Report No. 78

MAINTENANCE AND OPERATIONAL ACTIVITIES IN THE COMMAND AREAS OF SHAHPUR AND MIRWAL SMALL DAMS

By

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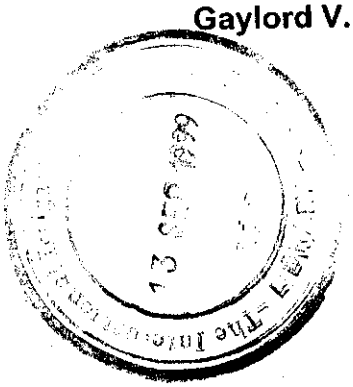

February 1999

PAKISTAN NATIONAL PROGRAM
INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE
LAHORE

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ACKNOWLEDGEMENTS

The authors are grateful to WRRI and SDO staff for the active participation in O&M training and walk through survey of the water channels in identification of maintenance problems. Thanks are also due to the water users from Shahpur and Mirwal command areas for their participation in the training of operation and maintenance of small dam irrigation system net work by Professor Gaylord V. Skogerboe with the assistance of Dr. Muhammad Akhtar Bhatti and Dr. Muhammad Asghar Cheema.

The authors also wish to thank OFWM, SDO and WRRI staff for providing technical assistance in construction of a suitable weir at the bifurcation structure to equitably distribute Shahpur Dam water in LBD and RBC. Special thanks are also due to water users for extending their cooperation with IIMI Pakistan staff in successfully undertaking the field activities.

The authors wish to thank Mr. Manzoor Hussain for his excellent job for formatting the report. Finally the authors acknowledge the financial assistance for this job from the Department for International Development (formerly ODA) of U.K.

Finally, the authors are most grateful for the untiring efforts of IIMI Field Team comprising of Mr. Muhammad Akram (Team Leader), Mr. Shabir Ahmad (Social Organizer), Mr. Wahid Ahmad (Social Organizer) and Mr. Abdul Razzaq (Field Assistant) during implementation of the O&M activities.

FOREWORD

This report presents maintenance and operations activities in the command areas of two small dams--Mirwal and Shahpur. The farmers had been organized a few years ago under this project by IIMI staff. The maintenance and operations activities were undertaken not only to improve the operation of these two small irrigation systems, but more importantly, to strengthen these young water users organizations.

For many years, the farmers complained to the Small Dams Organization for undertaking necessary maintenance. Under this program, IIMI staff encouraged these farmers to undertake better maintenance practices themselves. IIMI did provide a very modest amount of funding to support these activities. Soon, farmers began to recognize that they could accomplish much by organized behavior and collective action.

Similar experiences have occurred in Sindh and Punjab Provinces, where all of the farmers served by a secondary distributary canal have been organized into a Water Users Federation. These farmers had also expected the Provincial Irrigation Departments to undertake necessary maintenance measures, but were often disappointed for many years. Now, they have also learned to properly maintain their channels using their own resources, including labor and materials.

All of these Farmers Organizations have clearly demonstrated the capacity of Pakistani farmers to properly maintain and operate their subsystem. What is sorely needed is legal authority for these water users organizations and Joint Management Agreements with the Provincial Irrigation Departments. Unless this is done, farmers will continue to be oppressed and agriculture in Pakistan will remain stagnant.

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CHAPTER 1

INTRODUCTION

1.1. Background

Water for irrigation is the single most important input for ensuring, increasing and sustainable agricultural production in the vast and fertile tracts of rain-fed (barani) area. The Small Dams Organization (SDO) has been given the mandate to develop irrigation in these areas where water resources are scarce and agriculture has traditionally depended on rainfall. The SDO has constructed 31 small dams from 1961 to 1995 to provide reliable and timely irrigation water in the rain-fed area. This area covers most of Rawalpindi Division, which includes the districts of Rawalpindi, Attock, Jhelum and Chakwal with a total area of 2.2 million hectares (Cheema and Bandaragoda, 1997).

After completing the physical construction work, the SDO did not undertake further follow-up work on command area development. Only the dam operations and water releases were continued as a routine activity. Consequently, on the one hand, irrigation channels are not being properly maintained, and on the other hand, the farmers, whose experience was limited to rain-fed cultivation, could not harvest the benefit of the irrigated agriculture by adopting suitable irrigation practices.

These small dams are supposed to provide irrigation water to about 35,700 acres of culturable command area. Unfortunately, only 30 to 50 percent of this culturable command area have been brought under irrigation. Also, the overall cropping intensity remained at 87 percent. This low level of irrigation development is mainly due to inadequate institutional support for irrigation development at the secondary and tertiary levels (Shah, 1984).

With little support and assistance from SDO and lack of organized behavior among water users, there was hardly any chance of developing a system for maintaining the channels and allocating water efficiently. This situation offers an opportunity for organized water users groups to attempt replacing the existing nominal control over the irrigation system of small dams by having a completely farmer-managed irrigation system. If such an institutional arrangement becomes viable, it will provide valuable experiences regarding social organization in Pakistan's irrigated agriculture sector.

Taking note of this situation, the International Irrigation Management Institute (IIMI) Pakistan in collaboration with the Water Resource Research Institute (WRRI) of the National Agriculture Research Center (NARC) and the Small Dams Organization (SDO) initiated a pilot action research project titled "Social Organization for Improved System Management and Sustainable Irrigated Agriculture in Small Dams". The pilot project is being financed by the Department for International Development (formerly ODA) of U.K. and is being implemented in two of the representative dam command areas (i.e. Shahpur and Mirwal Small Dams) with participation of farmers/end users. The selection of the sample dams was made in collaboration with SDO and WRRI (IIMI-Pakistan, 1996). The location map for these pilot dams is presented in Figure 1.

1.2 Objectives of the Project

The objectives of the project as laid down in the project proposal and the inception report are as under:

a) to identify the extent of current problems related to the system of management and command area development in the selected small dam areas;
b) to facilitate the formation of an appropriate water users organization in each of the selected small dam pilot areas;

c) to assist the organization to become as functional as possible in the management of operation, maintenance and command area development with an emphasis on improved irrigated agricultural practices;
d) to develop methodologies in establishing water users organizations under the given technical, socio-economic and institutional conditions; and
e) to assess the viability of these chosen social organizations and their short-term effects on the operation and maintenance of small dam systems and on their command area development.

1.3 Project Activities

The project was initiated with the establishment of a field station at Fateh Jang, the closest place to have access to the selected two small dams. Initially, two social organizers and one field assistant were recruited and posted at the field station after necessary training at IIMI Field Station Haroonabad, IIMI-Pakistan Head Office Lahore and at WRRI, Islamabad. However, this number increased gradually and presently, there are three social organizers and one field assistant on the role. They are being guided by Dr. Muhammad Asghar Cheema, Sociologist and supervised by Mr. Don Jayatissa Bandaragoda, Senior Management Specialist. Both are based in Lahore, at the IIMI-Pakistan Head Office.

In the beginning of 1998, after doing considerable work on social mobilization, maintenance and operation issues related to the irrigation system were addressed. Prof. G. V. Skogerboe and Dr. M. Akhtar Bhatti from IIMI HQ Lahore provided the required inputs in the form of training and capacity building on these issues.

This report presents the details on the maintenance activities undertaken so far in Mirwal and Shahpur Small Dam command areas.

1.4. Organization of the Report

After the introduction, presented in Chapter One, the physical characteristics of the project site are presented in Chapter Two. Chapter Three deals with the social organization process, while Chapter Four contains information about capacity building for maintenance of the irrigation system. Chapter Five deals with key issues. Information about maintenance and improvements in the Shahpur Dam command area are presented in Chapter Six, whereas Chapter Seven deals with maintenance and operation plans for Mirwal and Shahpur Small Dams. Chapter Eight contains the conclusions and recommendations.

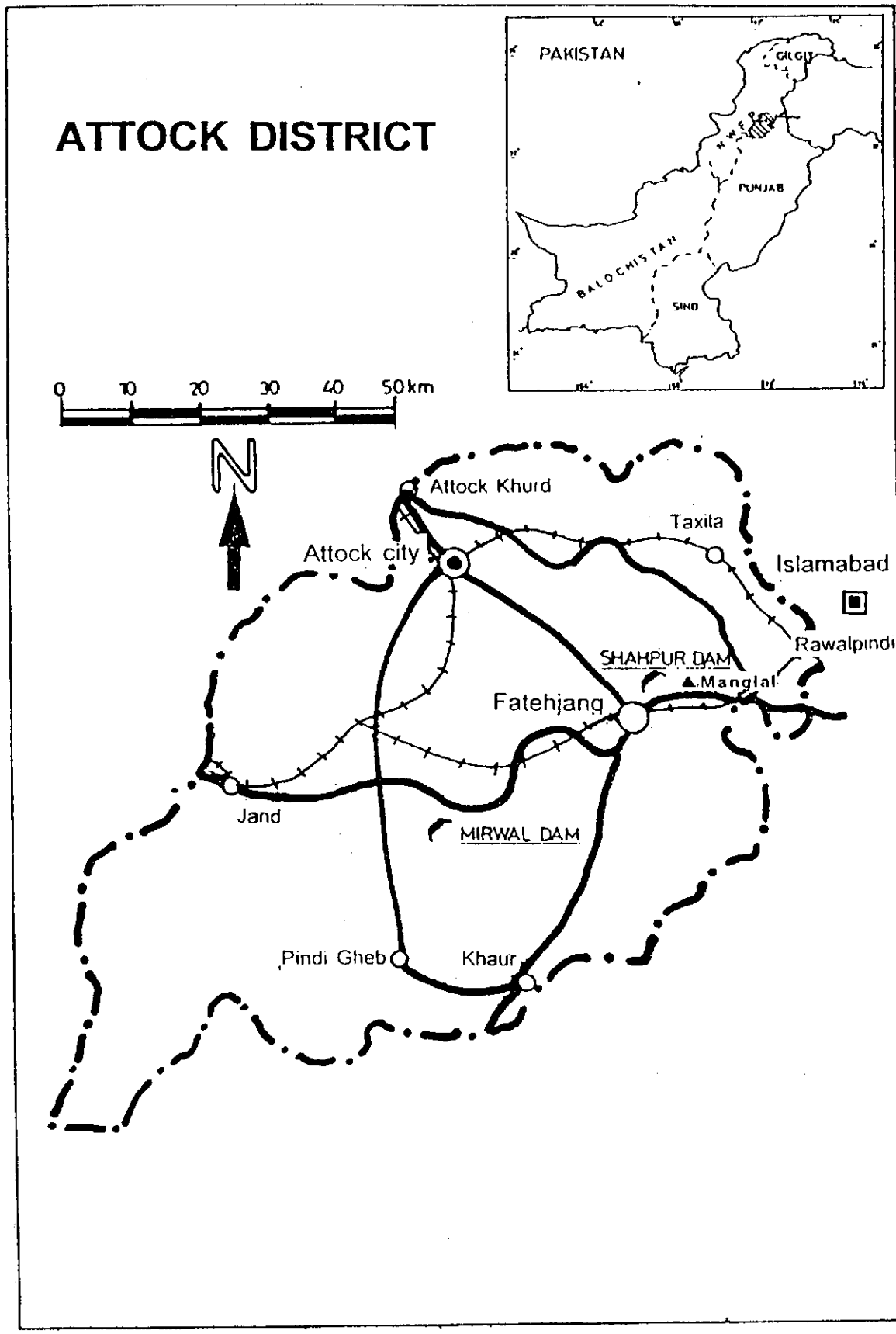

Figure 1. Location Map of Mirwal and Shahpur Dams.

CHAPTER 2

PHYSICAL CHARACTERISTICS OF THE PROJECT SITE

2.1. Shahpur Small Dam

2.1.1. Location

The Shahpur Small Dam is situated in Kala Chitta Range at about 47 km from Rawalpindi/Islamabad, in the barani (rain-fed) areas of Punjab. The dam site is about 8 km North of Fateh Jang town in District Attock. It is at 72° Longitude East and 33° Latitude North.

2.1.2. Climate

The climate of the area falls under the tropical semi-arid zone with an annual temperature above 24° C and dry winters. The highest day temperatures have been recorded in May and June when the hot weather remains unabated for days together with mean daily maximum temperatures above 45° C. The months of April to June are usually dry. The cold season starts in the middle of December and is characterized by fine weather, low humidity and a large variation in the range of temperature. The rainfall is about 737 millimeters in an average year.

2.1.3. Topography of the Area

The topography of the area, including the watershed, ranges from elevations 1392 feet (424 m) to 1772 feet (540 m). The command area is terraced, ranging from elevations 1451 feet (442 m) to 1390 feet (424 m).

2.1.4. Dam Construction

The Shahpur Small Dam is constructed on Nadna Kas stream, which was commissioned by the Small Dams Organization (SDO), Irrigation and Power Department of the Government of Punjab, during 1986 at a cost of Pak. Rupees 36.5 million. The initial cost was estimated to be Pak. Rupees 29.5 million in 1982. The soil is sandy clay and barani agriculture, comprised of wheat, maize, groundnut and sorghum, was in practice before the construction of the dam (Small Dams Organization, 1997a).

2.1.5. Dam Design

The main dam is a concrete gravity type having two feet thick stone masonry skin (extremely hard stone available locally) with a centrally located spillway. The free-board is four feet. Some characteristic data is given below.

