users played the role of promoters of WUOs to argue with and convince their own fellow water users who were showing dissent. Sometimes, the valiant efforts of the field team in trying to build up some confidence among the people were followed by extremely frustrating negative results. New strategies had to be developed while the work was in progress so that the project staff could meet a new field situation. To that extent, the developed process was not a blue-print that could be followed without many field modifications.

3.4 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 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 "Five Dialogic Steps" as given in Annex-2.

3.5 Organizational Structure as a mean for Participation

A major project objective has been to achieve maximum participation of the water users in irrigation and drainage management. Past experience shows that water users' participation at the tertiary level can accomplish satisfactory results in mobilizing resources and making decisions related to short-term objectives, such as watercourse lining or improvement. However, after the completion of this task, the water users associations were no longer sustainable. The main reason was the lack of a long-term purpose for organized collective action. If the organizational effort is moved upstream to a higher level (distributary or minor level), the proposition is that more meaningful and longer-term purposes for organization could be found. For instance, a water users organization at this higher level could achieve the maximum possible participation in

"joint management" of the irrigation system. Logically, users' participation would contribute to improving the efficiency, equity, reliability, productivity and sustainability associated with the use of irrigation water resources. These functions require a more regular involvement than construction and rehabilitation.

Since the number of water users in each of the three distributary commands in the Sindh and the two small dam areas in Northern Punjab was small, only a single tier of the organization was sufficient. However, in considering the large size of the Hakra 4-R Distributary, two planning issues emerged:

(1) In the context of a large number of water users, how best can they be offered an equitable opportunity for participation in the organizational process?

(2) How best could the size of the command area be used in identifying longer-term functions for the water users organizations[4](WUOs)?

The traditional way of organizing water users associations (WUAs), one for each watercourse, and then federating them to form a water users organization at the distributary level was considered too time-consuming. To optimally use the time and the other resources available, it was necessary to think of an appropriate alternative method for reaching the distributary level fairly quickly. A different approach also would help to avoid the perceived "WUA images" associated with the government sponsored water users associations. Eventually, the chosen alterative approach was to define a set of intermediary sub-systems within the Hakra 4-R Distributary, for organizational purposes.

Five logical sub-units were identified as sub-systems. This division was based on the existence of two minors in the distributary, and the possibility of dividing the main distributary channel into three reaches i.e. head, middle and tail, preferably in terms of hydraulic structures along the main distributary. The five sub-systems seemed to be appropriate units for this action research, for the following reasons:

* The division of the distributary on the basis of hydraulic structures helps in monitoring the discharges in terms of time and space;

* Medium sized groups were found to be more suitable for effective social organization at early stages of the pilot project;

* Initial representation at this intermediary sub-system level enables an equality of opportunity for the water users in gaining executive committee membership;

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[4] **WUOs is the generic term to mean WUAs and WUFs. In this instance, the organization at the intermediary level of Sub-System or Zone is also referred to as Sub-System WUO, or Zone WUO.**

* Cohesive water users groups could be identified in terms of clusters of watercourses (in each sub-system), which helped in social organization work more effectively; and

* The initial identification of these sub-systems helped in generating common interests.

This decision to organize water users at the sub-system level first, and then, federate the five sub-system WUOs to form the distributary level WUF, was very helpful in meeting an important institutional need. Since there were a large number of water users in the distributary command, who were fairly widely distributed over a large geographical area, and over a number of different social groups, there arose a social need to give recognition to a larger number of leaders than could be accommodated in a single apex WUF. The five sub-system WUOs were a reasonable compromise. A subsequent effort to form 123 WUAs at the watercourse level in the Hakra 4-R Distributary command area would provide more opportunities for persons who show interest in taking over leadership.

4. Motivation for Participation

Many farmer interviews during pilot project implementation confirmed the lessons learned in other countries. The farmers demonstrated that they would not be motivated to form their organizations for participating in government or donor sponsored programs, particularly if the projected emphasis is on collecting irrigation and drainage fees. They were enthusiastic to look for other advantages of being organized. They openly expressed the view that, being able to enhance the reliability of water supplies and to reduce the present levels of inequity in water distribution would be a greater benefit from their participation in management. Basically, they preferred to decide for themselves instead of depending on an unsympathetic bureaucracy.

The step-wise process adopted in the pilot project proved that a real motivation for participation would exist when the people are involved in the process of institutional development for participation and when they realize the actual benefits of participation[5]. Without any incentives for physical work, the pilot project interaction processes managed to build up a reasonably good motivational environment as they moved through the five dialogic steps. For instance, in the Hakra 4-R Distributary pilot site, the initial familiarization meetings were met with skepticism, the rapport building meetings achieved some success, and when it came to the stage of consultation meetings, the participation rate ranged from 25% to 62% in different sub-systems. In the selection meetings, the participation rate increased to 77% of the total number of water users.

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[5] **C. Maloney (1994) cites several authorities and experiences of other countries to point out that "the real process of rural development is that the people jointly identify their own problems and solutions, set their objectives, organize by their own methods, with their own leaders, and with mostly their own resources, all for their own increased profit", and that people's associations can never be successfully formed by administrative fiat.**

Considering the large command areas of each sub-system, and the large number of people involved, this reflects a very high degree of motivation among the water users. In the final federation meeting the select WUF's executive committee, the participation was 96% of the WUF members nominated by the water users community. A similar pattern of increasing enthusiasm was seen in the Sindh pilot sites as well.

5. Institutional Support for Farmers' Organizations

One important lesson to be learned from the on-going pilot projects on water users organizations is that they could have been much more effective and their results more meaningful by now, if authorities at policy and management levels supported them more seriously. Only a few policy makers and still fewer officials have readily paid some attention to this unprecedented social and institutional experiment, while some others have acted when the pressure came from the donors.

In all of the four canal irrigation pilot sites action-researched by IIMI, the farmers have completed their initial organizational phase, formed WUFs, and are awaiting for the necessary legal and administrative authority to conduct business as O&M organizations. They have forwarded their formal requests to the relevant authorities for this purpose and are ready to enter into Joint Management Agreements. In the Sindh Province, the WUFs have been registered under the WUA Ordinance, whereas, in the Punjab, they are awaiting for the new PIDA law to be effective as the Province's WUA Ordinance does not provide for distributary level organizations.

Should these new WUFs prove to be socially and economically viable, the next step would be to plan for a wider replication of pilot project outcomes. So far, no institutional framework or organizational arrangement has been made available to undertake such planning for the future. In the absence of the essential institutional support, the enthusiasm of the farmers in their new venture on social organization is likely to decline soon. Since participation in O&M management is a new phenomenon for the farmers, some advisory service on relevant legal, administrative and financial aspects are crucially needed by these organizations.

6. Implications for Drainage Management

The pilot projects have assumed the traditional integrated approach to irrigated agriculture in which irrigation and drainage could be seen as two complementary functions. This assumption may be valid up to the level of the distributary command area, where the emphasis is on on-farm water management. The pilot project WUFs are aware of this joint responsibility at this level.

However, in areas where special medium and large scale drainage infrastructure have been constructed, the capacity of the farmers to undertake the O&M costs of both irrigation and drainage has to be objectively evaluated. Emerging results of field investigations related to costs and benefits as they exist now strike a note of caution. IIMI's field research in the pilot project indicates that, for a range of net annual incomes

per hectare between Rs. 4,000 and Rs. 8,000, the present cost recovery charge (abiana) ranges from 1.2% to 0.6% of the net income, whereas the present estimates of drainage maintenance in LBOD areas would amount to almost 25% of the average net farm income in these areas!

Similarly, the possible duplication of farmers' organizations (one for irrigation and another for drainage) causes another concern. If a third organization is set up for groundwater, the situation would become still more confused among the same set of farmer members of all these organizations. Many evaluators have almost found it fashionable to dwell on the multiplicity of government agencies involved in resources management in rural areas. Are the participatory mechanisms to mirror the same degree of multiplicity, and defeat their purpose of being the solutions to these ailing agencies?

The recent policy initiatives to pass new laws for the creation of Provincial Irrigation and Drainage Authorities present a new dimension to this situation. The suggested organizational structure according to the new PIDA law would integrate these two functions under the Area Water Boards (AWBs) at the main canal level. Consequently, it is conceivable that the Farmers Organizations (FOs) to be sponsored by the AWBs can also undertake both functions for a defined levels of irrigation and drainage physical systems.

7. Conclusion

In concluding this presentation, reference can be made to some overall findings of the pilot project activities so far finalized. The designing of appropriate institutions for farmers' participation in the management of irrigation and drainage systems should take into account both the physical and community characteristics of the systems. The methodology of catalyzing the farmers into organized action needs to be fashioned according to the existing social conditions. Similarly, the experience suggests that the social capacity, including the society's ability to formulate and apply rules, resolve conflicts and bear the management responsibilities, would largely determine the sustainability of any participatory mechanism.

In the context of the above, the results of IIMI's pilot projects to date also helps in presenting the following recommendations:

* Objectives of organizing farmers should be very clear to all involved in this exercise;

* The success of establishing WUOs and their sustainability will depend on their environment such as legal, social, resource endowment and distribution, law and order and governance;

* Motivation of the participants is a major determinant of WUOs' success;

* The capacity of the community to be organized should be assessed initially to improve, if possible, its social and human capital to absorb new changes and be accountable for organizational actions;

* The process of organizing the water users' community is seldom seen as an important element in the overall programs of creating participatory management. The pilot projects offer evidence that a well planned process is of extreme value in the social organization part of the program; and

* Farmers' participation in irrigation and drainage management should not be seen merely as a strategy for cost recovery or for easing out the budgetary constraints; it should be viewed and projected as a genuine attempt to improve the productivity and equity in resource management. In this sense, there should be a strong policy support to nurture the development of participatory management mechanisms.