Table 2.1. General Characteristics of Shahpur Dam.

1	Type	Concrete Gravity
2	Maximum Height	24.38 m (80 ft)
3	Length at top	93.26 m (306 ft)
4	Top Width	3.05 m (10.00 ft)
5	Up stream Slope	Vertical
6	Down stream Slope	0.80:1
7	Top level of Dam Embankment	448.68 m (1472 ft)

2.1.6. Spillway

An un-gated ogee spillway is provided in the middle of the dam for passing flood discharges. The spillway is constructed in the main body of the dam. The capacity of the spillway is 35,600 cusecs. This amount of discharge has been anticipated on the basis of 230 mm rainfall, which is the maximum probable in 24 hours with a 1000-year return period. The width of the spillway adopted is

85 meters, which would easily handle discharge of 460 m^3/sec with a head of 3 meter above the crest. A flip type stilling basin has been provided to dissipate the energy of falling water from the spill way.

2.1.7. Reservoir

The reservoir of the Shahpur Dam has a gross storage capacity of 14,320 acre-feet out of which 4,079 acre-feet is the dead storage capacity and the rest is the live usable storage. The reservoir capacity has been fixed according to inflows generated by the catchment of the Shahpur Dam during the standard dry year from August 1948 to July 1979 to satisfy the irrigation requirements for 1,231 acres of land and 2 mgd of drinking water supply. The surface area submerged by water at normal reservoir level amounts to 700 acres.

The life of the dam depends upon the time required for siltation of the reservoir up to the dead storage level. Sedimentation of the reservoir created due to the construction of the dam across a natural water stream is inevitable. The dam under consideration is high enough to have a large sediment trap efficiency. The sediment load carried by water depends greatly on the watershed conditions. Deteriorating conditions, such as deforestation in the catchment area, increases the sediment load and, hence, shortens the life of the dam. On the other hand, improvements in these conditions result in decreased sediment loads, which results in less sediment deposition and longer reservoir life.

The life of the Shahpur Dam has been assumed as 50 years and the dead storage capacity has been fixed based on a sediment yield of 22,858m^3/sq. km of watershed per year.

2.1.7. Irrigation System

The Irrigation system of the Shahpur Dam consists of an outlet (off-take) structure from the dam and a main channel, which off-takes from the right side of the dam. The outlet is located on the right side of the dam structure. This is a steel-lined concert conduit fixed at the dead storage level having arrangements for regulation of flow. The regulation is done by a sluice valve, which operates from a platform at the downstream end of the conduit.

The main channel is divided into two branch channels at the RD 10+000. The length of the main channel is thus 10,000 feet. The left branch channel is 5400 feet, while the length of the right branch channel is 24,000 feet. There are 31 outlets in the irrigation system. The channel has a rectangular section of stone masonry with a 1:3:6 concrete ratio. The irrigation system network of the Shahpur Dam is presented in Figure 2.

The command area of Shahpur Dam comprises 1231 acres. The command area has been developed by partially lining watercourses, land leveling and demonstration of high value crops by the Agricultural Extension staff.

Before the construction of the dam, the cropping intensity based on barani agriculture was 60%, while after constructing the irrigation facility it is proposed to be 140%, which is to be achieved by 1993, within six years of constructing the dam.

2.2. Mirwal Small Dam

2.2.1. Location

The Mirwal Small Dam is located near the village, Mirwal, about 42 km to the West of Fateh Jang town on Fateh Jang Kohat Road in Attock District. This dam is situated at 72° Longitude East and 33° Latitude North.

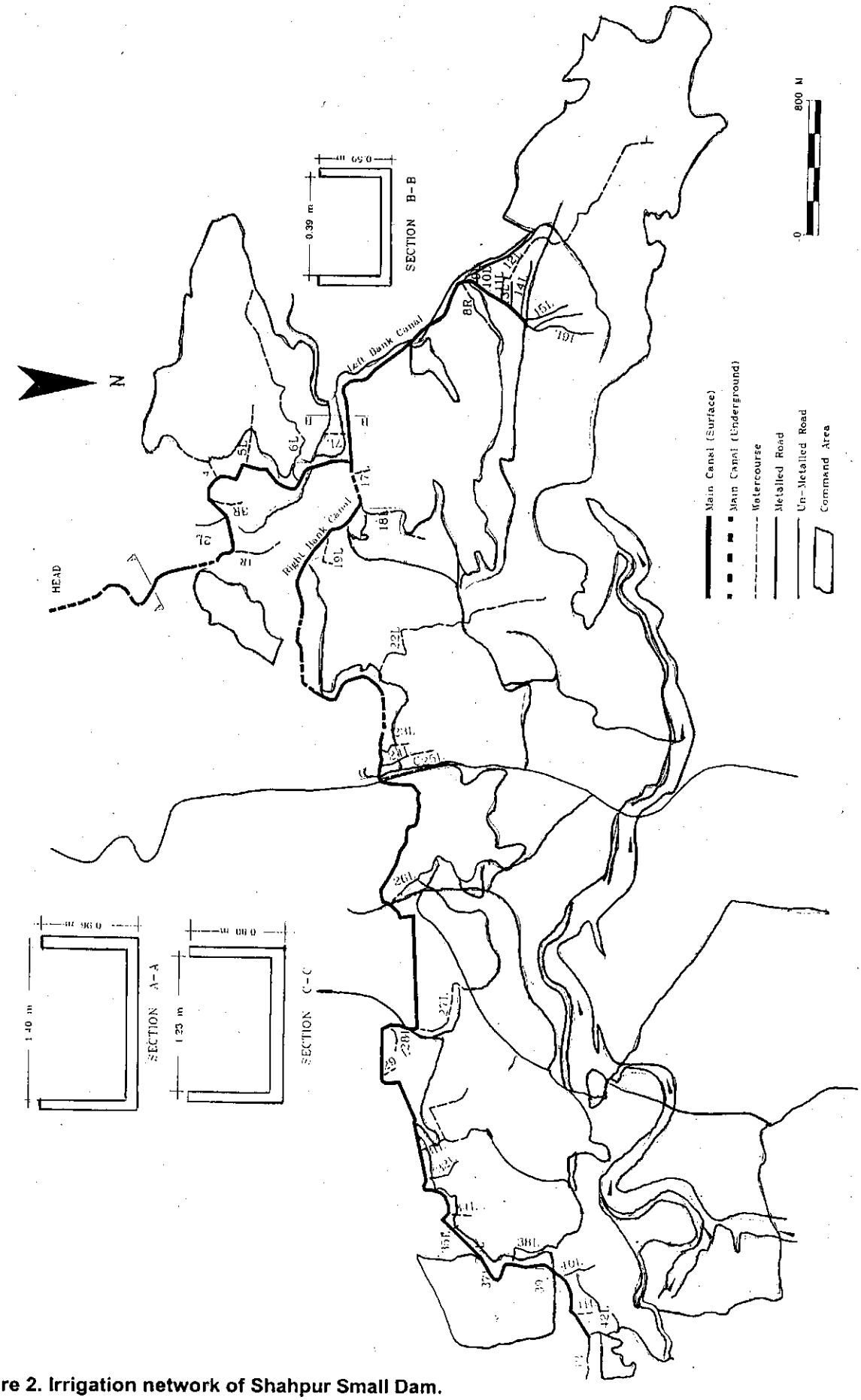

Figure 2. Irrigation network of Shahpur Small Dam.

Table 2.2. Salient Features of Shahpur Dam and Command Area

A. Hydrology	
Area of Catchment upto dam site	202 sq km
Rainfall in mean year	737 mm
Average Annual Sedimentation	5,88,000 cubic meters (cum)
Design flood before Routing	1,390 cum/s
Design flood after Routing	1,008 cum/s
Average Annual Inflow	2,060,100 cum
B. Reservoir	
Gross Storage Capacity	17,665,000 cum
Dead Storage Capacity	12,573,000 cum
Live Storage Capacity	5,092,000 cum
Normal Reservoir level	444.58 m
Dead storage level	442.73 m
Annual Withdrawal for Irrigation	1,041,000 cum
Pond area at N.P.L.	283.40ha
C. Dam	
Type	Concrete Gravity
Maximum Height	24.39 m (80 feet)
Length at Top	93.29 m (306 feet)
Top Width	3.04 m (10 feet)
Upstream slope	
Vertical Down stream slope	0.8 : 1
Top level of Dam Embankment	448.78 m (1472 feet)
D. Spillway	
Type	Ogee Spillway
Spill Level	444.58 m (1458 feet)
Width	85.36 m (280 feet)
Capacity	1008 cum/s (35,600 cfs)
E. Irrigation System	
Type	Gravity Flow
GCA	644.13 ha (1591 acres)
CCA	506.00 (1250 acres)
Proposed Cropping Intensity	140 percent
Kharif	55 percent
Rabi	85 percent
Capacity of the System	15 cusecs
Slope of Main Channel	1 : 5000
Length of Main Channel	3048.78 m (10,000 feet)
Length of Branches	9083.16 m (29,800 feet)
Left Channel	1645.94 m (5400 feet)
Right Channel	7315.28 m (24,000 feet)

Source: SDO, 1997, Operational Manual

2.2.2. Climate

The climate of the area falls under the tropical semi-arid zone with an annual temperature above 24° C and dry winters. The highest day temperature has been recorded in May and June when the hot weather continues unabated for many days with the mean day maximum temperature above 45° C. The months of April to June are usually hot and dusty. The cold season starts in the middle of December and is characterized by fine weather, low humidity and large variations in the range of temperature.

Physical Characteristics of the Project Site

2.2.3. Topography of the Area

The topography of the area including the watershed, ranges from elevation 1245 ft. (379.5 m) to 1629 ft. (496.65 m). The command area is terraced, ranging from 1298 ft. (396m) elevation to 1270 ft. (387 m). The soil is sandy silty clay. Barani Agriculture, comprised of wheat, maize groundnuts and sorghum, was in practice before the construction of the dam.

2.2.4. Dam Construction

The original project was approved during 1988 at a cost of Rs. 444.25 million, while the revised cost was Rs. 422.29 million. The Feasibility Report for this project was prepared as per guidelines of the Asian Development Bank, who provided loan funds for this project. The construction of the Mirwal Dam project was completed during the year 1990. (Small Dams Organization, 1997. b).

2.2.5. Dam Design

The main dam is a concrete gravity in a 1:2:4 concrete ratio with a centrally located spillway. The freeboard has been kept as 4.0 ft. The top of the dam is at 1322 ft. The maximum height of the dam in the central spillway portion is 79 feet (Table 2.3).

Table 2.3. General Characteristics of Mirwal Dam.

1	Type	Concrete Gravity
2	Maximum Height	24.07 m (79.00 ft.)
3	Length at Top	576.99 m (1893.00 ft.)
4	Top width	1.79 m (5.90 ft.)
5	Up stream slope	Vertical
6	Down stream slope	0.8:1
7	Top level of Dam Embankment	429.10 m (1322.00 ft.)
8	Depth of key Trench	2.00 m (6.56 ft.)
9	Width of Key Trench at bottom	1.50 m (5.00 ft.) & 0.32 m (1.00 ft.)
10	Side Slopes of Key Trench	1:1 & 2:1

On the right side of the main dam, there is a valley depression, which has been plugged by providing a saddle bund, which is 900 feet in length. This saddle bund consists of homogenous earth-fill with side slopes of 3: 1 and 2.5:1 at the upstream (u/s) and downstream (d/s) sides, respectively (Table 2.4). The u/s slope of the saddle bund has been protected with 1.5 feet thick pitching. The top level has been kept 1324 Ft.

Table 2.4. Characteristics of the Saddle Bund.

1	Type	Homogenous Earth fill
2	Maximum Height	4.45 m (14.60 ft.)
3	Length at Top	308.44 m (950.00 ft.)
4	Top width	4.57 m (15.00)
5	Upstream slope	3:1
6	Downstream slope	2.5:1
7	Top Elev. of Dam Embankment	429.87 m (1324.00 ft.)
8	Depth of Key Trench	1.52 m (5.00 ft.)
9	Width of Key Trench at bottom	4.57 m (15.00 ft.)
10	Side Slopes of Key Trench	1:1

2.2.6. Spillway

As ogee curve spillway has been provided in the center of dam to pass flood discharges. The capacity of the spillway is 7157 cusecs. This much discharge has been anticipated on the basis of 240 mm rainfall, which is the maximum probable 24-hours rainfall with a 1000- year return period.

The width of spillway adopted is 30 meters, which would easily handle discharge of 208 cum/s with head over spillway about 1.83 meter. A U.S. Bureau of Reclamation type II stilling basin has been provided to dissipate the energy of falling water at the base of the dam.

2.2.7. Reservoir

The reservoir of the Mirwal Dam has a gross storage capacity of 3765 acre-feet (ac-ft) out of which 2726 ac-ft is the live storage capacity and the rest is dead storage. The reservoir capacity has been fixed according to inflows generated by the catchment of the Mirwal Dam during the standard dry years i.e. Aug. 1982 to July 1985 to satisfy the irrigation requirements for 1050 acres of cultivated land. The reservoir surface area at Normal Pond Level (NPL) consists of 184 acres.

The life of the dam depends upon the time required for siltation of the reservoir up to the dead storage level. Sedimentation of the reservoir created due to the construction of the dam across a natural water and stream is inevitable. The Dam under consideration is high enough to have a large sediment trapping efficiency. The sediment load carried by water depends greatly on the watershed conditions. Deteriorating conditions, such as deforestation in the catchment area, increases the sediment load, and hence, shortens the life of the reservoir. On the other had, improvements in these conditions result in decreased sediment loads and longer reservoir life.

The life of the Mirwal Dam has been assumed as 50 years and the dead storage capacity has been fixed on a sediment yield of 200 cum/sq km of watershed per year.

2.2.8. Irrigation System

A sluice valve on the right flank has been provided as off-takes from the reservoir. An additional sluice valve is also provided on the back, which could be used when the reservoir fills with sediment up to the level of the present working offtakes. The working offtakes are each controlled by 1-foot diameter sluice valves having a sill level at 394.82 meters (1295 feet).

The irrigation system consists of one main channel and one minor (Sher Jang Minor) which off-takes from RD 9600 of the main channel. The length of the main channel is 22,745 feet. The length of the minor is 5500 feet. The discharge at the head of the main channel is 11 cusecs and the area under command is 1050 acres. The irrigation system network of the Mirwal Dam is presented in Figure 3. There are three major siphons (Table 2.5), four fall structures (Table 2.6) and 39 outlets in the irrigation system. For details, characteristics of the irrigation system are attached as Table No. 2.7. The irrigation system network of Mirwal Small Dam is presented in Figure 3.

Table 2.5. Siphons along the Main Canal Below Mirwal Dam.

Description of Siphons	From RD	To RD	Length in feet	Discharge
Main Channel				
Siphon No. 1	1160	1970	810	11.00 cusecs
Siphon No. 2	7200	7700	500	11.00 cusecs
Siphon No. 3	8800	9550	750	11.00 cusecs

Table 2.6. Fall Structures along the Main Canal Below Mirwal Dam.

Description of Falls	RD (in ft)	Head Loss (in ft.)
Main Channel		
Fall No. 1	17,200	2.00
Fall No. 2	17,600	2.00
Fall No. 3	18,700	2.00
Fall No. 4	21,500	2.00

The total length of the irrigation channels is 28,245 feet having a discharge of 11 cusecs, while the area under command is 1050 acres. There are two sections of the main channel; the starting section is rectangular of brick masonry, which is 350 feet in length, while the other section is trapezoidal concrete lining having a 1:3:6 ratio.

Physical Characteristics of the Project Site

The creation of Mirwal Dam reservoir has raised the subsurface soil water levels in the adjoining villages in a radius of about 5 miles. This has increased the yield of the existing wells and provided a potential source for tapping of ground water by tubewells and other means.

Table 12. Salient Features of Mirwal Dam and Command Area

A. Hydrology	
Area of catchment upto dam site	38 sq km
Rainfall as in standard dry year	611 mm
Rainfall by mean year	740 mm
Design flood before routing	**300 cum/s**
Design Flood after routing	203 cum/s
Average annual Inflow	48,52,000 cum
B. Reservoir	
Gross Storage Capacity	46,47,000 cum
Dead Storage Capacity	12,81,000 cum
Live Storage Capacity	33,67,000 cum
Normal Reservoir Level	400 m
Dead storage level	394.82 m
Annual Withdrawal for Irrigation	23,58,000 cum
Estimated Evaporation Losses	14,16,000 cum
Pond Area at N.P.L	74 ha
C. Dam	
Type	Concrete gravity dam
Maximum Height	24 m
Length at Top	370.42 m
Top Width	1.79 m
Upstream slope	Vertical
Downstream slope	0.8 : 1
Top Elevation of Dam Embankment	403 m
D. Spillway (Elevation)	
Type	Ogee Spillway
Spill Level	400.3 m
Spillway Width	30 m
Capacity	252.69 cum/s
E. Irrigation system	
Type	Gravity Flow
Gross Command Area (GCA)	465.21 ha
Culturable Command Area (CCA)	424.14 ha
Proposed Cropping Intensity	140 percent
Kharif	55 percent
Rabi	85 percent
Capacity of the System	11 Cusecs
Slope of Main Channels	1 : 2000
Length of Main Channels	6934.45 m
Length of Minor.	1679.92 m

Source: SDO, 1997, Operational Manual

The command area of Mirwal Dam comprises 1050 acres. The command area has been developed by partially lining of the watercourses and land leveling, as well as demonstrating high value crops by the Agriculture Extension staff.

Before the construction of the dam, the cropping intensity based on barani agriculture was 70%, while after constructing the irrigation facility it is proposed to be 140% which is to be achieved, within six years of completing construction of the dam (by 2001).

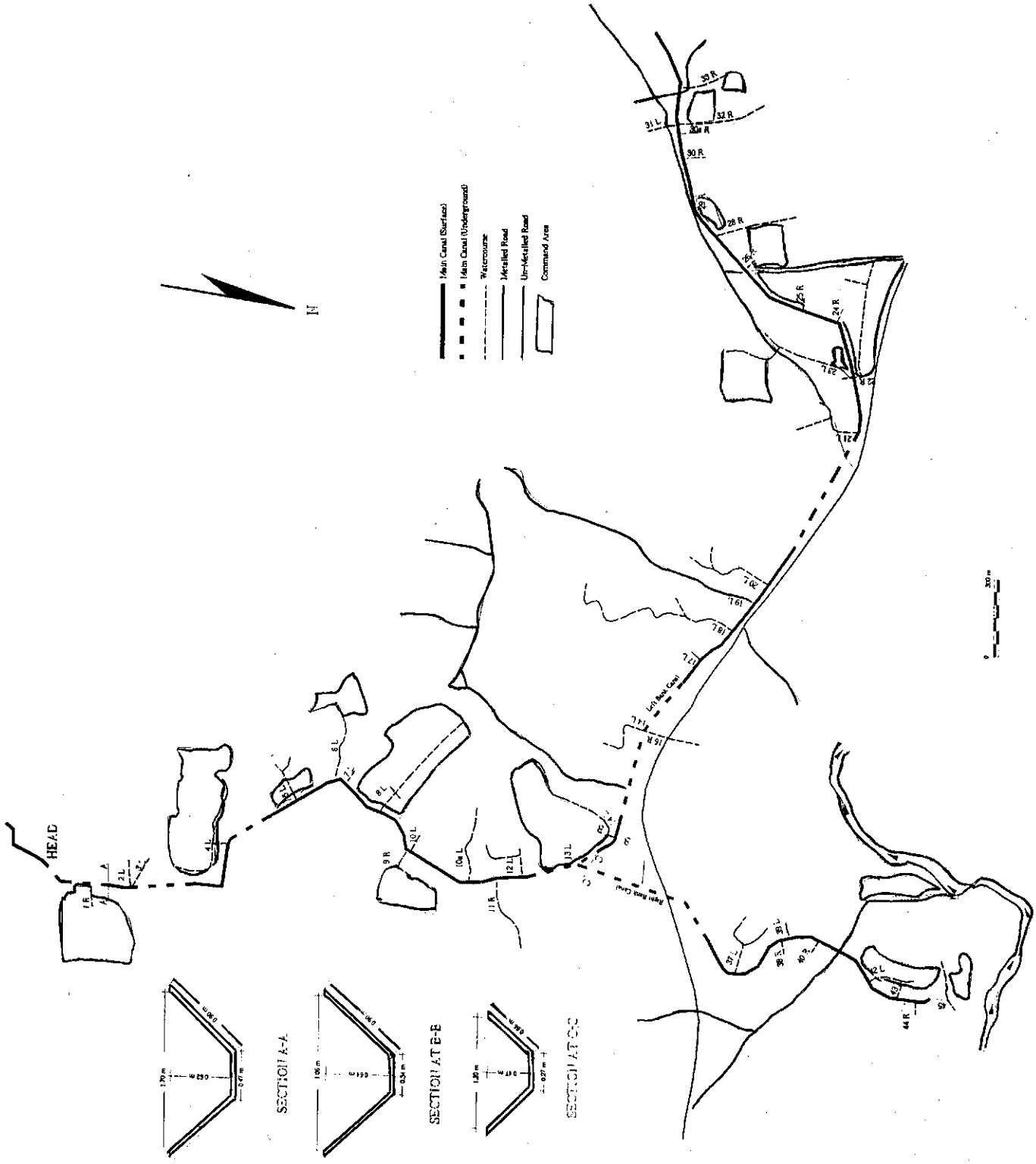

Figure 3. Irrigation Network of Mirwal Small Dam.

CHAPTER 3

SOCIAL ORGANIZATION PROCESS

The Social Organization Field Team (SOFTware) and the Social Organization Volunteers (SOVs) adopted a step-wise process in organizing farmers in the two small dam areas. Each step was to progressively build up the level of awareness among the people regarding the environment, the need to get organized, and the social organization methodologies to be used. The step-wise process was adapted from the organizational development discussed in a management transfer procedure (Skogerboe et al., 1993), which is given in Annex D. The second phase of this process, namely, initial organization, formed the main focus of the action research, and was conducted in five dialogic steps:

- Familiarization Meetings;
- Rapport Building Meetings;
- Consultation Meetings;
- Selection Meetings; and
- Formation of Farmers' Organizations.

3.1. Familiarization Meetings

Familiarization meetings started with initial interactions with the people in the area. These meetings were very informal and were conducted in small groups, as an entry point into the community. During the familiarization meetings, which also included visits for identification of SOVs, it was felt that the community had a poor understanding regarding any form of institutional development and was not willing to play any active role. No specific attempt was made to rectify this situation at this stage, as the main purpose was to gain an understanding of the internal dynamics of the community. The identified situation is outlined below:

- The farmers were disillusioned about the government agencies and other nonproductive or dummy rural organizations created by various interventions;
- Farmers were in the habit of seeking tangible benefits from such interventions (subsidies, physical work, credit, etc.);
- Some were hesitant to form an organization at this stage because of the fear of being exposed about their illegal practices in getting extra water;
- There was a hidden suspicion about privatization of irrigation systems, such as charging high "aabiana" or water rates, and increased taxes;
- Fear of conflicts within the community caused some reluctance to even try organizational behavior;
- As a consequence of dominance of a few influentials, the other farmers were hesitant to take an initiative; and
- Agriculture was not a full-time job for some of the farmers in the small dam command areas. The income base of the farmers is diversified in such a way that they did not spend sufficient time on farming and appeared to have lost hopes in irrigated agriculture.

3.2. Rapport Building Meetings

Following up on familiarization meetings and the selection of SOVs, a series of small group meetings were conducted with the help of the SOVs to provide the people with information about the action research objectives and methodologies, and also to build up trust between the field team and the community.

The process of rapport building meetings was started simultaneously with the collection of further basic information about the area, the irrigation system, and agriculture, along with socio-economic and political conditions of the command area. Details about IIMI-Pakistan were given, and the status of IIMI-Pakistan as an independent research-oriented organization was emphasized and its legal status in the country was explained.

The meetings usually started informally in a conversational mode by raising questions about the condition of crops, water supply situation and other irrigated agriculture related problems. In every meeting, farmers showed a great deal of interest in talking about their problems, especially related to dam water, farm inputs and marketing of their produce. At the end of each meeting, the SOVs were requested to discuss this idea with other farmers and explain to them the role of IIMI in this regard.

3.3. Consultation Meetings

The rapport building meetings led to another series of more formal meetings in larger groups, involving the farmers in discussions regarding the solutions to their problems. People were consulted regarding the needed organizations, their structures, and their objectives. Consultation meetings, conducted at the village level, played a significant role in the social organization process. Consultation proved to be a vital part of the participatory action research program. These meetings were conducted in such an environment that farmers were free to express their views and suggestions. The main points discussed and negotiated in these meetings were:

- Membership of Farmers Organization;
- Organizational Structure of Farmers Organization;
- The method of selecting the executive members; and
- Authority and tenure of the executive members.

In these consultation meetings, the IIMI Fateh Jang Field Team's intervention was at a minimum level to assist in the discussions, and also to introduce some concepts, such as ensuring equal opportunity for participation in the selection or election of office bearers, and the freedom of expression for everybody during discussions. Generally, the farmers agreed that they could get organized and that organized farmers could manage water more efficiently and more equitably than at present. Farmers were of the belief that the provision of legal authority and powers to Farmers Organizations is very important for their success (Cheema and Bandaragoda, 1998).

The main decisions reached during these consultation meetings included the following:

- As only a small number of farmers are using dam water, all of the farmers of the command area should be members of the Farmers Organization;
- Selection meetings to identify organizational leaders should be first held at the village level, and all the farmers living in that particular village should be informed of the meetings;
- SOVs and the IIMI Field Team would be jointly responsible for ensuring that farmers in the command area are informed about meetings;
- Mithial, Kisran and Traggar villages, in Mirwal Small Dam command area, should be treated as a single unit (village) as a small number of farmers from these villages have land holdings in the dam command area;

Next >>

- Meetings should start with reiteration of the objectives of the pilot project so that the farmers who earlier were unaware of this project might become aware of the needed details; farmers should choose three executive members, who would represent each village in Mirwal Small Dam command; in Shahpur Small Dam, the number of executives members may vary from village-to-village; executive committee members should be selected through mutual understanding, or by consensus, and not through competition;
- After the selection of executive committee members from each village, there should be a combined meeting of these executive members and farmers of the command area, in which office bearers of the Farmers Organization should be selected through consensus in such a way that at least one office bearer should represent each village; and
- Tenure of the Farmers Organization office bearers should be one year.