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Table 1. Some Details of the Hakra 4-R Distributary.

Channel	Length (kms)	Design Discharge cumecs (Cusecs)	Authorized Withdrawal cumecs (Cusecs) *	No. of Outlets	CCA (acres)	No. of Shareholders	Extent of land per owner (ha)
Main distributary channel	36	5.6 (193)	3.0 (106)	75	27,100	2,775	3.95
1-RA Minor Labsingh	7	0.62 (22)	0.6 (21.8)	15	6,100	565	4.37
1-R Minor Badruwala	15	1.22 (43)	1.13 (40)	33	10,200	1,350	3.06
Total	58		4.73 (168)	123	43,400	4,690	3.75

* Authorized withdrawal is the sum of authorized discharges into the watercourses within each secondary channel.

Source: Bandaragoda D. J., M.U. Hassan, Z.I. Mirza, M.A. Cheema and W.U. Zaman. Organizing Water Users for Distributary Management: Preliminary Results From a Pilot Study in the Hakra 4-R Distributary of the Eastern Sadiqia Canal System of Pakistan's Punjab Province. IIMI-Pak, Lahore.

Table 2. Information on Three Selected Distributaries/Minors.

Name of Distributary/ Minor	No. of Outlets	CCA Hectares	No. of Land Owners			Extent of land per owner (ha)	No. of Villages	No. of House-holds	Popu-lation
			Total	Owning >40 ha	Owning <10 ha				
Bareji Distributary (Mirpurkhas)	24	5,728	197	20	109	29.07	79	1,703	10,580
Dhoro Naro Minor (Nawabshah)	25	5,353	421	17	336	12.71	147	2,468	19,822
Heran Disty Main Stream (Sanghar)	24	4,935	435	-	100	11.34	30	2,053	15,687
Khadwari Minor (Sanghar)	7	1,230	104	1	33	11.83	14	1,097	11,130
Heran Disty Total (Sanghar)	31	6,164	539	1	133	11.43	44	3,150	26,817

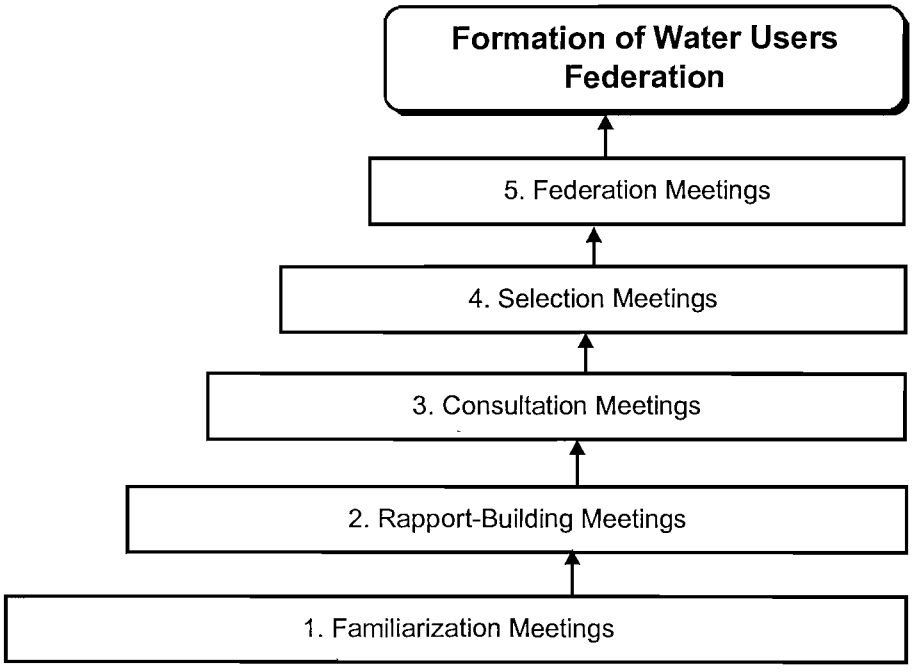
Source: Bandaragoda, D.J and Yameen Memon, 1997. Moving Towards Participatory Irrigation Management. IIMI-Pakistan, Lahore.

Table 3. Some Details of Mirwal and Shahpur Small Dams

Small Dam Canal	Length (Kms)	Design Discharge (cusecs)	Live Storage Capacity (AF)	CCA (acres)	No. of Outlets	No. of Water Users	Extent of land per owner ha
Mirwal Canal	9.97 b	11 i	2726 i	425 ha	45 n	95 i	4.47
Shahpur Canal	12.17 b	15 a	4095 i	506 ha	43 b	157 i	10.5

Source: Cheema, M.A. and D.J. Bandaragoda, 1997. Social Organization for Improved System Management and Sustainable Irrigated Agriculture in Mirwal and Shahpur Small Dams: Preliminary Results. (A Report).

Annex- 2



Five Dialogic Steps