Even at this stage, some farmers, influenced by the negative propaganda by some mischievous elements, opposed the organizational efforts. They feared that fees and taxes would be increased, or that the organization would be a cover for some hidden agenda, such as privatization of small dams, or introduction of agricultural taxes. The IIMI Field Team made valiant efforts to remove these doubts and misconceptions, and finally succeeded in maintaining the initial enthusiasm among the majority of the people.

3.4. Selection Meetings

The fourth dialogic step was to engage the farmers in a series of meetings to discuss and implement the selection of organizational leaders at the village level. A majority of farmers had proposed that office bearers should be educated, well informed about the command area, have the ability to interact with officials and other outsiders regarding problems of the area, and negotiate some solutions to those problems.

Efforts were made to inform every water user in each village about the date and time of the meeting, so that they were provided equal opportunity to participate. These selection meetings were normally held in the afternoon when most people were free to attend. In the Mirwal village, the meeting was conducted at the Mirwal Small Dam rest house on Sunday, March 23, 1997 at 8:00 a.m., as desired by the majority of the people. Date, time and venue of the meeting were usually decided in consultation with the SOVs. In addition to the information transmitted through the SOVs, other methods, such as announcements in the village mosque and letters of invitation mailed to every water user, were used to ensure maximum participation.

In total, four selection meetings were organized in the Mirwal Small Dam command area. The process for selecting executive members was started on 23 March and completed on 12 May 1997. Similarly, four selections meetings were arranged in Shahpur Small Dam command area during August and September of 1997.

3.5. Selection of Office Bearers for Farmers Organizations

3.5.1. Mirwal Small Dam

On 6 April 1997, a meeting of the selected village level organizational leaders was held at the rest house of the Mirwal Small Dam. The meeting started at 10:00 a.m., and about 66 percent of the farmers of the command area (including all of the selected village leaders) were present. The purpose of the meeting was to select or elect office bearers of the Mirwal Dam Farmers Organization.

The meeting first decided to select four office bearers, without designation, one from each of the four villages in the Mirwal Dam command area. After the four members were identified, they were given time for deliberation among themselves to arrive at some decision about the designations (Table 3.1). After 15 minutes of deliberation, they came out with a consensus on the listing of four names with four designations (President, Vice President, General Secretary and Treasurer) for the Mirwal Small

Dam Farmers Organization. An advisory committee, comprising 7 members, was also constituted by the farmers. a local notable farmer announced the names of these office bearers, along with their designations, and nobody opposed it. A fifth office bearer, (Secretary Information) was selected later on 29 April 1997. The oath taking ceremony and first meeting of the FO was held on 8 May 1997.

Table 3.1. Office Bearers of Mirwal Small Dam FO.

President	Maj. (Retd.) Taj Muhammad Khan
Vice President	Ghulam Asghar Khan
Secretary	Sardar Jaffar Khan
Treasurer	Muhammad Iqbal
Secretary Information	Khan Malik Tahir

3.5.2. Shahpur Small Dam

A meeting of the selected farmers' representatives from the villages in the command area was held on 31 October 1997, at Government Primary School, Amir Khan, to select the office bearers for the Shahpur Small Dam Farmers Organization. Forty farmers (including farmers representatives) from all of the four villages in the Shahpur Dam command area participated in the meeting. The same procedure, as was adopted for the formation of the Farmers Organization of Mirwal Small Dam, was followed. With complete agreement, the farmers' representatives first selected one nominee from each village. Then, after a deliberation of just 5-8 minutes, they presented the list of four names with their respective portfolios in the Farmers Organization (Table 3.2). Along with the IIMI-Pakistan Field Staff, the meeting was attended by Mr. Tissa Bandaragoda, Senior Management Specialist, and Dr. Asghar Cheema, Sociologist, from IIMI-Pakistan Head Office, Lahore.

The oath-taking ceremony of the office bearers for the Shahpur Small Dam FO was held on 10 December 1997. The Project Director, Small Dams Organization and Chief, Agency for Barani Area Development, were the senior government officials who participated in the meeting and administered the oath to the office bearers of the Shahpur Small Dam Farmers Organization.

Table 3.2. Office Bearers of Shahpur Small Dam FO.

President	Ikhlaq Ahmad Khan
Vice President	M. Azam Khan
Secretary	Muhammad Akram
Treasurer	Mehmood Khan
Secretary Information	Hukam Daad

3.6. Registration of Farmers Organization

To provide legal coverage to the Farmers Organizations and to give due recognition of Shahpur and Mirwal Small Dams, these organizations have to be registered with some government agency. In this respect, the On-Farm Water Management Directorate, Ministry of Agriculture, Government of the Punjab was consulted and the registration of FOs with the Directorate of OFWM, Rawalpindi was completed.

3.6.1. Farmers Organization of Shahpur Dam

In order to fulfil the requirements for registration of the Shahpur Dam FO, water users associations at the watercourse level were formed and registered during June 1998. Besides the IIMI Field Team, the water management specialist and water management officer of the OFWM Field Team, Fateh Jang took active part in the formation and registration of these water uses associations.

Two meetings were held to register the Shahpur Small Dam FO. The first meeting took place on 6 June, 1998. As the Director, On Farm Water Management, Rawalpindi, came late from Rawalpindi due to some official engagement, the meeting was postponed till 26 June 1998. Besides IIMI-Pakistan

staff and OFWM officials, about 80 farmers were gathered on the premises of a Primary School, Amir Khan Village.

The FO Shahpur Small Dam was registered under the OFWM Water Users Association Act, 1981 as WUA Shahpur Small Dam. To Malik Mumtaz Ahmad Awan, Director Field OFWM Rawalpindi, now after the registration of WUA Shahpur Dam, the decisions by the executive committee will have a legal value. Decisions taken by the WUA will be preferred even in civil courts and they can now enter into agreements with other line agencies for some productive purposes. With registration of the FO by OFWM, a new life has been seen among the water users and they have become active and have started taking more interest in project activities.

3.6.2. FO of Mirwal Small Dam

To register the FO of Mirwal Small Dam, the same procedure, as in the case of Shahpur Small Dam, was adopted. First, all the farmers at the watercourses were consulted and associations at the watercourse level were formed. On 22 July 1998, a meeting with farmers of the dam was held at Mirwal Small Dam Rest House, in which besides IIMI-Pakistan staff, officials from OFWM participated. Over 70 percent of the water users (enough for the purpose of registration) were present.

Once the FO Mirwal Small Dam was registered as WUA Mirwal Small Dam, Director Field, OFWM, Rawalpindi Region briefed the participants about the advantages of registration with the OFWM Directorate. To him, through registration, the WUA has become a legal body and the decisions of the office bearers will be binding on every farmer in the command area of Mirwal Small Dam.

CHAPTER 4

CAPACITY BUILDING FOR MAINTENANCE AND OPERATIONS

The most important task undertaken after the social mobilization and formation of WUOs was to build understanding and capacity of their members (water users) on Maintenance and Operation (M&O) issues related to their respective irrigation systems. This was done through a series of formal training, interactions with discussions, and demonstration sessions. Considerable time was spent on detailed group discussions and questions-answers on key issues during these sessions. Also, efforts were made, wherever it was possible, to show practical examples through identification of problems and their possible solutions. The capacity building work was conducted employing the processes and procedures described below.

4.1 Awareness Building on Maintenance and Operation (M & O)

During the social mobilization process, it was found that the water users were not fully prepared to play an active role in M & O. Keeping this in view, an awareness building campaign was undertaken by the IIMI Fateh Jang Field Team. Awareness of key actors regarding the objectives and goals of forming an FO played an important role in generating interest. After generating considerable interest and willingness among the water users, formal training sessions were arranged on their initiative and request.

4.2. Formal Training on Maintenance and Operation

Formal trainings were organized for the water users of both the small dams, including office bearers of FOs, on Maintenance and Operation (M & O) issues with the following objectives:

- to familiarize them with the concept of participatory irrigation management;
- to familiarize them with M&O issues related to their irrigation systems; and
- to address these issues positively and efficiently.

To accomplish these objectives, a two-day formal training was arranged for the members of each Farmers Organization in February 1998 on their respective irrigation system. The strategy adopted for the training was to visit the system (walk-through) jointly with the water users to observe and collect information about the system and its related problems. All of the information collected was analyzed to identify key constraints and problems. After identification of key issues and problems, their solutions were identified.

The two-day time period was scheduled in such a way that the mornings of the first days of the two training were spent on the presentation of general M & O issues to the participants through an interactive mode, which generated lively discussions. Whereas the afternoons were spent on "a walk through" along the system identifying jointly the specific M & O issues related to the irrigation system. On the second day, these issues were analyzed to chalk out detailed maintenance plans through a participatory approach.

In addition to the water users, staff from NARC and SDO also participated in these trainings. The details on the organization of the training and participants are given in Annex A.

The joint "walk-through" along the irrigation systems from both dams was observed as the most important step to diagnose all of the deferred maintenance needs along the main channel as well as tertiary channels. The water users took a great deal of interest in identifying different maintenance needs and even suggested their possible solutions.

4.3 Continuous Interaction for Capacity Building

4.3.1. FOs

The formal training played a key role in sensitizing and informing the members of both FOs on the importance of M & O for the systems and their possible role in implementing M & O activities in the future. Yet, the members always had many questions and were not fully clear on the way it could be done on the ground.

To build their knowledge and confidence through an incremental process, continuous interaction was ensured for the following six months after conducting the formal trainings. A series of meetings were held with the executive bodies and members, from March to October 1998, to strengthen their understanding and building their capacity to participate effectively in the M & O of both irrigation systems. The details of these meetings are provided in Annex B.

4.3.2. Small Dams Organization (SDO)

One of the important achievements was close collaboration with the field staff of the Small Dams Organization (SDO), Irrigation and Power Department, Government of the Punjab, in this whole process. Rather, it was a joint venture of SDO and IIMI. The Project Director (equivalent of Superintending Engineer), along with his Executive Engineer, Sub-Divisional Officer and Sub-engineers, participated and made substantial contributions in all of the important events. The Sub-Engineers participated actively in almost all of the activities requiring their presence and participation.

4.3.3. On-Farm Water Management (OFWM)

The OFWM Directorate of Rawalpindi was involved in most of the important events. Their staff participated and provided excellent cooperation in all of the activities, especially in registering the WUOs.

4.3.4. Water Resources Research Institute (WRRI)

The WRRI was a key partner in this project. Their staff participated and contributed significantly in these M&O trainings. Their participation in the project activities resulted in a survey report entitled "Initial Technical Diagnostic Surveys for Mirwal and Shahpur Dams in Pothwar Plateau" during April 1997.

CHAPTER 5

KEY ISSUES

The training of water users, coupled with continuous interaction and follow-up played a vital role in improving the FO's understanding and strengthening their capacity for M&O activities of their respective irrigation systems. The capacity building efforts focused initially on the aspects described below, which covers both social as well as technical issues.

5.1. Need for Cooperation

The members of the FOs were made to realize that the most difficult part is related to cooperation among themselves, which had successfully been achieved by them already. A clear demonstration was formation of the FOs at both of the dams, holding regular meetings and discussing common problems related to irrigated agriculture. Water, being the most important single input for irrigated agriculture in rain-fed areas, does require their due attention and calls for a common wisdom.

There is not much difficulty in thinking, planning and acting jointly for maintaining and improving their vital facility for irrigating crops (i.e. the irrigation system). There are many things, which are possible to undertake by the water users in connection with M & O of the irrigation system (e.g. cleaning, opening and closing of the outlets, following a prescribed schedule to save water from wastage, minor repairs, etc.). To realize this potential, the key is "cooperation". This cooperation should be among water users as well as with all other agencies.

5.2. Participatory Approach

They slowly began to understand that the time had come when the beneficiaries/end users are required to play a vital role. The SDO had built the facility for them without their active participation, but this system cannot be properly maintained and operated without their active participation. They were also briefed on the potential dangers and wastage of resources that could occur due to lack of their participation. In contrast, their participation in various activities may yield tangible results and benefits for the whole community and nation.

5.3. Appreciation of Irrigation Facility and Water Availability

The water users were observed complaining most of the time without acknowledging and appreciating the potential of this valuable resource in the form of an irrigation facility. They had a negative opinion of SDO and its affairs as far as M & O of the irrigation systems were concerned. They had tried hard in the past with SDO at various levels, but they were disappointed due to their attitude and workings; also they were pessimistic about any perspective for any improvement in the near future.

The water users for both small dam organizations were informed and came to realize that they were fortunate to have such an access to irrigation water resource. The nation had to spend a huge amount of public funds to provide them with this extraordinary irrigation facility. Therefore, they have a moral obligation to make efficient and judicious use of this facility for their own sake, but for the sake of the nation as well. Through continuous stress on this point, a positive change was noted in the behavior of the water users towards the irrigation facilities and they started taking an interest. A clear evidence was their willingness to share the M & O expenditures and their participation in the implementation of M & O activities later on.

They were also informed about the principle "Union is a strength" and were narrated examples about how this was used in relation to M & O activities of irrigation systems in other parts of the world.

5.4. Importance of Maintenance and Operation of the Facility

After much discussion, the water users began to appreciate that it is for their own benefit that the irrigation systems provided by small dams should be maintained and operated properly for obtaining long-term benefits. Keeping in view the declining funds available for M & O with SDO, it is becoming increasingly difficult to maintain and operate these systems properly by the SDO. Therefore, the water users must realize the great benefits accruing to them due to these systems and they can only be continued if they can be properly maintained and operated. Also, improvements in operations are essential for equitable distribution of irrigation water from head to tail of the main, secondary and tertiary channels.

5.5. Matching Irrigation Water Supplies to Demand

Discussions were held with the water users regarding two ways to increase the available irrigation water supplies in relation to their demand.

The first is to increase the quantity of irrigation supplies physically through supplementing the already available irrigation supplies through provision of additional water. This process is long and requires considerable resources. Considering the present economic situation, it is not likely that SDO can do anything to provide additional water supplies in the near future.

The second is to reduce the net demand for irrigation water supplies through reduction in the wastage and by more efficient use of the available irrigation water supplies. This can be done to a large extent by themselves without much trouble.

Water is a precious natural resource and should be used very carefully. This implies that irrigation may be applied to the fields according to the crop water needs. Water distribution may be done according to the established rights and shares. There is a moral duty to share the extra water with others.

5.6. Measurement of Water

Without knowing the quantity of water flowing at various points in the irrigation system, it is very difficult for each farmer to know how much water is being received and also, to demand for their sanctioned share of the water available supply. Accurate water measurement is very essential for running an irrigation system successfully.

The float method of flow measurement was explained and demonstrated to generate an interest among the water users. They took interest in knowing more about this method and its use for measuring water. Formal training will be organized at a latter stage.

5.7. IIMI's Role

The difference between Irrigation Department and IIMI was made clear to the farmers of the area. In every meeting, the field team informed that IIMI is a research oriented international organization and is different from Government departments. This international organization is actively trying to solve irrigation management problems by organizing farmers at the selected dams. The role of IIMI is to bridge the gap between farmers and the line agencies. The IIMI is playing the role of catalyst, the presence of which speeds up the processes.

CHAPTER 6

MAINTENANCE AND IMPROVEMENT OF SHAHPUR DAM

As a result of the continuous efforts being made to strengthen the capacity of FOs on maintenance of the irrigation system, the key maintenance and improvement activities at Shahpur Dam that were undertaken are described below.

6.1. Water division Between the Branches

There is a "bifurcation" structure at RD 10+000 of the main irrigation channel of Shahpur Dam, which divides water between the Right Bank Canal (RBC) and the Left Bank Canal (RBC) according to their command areas, which are 685 and 375 acres, respectively. Unfortunately, the structure was not performing its functions due to a design problem.

6.1.1. The Conflict

The main irrigation channel is divided into two branches/minors at RD 10+000. Initially, as per design and the operational arrangements, one branch used to operate at a time and used to draw the whole discharge entering into the main channel from the reservoir. The channel design corresponded to this type of operation. Later on, the operational arrangements were modified to accommodate both branches for drawing water simultaneously following a proportional arrangement based on the command area served by each branch.

The conflict started due to the introduction of this proportional system, which was not done properly. The proportional system divided the water 60:40 in RBC and LBC, respectively. Unfortunately, the flow conditions were not the same, there by actual flow was not of the ratio 60:40; it was just the opposite.

The physical condition at the bifurcation was such that the LBC had an open flume where as RBC was an underground pipe with irregular slope. Due to this difference in hydraulic conditions, the LBC drew more water. The measurements revealed that the water flow was almost 1:2 i.e., LBC was drawing water almost double than what RBC was drawing.

This was the most serious problem, which was creating unrest among the farmers in the command area and thereby also hindered the process of social organization in the area. The farmers located on both branches were blaming each other for this problem.

6.1.2. Solutions by Small Dams Organization (SDO)

The problem at the bifurcation started soon after its original construction. The off-take structures for both the branches were different. Their hydraulic flow conditions were not the same. A proportional divider installed just upstream of these off-takes without considering their flow conditions could not function properly. Therefore, the bifurcation structure was not delivering water according to the share of the commanded areas. At the complaint of the farmers located on the RBC, the SDO raised the bed of the LBC to rectify the situation. The raised bed was demolished by someone and the problem persisted.

The SDO institutionalized a warabandi (schedule) through sharing the days of a week between the two branches and installed a gate to close the water for LBC whenever their turn was over. The warabandi permitted full supply to one branch at a time. Because the farmers were used to obtaining water according to their will and also due to the cultivation of vegetable crops (they need water more frequently), farmers ended up breaking the warabandi by demolishing the gated structures installed by the SDO.

6.3.1. IIMI'S Approach

Knowing the concern and appreciating the gravity of this distribution problem, IIMI staff started promoting a rationale based on the principle of sanctioned command area. This implied that each branch should have continuous flow but according to its sanctioned command area. A consensus was reached through the FO that the share must be allocated and provided according to the command area. This principle was further reinforced and strengthened during the formal training.

After obtaining a written agreement from both parties, a solution was proposed on the basis of agreed principle i.e. water share proportional to the command area of each branch. According to the agreement, the water share was 60:40 for RBC and LBC, respectively. Two current meters (Photograph A shows current metering to determine the discharge of LBC) were used simultaneously to regulate the flow according to this proportion through construction of a temporary weir for LBC. The temporary arrangement was carried out for 5 days before it was permanently constructed (Photographs B, C and D showing the work in progress). The cost of materials along with water distribution before and after construction are listed in Table 6.1.

Table 6.1. Improvement of Bifurcation Structure and Water Distribution.

Cost of Weir Improvement at Bifurcation Materials	Amount in Pakistani Rupees
1. Cement	260
2. Sand	100
3. Labor	750
4. Bricks	350
5. Transportation	250
Total	1710
The construction was carried out by the SDO staff.	

Average Water Distribution (cfs)		
Channel	Before (March 30, 1998)	After (April 1, 1998)
RBC	2.67	4.08
LBC	4.01	2.60

6.2 Leakage from the Main Channel

6.2.1. Actual Condition

The main channel (from RD 0+000 to RD 10+000) had hundreds of small leakage holes in the rubble masonary lining throughout its lining. The discharge estimates indicated that at least 45 percent of the water released from the reservoir was being wasted up to the bifurcation structure. The leakage was both from the exterior wall of the channel as well as from the bed of the channel. In some cases, the leakage was not apparent in the immediate vicinity, rather water was coming out at distant places. At some places, rains have destroyed the walls of the main channel (Photographs E, F, G and H show some of the maintenance problems of the main channel).

6.2.2. Maintenance Works

The repair works were to be done for the bed as well as walls of the main channel to reduce the wastage of irrigation water, which was more than 45 percent in 10,000 feet of length. The SDO was requested by the FO and persuaded by the IIMI-Pakistan staff to undertake these repairs (Table 6.2). The SDO was able to repair the channel and aqueducts during the months of April, May, June and July, 1998 (Photographs I, J, K, L and M show the maintenance activities carried out in the main channel).

Photograph A. Current metering to determine the discharge of LBC.

Photograph B. Work in progress at the bifurcation structure.

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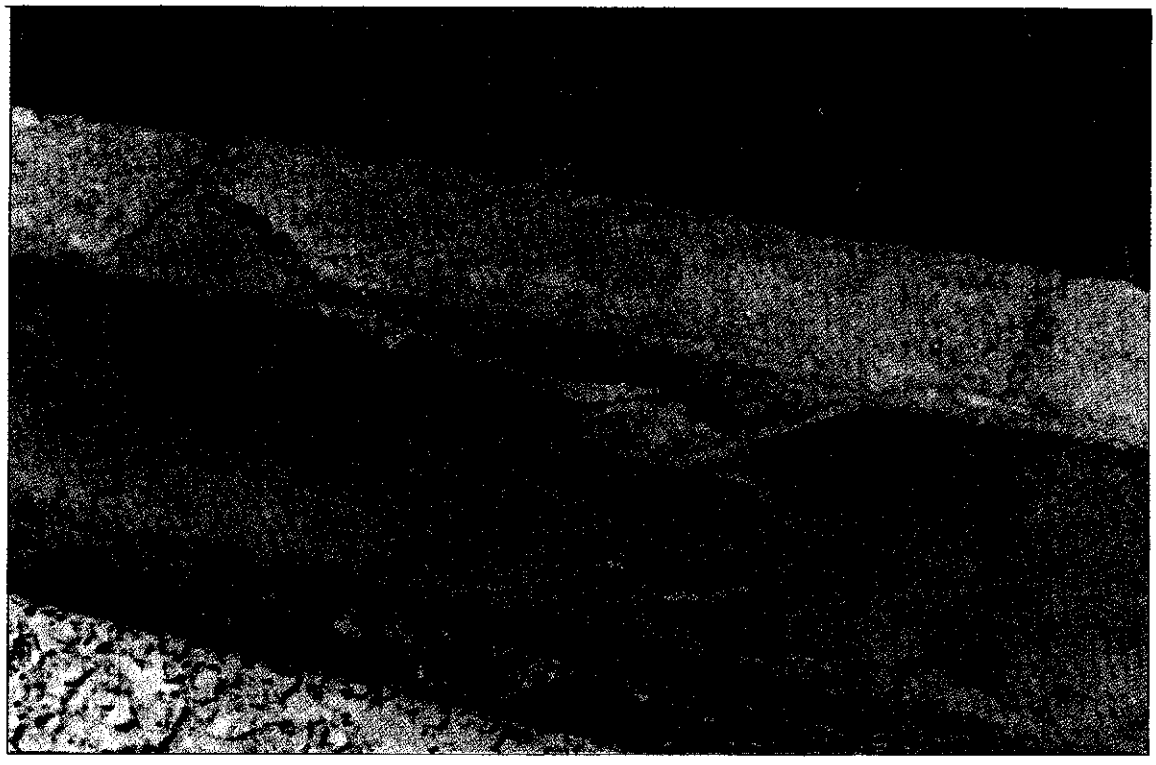
Photograph C. Work in progress at the bifurcation structure and LBC.

Photograph D. Work in progress at the bifurcation structure and discussion with the water users.

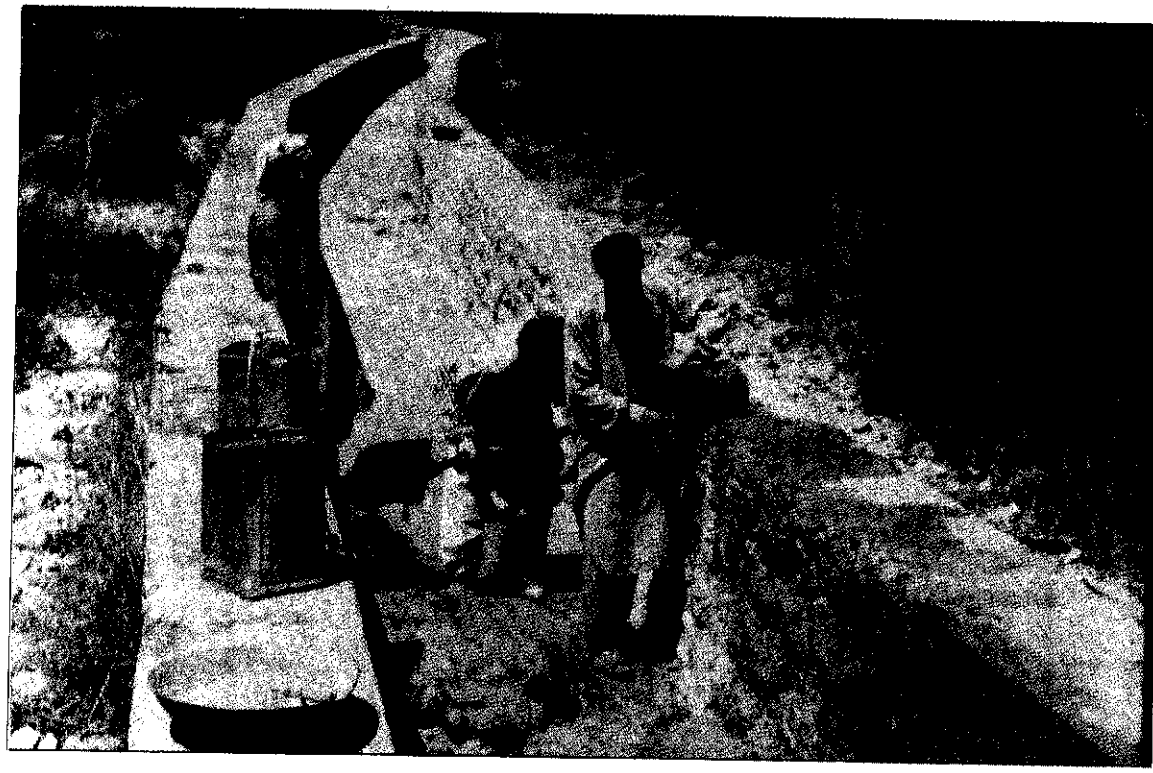
Photograph E. Maintenance problems in the main channel.



Photograph F. Maintenance problems in the main channel.

Photograph G. Maintenance problems in the LBC.

Photograph H. Maintenance work is in progress in the main channel.

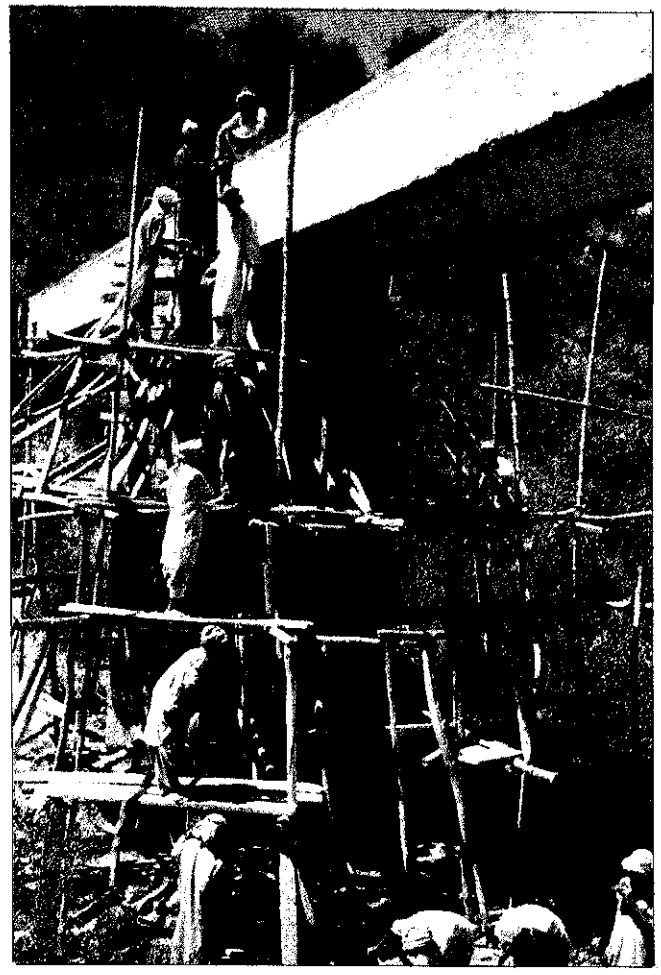


Photograph I. Maintenance activities carried out in the main channel.

Photograph J. Maintenance and repair works in progress in the main channel.

Photograph L. Maintenance and repair works in progress in the main channel.

Photograph K. Maintenance and repair works in progress in the main channel.



Photograph M. Maintenance and repair of pillar in the main channel.

Table 6.2. Summary of maintenance work done by the Small Dams Organization during Summer 1998.

Location	Work done	Amount Incurred (Rs)
Apron D/S Bucket	Restoration of Flood Damage	7,03,000
6900-10000 RD	1. Removing of Cement Plaster (5160 sq. ft) 2. Cement Plaster 1:3 (5160 sft) 3. Plain Cement Concrete 1:2:4 (658 sft)	48,000
1500 – 2800 RD	1. Brick Work (134 sft) 2. Removing Cement Plaster (4710 sft) 3. Cement Plaster 1:3 (4924 sft)	49,000
4500 – 6045 RD	1. Removing Plaster (5130 sq ft) 2. Cement Plaster 1:3 (5130 sft) 3. Plain Cement Concrete 1:2:4 (654 sft)	48,000
21500 – 21570 RD 14000 – 14600 RD	1. Flood Damage Repair 2. Repair of Right Channel	72,000
1187 – 1309 RD 4955 – 5477 RD 6045 – 6290 RD	Restoration of Flood Damaged Piers	3,00,000

Table 6.3. Other repairs below Shahpur Dam.

Aqueduct No. 1. One pier was protected and maintained by depositing concrete material from base to top.
Aqueduct No.3. Two piers were repaired and protected against flood damages.
Aqueduct No.4. Two piers were repaired.
Main Sump. Walls of main sump at zero RD was raised to 2.5 ft so that overflowing of water can be checked and the valve can be opened to its maximum capacity. In order to sustain the system, G.I. wire crates were also placed and adjusted in front of the bucket of the spillway; water falls over these after flowing over the spillway.

6.3. Leakage in the Left Branch of Shahpur Dam

The left branch of the Shahpur Dam was in very poor condition, resulting in considerable water leakage; therefore, repair and maintenance was required. Maintenance work was accomplished during a three-month period (July to September 1998) by the farmers in the command of left branch with the technical and financial assistance of IIMI-Pakistan, which is presented in Table 6.4. The cost of materials and transportation was Rs. 57,814, while the labor cost (labor provided by the water users/farmers) amounted to Rs. 52,650 (Table 6.5). A more detailed description of the maintenance activities are listed in Table 6.6.

Table 6.4. Cost of material and transportation for repairing Left Branch of Canal of Shahpur Dam

Material	Quantity	Cost (Rs.)
Cement + Transportation	227 bags	40,655
Sand + Transportation	2200 cft	13,154
Crush + Transportation	600 cft	4,005
Total Expenditure		57,814

Table 6.5. Value of labor cost provided by the water users/farmers for repairing Left Branch Canal of Shahpur Dam.

1. Cleaning of Left Branch	12,900
2. Plastering	9,600
3. Cleaning of Watercourses	22,200
4. Fixing of Outlets	5,000
5. Donkey (to transport material at the site) @ Rs 50 for 32 days	1,600
6. Manual Trolley (@ Rs. 30 for 45 days	1,500
Total	52,650

Table 6.6. Maintenance work along Left Branch Canal at Shahpur Dam.

Distance from Bifurcation structure	Problems	Maintenance/Repair Work
RD 0+000 to 1+000	Minor leakage of water through side walls.	Minor maintenance work with gola (fillet) in patches was done to save leakage and further deterioration.
RD 1+045 to 1+225	Canal bed and walls were severely damaged, resulting in further damage to canal and severe leakage through walls and bed.	A concrete bed was laid down in this portion and walls were also repaired.
RD 1+225 to 1+370	Minor deterioration of walls.	Repair in patches to avoid further deterioration.
RD 1+370 to 1+415	Very severe seepage of water, resulting in water logging in the adjoining area and damage of crops.	Both sides of the wall were repaired and new concrete bed was laid.
RD 1+500 to 1+575	Thick vegetation and silt inside the canal resulting in slow flowing of water and minor cracks in the walls resulting in leakage of water.	After desiltation and removing vegetation, minor maintenance work was done to control leakage of water.
RD 1+600 to 2+150	Holes in the wall, standing water, removal of plaster, and poor condition of bed resulting in further deterioration of channel.	Walls were plastered, holes in the side walls were plugged and concrete bed laid.
RD 2+150 to 2+900	Minor deterioration of walls and seepage of water through joints of wall and bed.	Damaged side walls were repaired and gola (fillet) was made through out this portion.
RD 2+900 to 2+905	The bed of this small portion was badly damaged.	New bed was laid and wall were plastered.
RD 2+905 to 3+055	The bed of this portion of branch was severely damaged.	Minor maintenance in case of walls and gola was made through out this portion to check losses of water.
RD 3+055 to 3+065	This part of the channel was losing its viability due to bad condition of its bed and walls.	Bed was laid and walls were repaired. Gola was also made to check water losses.
RD 3+325 to 3+345	Chances of seepage of water and further danger of deterioration.	Bed was rebuilt and sides of channel were repaired as required.
RD 3+875 to 3+880	Bed was non-existent, and walls deteriorated.	Bed was laid and walls were plastered in small patches.
RD 3+880 to 5+400	Lots of vegetation and silt in the channel and a substantial amount of water goes to waste.	Gola was made throughout this section, desiltation was carried out and wall were repaired.

Besides maintenance work done on the Left Branch Canal downstream from the bifurcation structure, some watercourses off-taking from this canal were also taken care of (Table 6.7, 6.8 and 6.9). Here again, IIMI-Pakistan gave technical and financial assistance to farmers in the Left Branch Canal Channel command area.

Table 6.7. Maintenance activities on Watercourse 3-R of Left Branch Canal, Shahpur Dam.

a)	Total length repaired	890 ft
b)	Gola (fillet) on both sides	750 ft
c)	Bed length that was laid	65 ft
d)	Sides repaired	750 ft
e)	Broken outlets	1
f)	Desiltation and removal of vegetation	750 ft
g)	Construction of small nakka structures	2

Table 6.8. Maintenance activities on watercourse 6-L, Left Branch Canal, Shahpur Dam.

a)	Total repaired length	1652 feet
b)	New bed laid	1350 feet
c)	Walls repaired	1652 ft
d)	Holes in the walls were plugged	1652 ft
e)	Nakkas were constructed	5
f)	Desiltation and removal of vegetation	1652 ft

Table 6.9. Maintenance activities at the tail of Left Branch Canal, Shahpur Dam.

a)	Total repaired length	312 feet
b)	Desiltation and removal of vegetation	312 ft
c)	New bed where needed	312 ft
d)	Small holes in the bed and side walls	312 ft

The help and assistance of farmers was key to the successful implementation of maintenance activities (Photographs N, O, P and Q show their participation in different activities). An escape was also constructed to divert water back to the stream, when water is not needed, such as during a rainfall period. Photograph R shows the escape for draining water to the steam. Table 6.10 contains the list of the farmers who participated in the desiltation, repair and maintenance work.

Table 6.10. Names of the water users farmers and the maintenance service rendered.

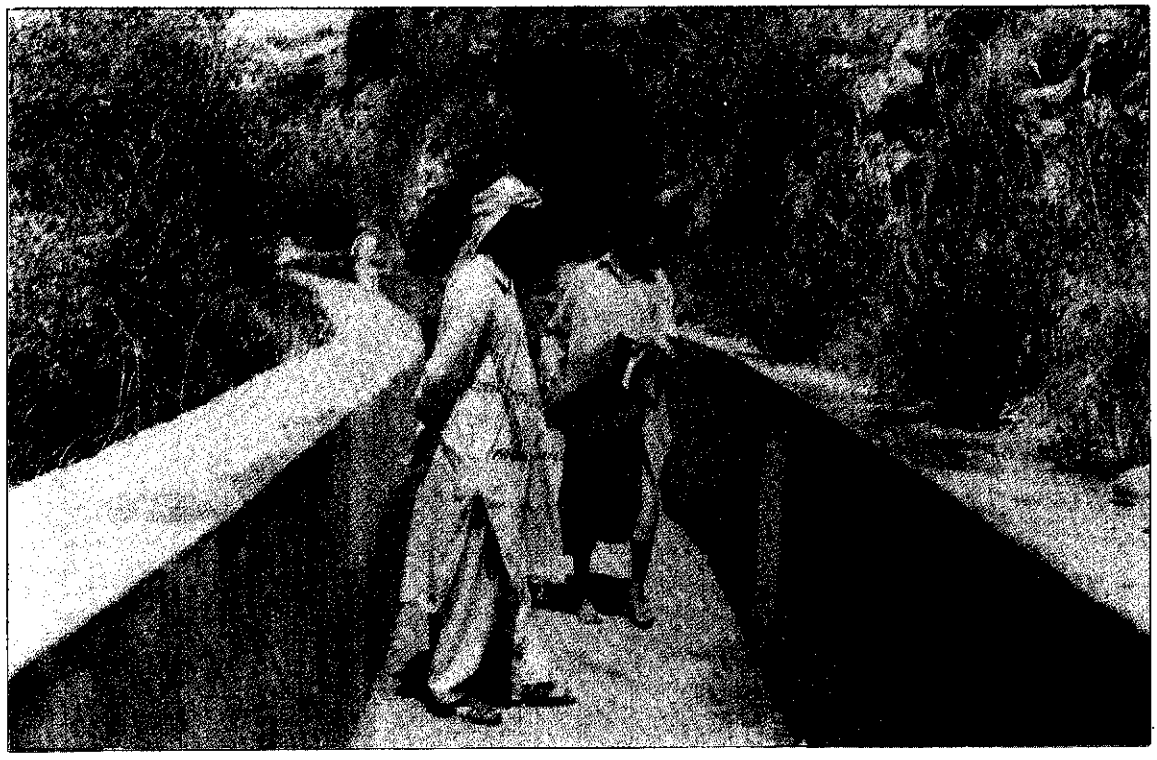
Name of the Water User/Farmer	Service Rendered	Name of the Water User/ Farmer	Service Rendered
Haji Karam Daad	Supervision	Zumard Khan	Supervision, labor, provided camel
Tahir Khan	Supervision	Wilayat Ali	Labor
Haji Ashraf	Labor	Daood Khan	Labor
Malik Bashir	Labor, provided Donkey	Noor Kkhan	Spade, bucket
M. Akram	Supervision, tractor	Sufi Safdar	Supervision
Himayat Ali	Labor, donkey	Ashraf	Donkey, Spade, Drinking water
Hidayat Ali	Labor	Haider Zaman	Supervision, Drinking water
Malik Sarfraz	Labor, tractor, Supervision	Riasat Ali	Supervision, Provided Store
Haji Dilawar	Labor	M. Ali	Supervision, Drinking Water
Raja Iqbal	Labor	Haji Nawaz	Supervision, drinking Water
M. Shafi	Labor	Wajid Ali	Labor, Manual Trolley
M. Safdar Maliar	Labor	Haji Ashraf	Supervision
M. Safdar	Labor	Zamin Shah	Labor
Ahmad Khan	Labor	Ghulam Siddiq	Labor
M. Kiaz	Labor	M. Asif	Manual Trolley
Zahid Haidayat	Donkey	M. Ashraf	Labor
Shahid Ali	Donkey	Ghulam Farid	Labor
Jehangir Khan	Labor	Yaqoob	Labor
Khan Doura	Donkey	Hafiz Afzal	Labor
Mumraiz Khan	Labor	Khizer Hayat Khan	Supervision

Photograph N. Farmers participation in desiltation activities at LBC.

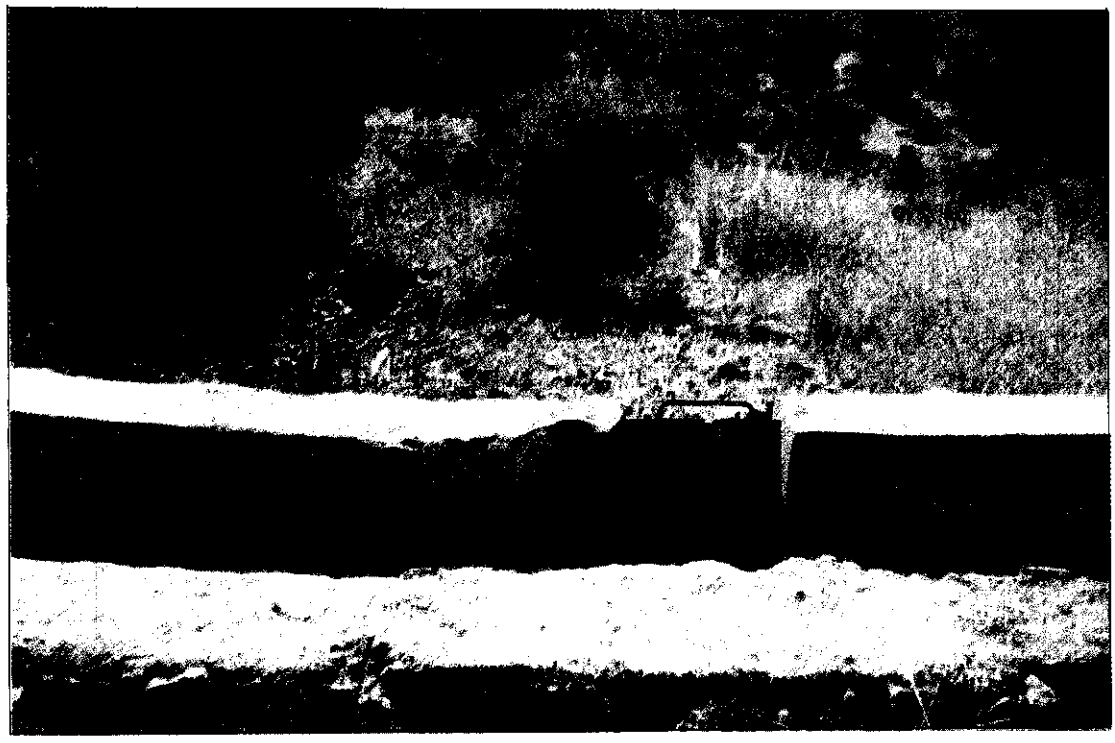
Photograph O. Farmers participation in desiltation of LBC.

Next >>

Photograph P. Farmers participation in the maintenance and repair of LBC.



Photograph Q. Farmers participation in repair work of main channel.



Photograph R. Escape for draining water to the steam.

CHAPTER 7

MAINTENANCE AND OPERATION PLAN FOR MIRWAL AND SHAHPUR SMALL DAMS

7.1. Maintenance Plan for Mirwal Dam

7.1.1. Leakage from Construction Joints

IIMI undertook a diagnostic survey of the Mirwal Dam irrigation system in 1997. The survey was done in collaboration with the Water Resources Research Institute (WRRI), National Agricultural Research Center Islamabad. The objective of the survey was to identify key constraints faced by the system. The survey revealed that 30-40% of the irrigation water diverted at the outlet works of Mirwal Dam was being lost in the conveyance system (WRRI, 1997). This was very disappointing as the dam, as well as the irrigation system, was commissioned in 1990 and the channel's physical condition was apparently very good.

During the walk-through of the Mirwal Dam irrigation system, the participants were impressed with the quality of construction. The only key maintenance activity identified jointly with SDO and FO below Mirwal Dam was repair of the construction joints in the main channel. Most of the joints were leaking due to vegetative growth. A joint decision was made to clean and refill the joints properly. The poor condition of the joints explained the severe losses in the conveyance system. The maintenance activity was planned, organized and implemented jointly by the SDO, the Mirwal Dam FO and IIMI.

7.1.2. Land Levelling

Land levelling was observed as a major problem obstructing the command area development below Mirwal Dam. In fact, the elevation of the main channel does not provide access to gravity flow to a great number of adjoining fields. The water users need bulldozers and tractors to remove considerable amount of topsoil from their fields to receive irrigation water flows through gravity. The cost of this operation is too high and is not within the reach of a majority of the farmers.

The solution could be in the provision of bulldozers and tractors to remove topsoil on subsidized rates to facilitate the command area development.

7.1.3. Lift Irrigation

Lift pumps can also be used to lift water to irrigate those fields with higher elevations. This, again, is a costly option. The solution could be in providing pumping sets to lift water for irrigation on subsidized rates to facilitate the command area development. Anyhow, there is great potential for command area development and some of the farmers from both of the pilot sites have already started lifting water from the main channels, as well as from the ponds. Still, there are some who have applied with OFWM for schemes to lift water for their crop irrigation. In the following data, a list of the farmers is provided who have started lifting water in the 1998 Kharif season, while the others have started from this 1998-99 Rabi season. It is expected that with this development an area of about 750 kanals (about 94 acres) will be brought under irrigation below the Mirwal Dam command area. This means that about 25 percent of the existing irrigated area will come under irrigation by the end of the 1998-99 Rabi season. This happened only with the active participation of the farmers and their representatives (FO office bearers) in the project activities.

1. Mr. Ghulam Rasool of Nathain village, in the command of Mirwal Small Dam, started lifting water through lift pump during mid-1998 (Kharif season). He is expecting to irrigate about 60 kanals of his land at the end of this 1998-99 Rabi season. During last Kharif, he had vegetable and maize crops in his fields.
2. Mr. Khizer of the same village (Nathain) also started lifting water during the 1998 Kharif season and brought about 50 kanals under irrigation.
3. Mr. Asghar Ali of the same village (Nathain) applied in the beginning of 1998 with the Small Dams Organization for water lifting from the main channel of Mirwal Dam. But it only got materialized with the intervention of the Mirwal Dam FO and IIMI-Pakistan staff. Mr. Asghar Ali is hopeful to bring about 187 kanals of his land under irrigation.
4. Malik Taj Hussain of Mirwal Village started lifting dam water from the main channel during last Kharif season (1998). He brought 40 kanals of land under irrigation and in this last season he had a good vegetable crop. In this 1998-99 Rabi season, he has cultivated vegetables and wheat, which seems better as compared with the wheat crop on the adjoining land.
5. Fazal Hussain of Nathain village applied for a new mogha two years ago. With the FO involvement and support of IIMI-Pakistan staff, he has been able to obtain approval for a new outlet. He has levelled about 200 kanals of his land, which is a good investment. He has started irrigating his land during this 1998-99 Rabi season and is expected to bring the 200 kanals of levelled land under irrigation.
6. Mr. Liaqat of Mirwal Village, after FO involvement and with the assistance of IIMI staff, has been able to obtain approval to lift water from the main channel during this 1998-99 Rabi season. He is expecting to bring about 200 kanals of land under irrigation.
7. With permission of the Small Dams Organization, Mr. Habib Ahmad Khan of Mirwal Village has started lifting water directly from the pond during the last 1998 Kharif season. He is expected to bring about 50 kanals of his land under irrigation.

There is no systematic procedure for water distribution at the secondary and tertiary levels. This implies that any water user can start irrigating his fields at any time. There is a need to make an inventory of all the outlets with their present command areas to propose a schedule for streamlining the operations.

7.2. Operational Plans for Mirwal and Shahpur Dams

7.2.1. Present Operational Schedule

The water users were not following any formal or informal water distribution schedule (warabandi) on both of the irrigation systems. The water was flowing continuously and water users were using as and when needed. The water was only shut-off during the rains. Scarce and very costly irrigation water was being wasted due to the lack of a water distribution schedule at the secondary, as well as tertiary, levels.

7.2.2. Consensus to Follow a Schedule

The FOs/WUOs were informed, demonstrated and trained on how to develop a water schedule, which will ensure reliable and equitable water distribution among all of the water users without wasting so much water. Several sessions were held to develop a consensus among them to follow a common principal of equity.

7.2.3. Inventory of Water Users

After obtaining their agreement in principle, an inventory to list all of the shareholders was initiated. The inventory listed all water users along with their lands owned / operated/ located / served by each outlet (mogha) along the irrigation system. This is being prepared in collaboration with the FOs, Revenue Patwari and Canal Patwari. Efforts were made to avoid any errors and omissions in this inventory.

The field team of IIMI played a major role through a walkthrough of the water channels in order to determine the exact position of outlets and to meet the respective water users.

7.2.4. Temporary Schedule (Warabandi)

Based on the inventory, warabandi schedules for the shareholders of both irrigation systems were formulated jointly by the SDO, IIMI and FOs. These will be implemented during the 1998-99 Rabi season to evaluate these schedules for their suitability and efficacy. These warabandi schedules were prepared at the request from the FOs office bearers, tail-enders and small holders so that everybody can enjoy their right to water. The warabandi schedules are based on 24 hours operation for seven days and only legal outlets have been considered in this schedule. The warabandi schedule at Shahpur Small Dam is presented in Annex C. This also constitutes the implementation of the operational plans, an important project activity that leads towards strengthening the FOs and sustainability of the irrigation systems.

7.2.5. Finalization of Schedule

Based on the joint evaluations of these schedules, they will be finalized and notified by the SDO in due course of time.

CHAPTER 8

CONCLUSIONS

Based on the results presented in the previous chapters, the preliminary conclusions that were reached are listed below.

The physical condition of the Shahpur Small Dam irrigation system was not satisfactory. The maintenance activities that had been undertaken were largely inadequate for ensuring satisfactory operation of the irrigation system. This was mainly due to non- availability of financial resources (according to the SDO) for undertaking adequate maintenance of the irrigation system. Proper maintenance of the irrigation system is essential to achieve the anticipated benefits, as well as economic justification of the investments made.

The physical condition of the irrigation system of the Mirwal Small Dam was relatively satisfactory. The only major maintenance problem was leaking of construction joints.

Even with the availability of financial resources, the maintenance and operations of irrigation systems cannot be accomplished efficiently and cost-effectively without active participation and collaboration of the beneficiaries (i.e. water users). There was little evidence regarding water user's involvement in the maintenance activities undertaken in the past.

Motivating, strengthening, awareness and capacity building of water user's on maintenance and operations of their respective irrigation system can ensure water users participation in sustaining the irrigation system.

Water users' participation in the planning and implementation of the maintenance activities can reduce the maintenance costs substantially and increase the efficiency of both human and financial resources available for maintenance activities.

Contributions by the water users in kind and cash for the maintenance activities can increase substantially the financial resources available for the maintenance, especially considering the inadequacy of financial resources available to the SDO to meet the increasing costs of maintenance requirements for the small dams.

Water users' participation and contribution inculcates a sense of ownership among them, which is otherwise not generally present. This feeling among water users was found to be a key for their motivation and responsible behavior.

Operations of both the irrigation systems were left to water users without any temporary or permanent schedule. Water users were using water as and when they needed. Lack of a water distribution schedule both at the secondary and tertiary levels was the major factor for the substantial irrigation water wastage in both irrigation systems.

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ANNEX A

TRAINING OF WATER USERS OF SHARPUR SMALL DAM
DATE 10 and 11-2-98 VENUE Village Amir Khan
PARTICIAPNTS

a) **Office Bearers of Water Users' Organization**

1.	Ikhlaq Khan	President
2.	Muhammad Azam Khan	Vice President
3.	Muhammad Akram	Secretary General
4.	Hukam Daad	Secretary Information
5.	Mehmood Khan	Treasurer

b) **Water Users**

There were about 60 farmers who participated in the training.

c) **Small Dams Organization**

1. Executive Engineer 2. Sub-Divisional Officer 3. Sub-Engineer 4. Patwari 5. Valveman

d) **WRRI-NARC**

1. Dr. Shafique Ahmad PSO/PI (SWC)
2. Muhammad Aslam (SSO)
3. Muhammad Yasin (SSO)

e) **IIMI-Pakistan**

1. Professor Gaylord V. Skogerboe, Director, IIMI-Pakistan
2. Dr. Muhammad Akhtar Bhatti, Irrigation Engineer
3. Dr. Muhammad Asghar Cheema, Sociologist
4. Field Team
   i) Muhammad Akram ii) Shabir Ahmad iii) Abdul Waheed iv) Nasir Mehmood

The most important task undertaken after the social mobilization and formation of FOs was to build understanding and capacity of the water users on maintenance and operation issues related to their irrigation system. A formal training was organized in this respect for the water users from Shahpur Dam command area with the following objectives:

- To familiarize them with the principles of participatory irrigation management;
- To familiarize them with M&O issues related to their irrigation system; and
- To address these issues positively and efficiently.

In addition to the water users, staff from IIMI-Pakistan, NARC and SDO participated in the training. Professor Gaylord V. Skogerboe was the chief trainer and was assisted by Dr. Akhtar Bhatti and Dr. Asghar Cheema. The strategy adopted for the training was to discuss the O&M related issues with participants in the morning session. In the afternoon, the strategy was to visit the system (walk-through) jointly with the water users to observe and collect information about the system and its related problems.

On the second day, all the information collected was analyzed to identify key constraints and problems. After identification of key issues and problems, their solutions were identified.

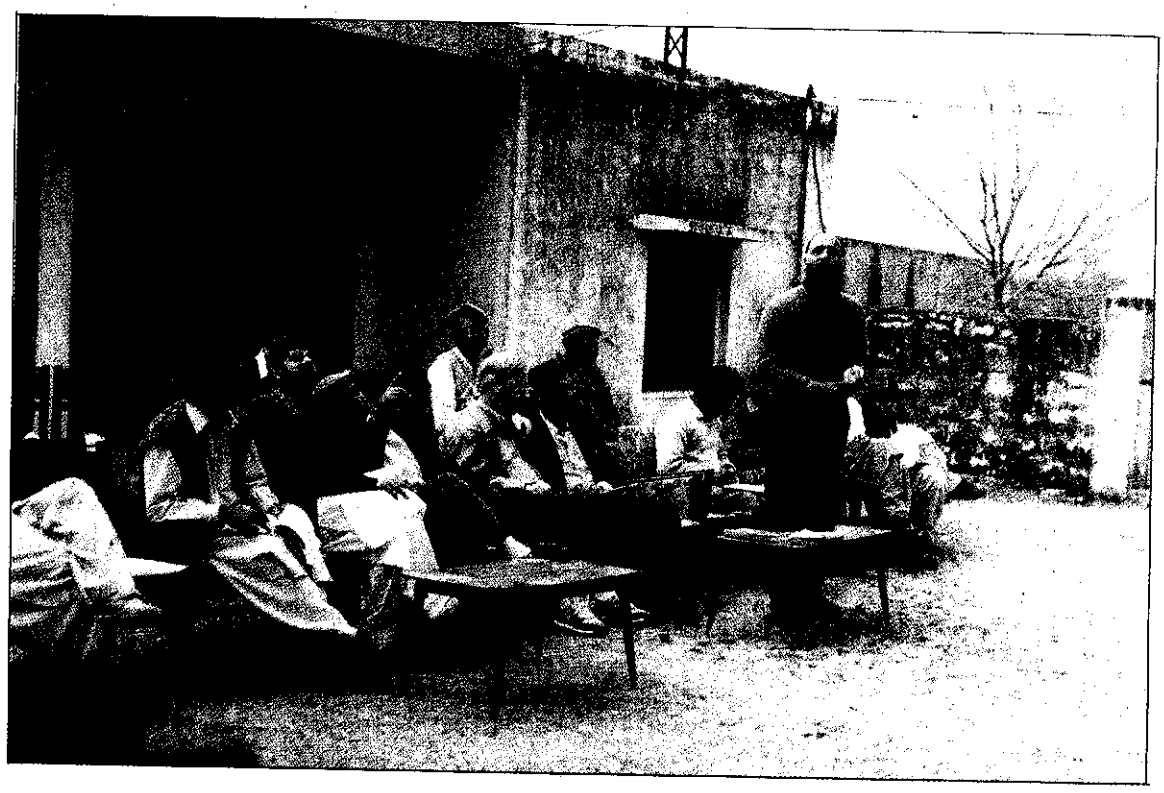
Following are some of the photographs showing the M&O training conducted by IIMI-Pakistan staff.

Photograph S. Members of Shahpur Dam Farmers' Organization are in a meeting with Professor Skogerboe and other IIMI-Pakistan Field Team members before conducting the walk-through. Dr. Cheema is explaining the agenda for the meeting.

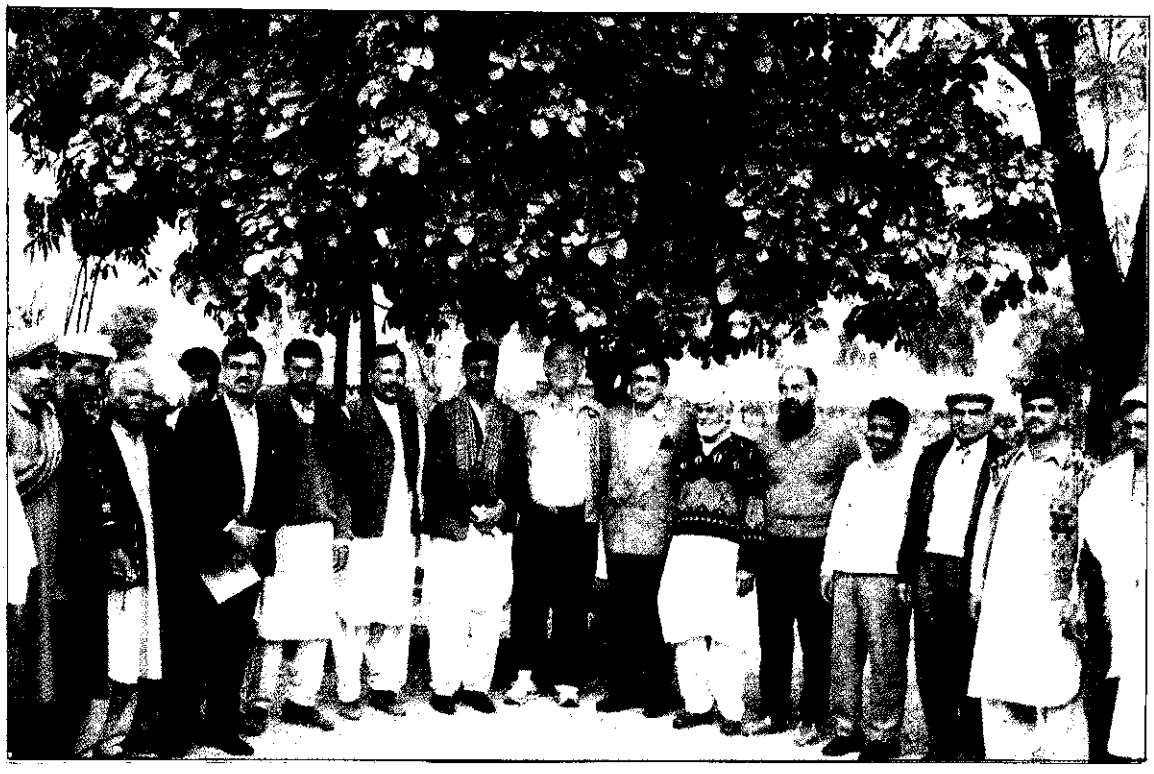
Photograph T. Prof. Gaylord V. Skogerboe is addressing the farmers in the command of Shahpur Dam with special reference to maintenance and operation of the water channels, while Dr. Akhtar Bhatti is acting as a translator.

Photograph U. After visiting the bifurcation structure of the Shahpur Dam main channel, Dr. Cheema, IIMI-Pakistan, along with the President and Secretary of the FO, along with other farmers are marching towards other sections of the main channel.

Photograph V. Walk-through survey of Shahpur Dam Main Canal for operation and maintenance planning. Professor Skogerboe and other IIMI-Pakistan Field Team members are found in discussion with the local farmers.



Photograph W.Dr. M. Akhtar Bhatti, IIMI-Pakistan, is explaining the operation and maintenance plan of Shahpur Dam water channels to the participants.



Photograph X. Group photo of farmers of Shahpur Dam with Professor Skogerboe, staff from IIMI-Pakistan, Small Dams Organization and WRRI after discussion of operation and maintenance plans.

2. TRAINING OF WATER USERS OF MIRWAL SMALL DAM

DATE 12 and 13-2-98 VENUE Rest House, Mirwal Small Dam

PARTICIPANTS:

a) Farmers Organization

1. Major (Retd.) Taj Muhammad Khan	President
2. Ghulam Asghar Khan	Vice President
3. Sardar Jaffer Khan	Secretary General
4. Khan Malik Tahir	Secretary Information
5. Farmers	16

b) Small Dams Organization

1. Executive Engineer 2. Sub-Divisional Officer 3. Sub-Engineer 4. Patwari 5. Valveman

c) WRRI-NARC

1. Dr. Shafique Ahmad 2. Muhammad Aslam 3. Muhammad Yasin

d) IIMI-Pakistan

1. Professor Gaylord V. Skogerboe, Director IIMI-Pakistan
2. Dr. Muhammad Akhtar Bhatti, Irrigation Engineer
3. Dr. Muhammad Asghar Cheema, Sociologist
4. Field Team
   i) Muhammad Akram ii) Shabir Ahmad iii) Abdul Wahid iv) Nasir Mehmood

After doing the M&O training exercise in the Shahpur Small Dam command area, training in M&O was also conducted in the Mirwal Dam command area. Besides IIMI-Pakistan staff, water users, personnel from WRRI and SDO also participated.

The same strategy as used at Shahpur Dam was adopted. During this two days training, the morning session of the first day was devoted to informal discussion with the water users in identifying M&O related problems. In the afternoon session, the Mirwal Dam irrigation system was visited jointly with the water users to observe and collect information about the system and its related problems. The participants started from the tail of the main channel and gathered at each important point to discuss in detail with Prof. Skogerboe, who very nicely elaborated the system to the water users and the staff from NARC and SDO. At the point of bifurcation of the main channel, the participants met a group of farmers, including Malik Nazir, former Inspector General Police. The group inquired a lot about O&M related questions, which were answered by Prof. Skogerboe to their satisfaction.

The second day was devoted to detailed discussions about what had been observed during the walk-through of the Mirwal Dam irrigation system. All the information collected was analyzed to identify principal problems and constraints and their solutions.

Here are some of the photographs depicting the training organized by the IIMI-Pakistan staff for the benefit of the water users.

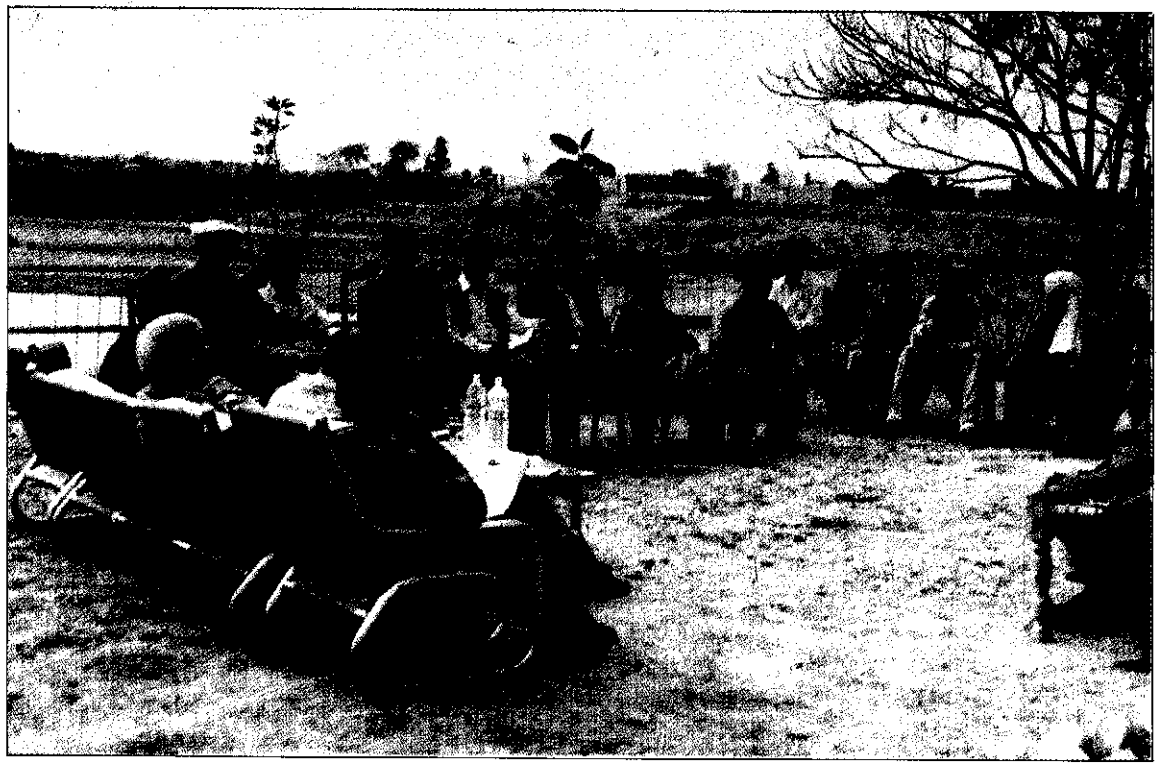
Photograph Y. Professor Gaylord V. Skogerboe is explaining preventive maintenance plans to farmers during the walk-through survey of Left Bank Canal of Mirwal Small Dam.

Photograph Z. Participants along with Prof. Skogerboe are observing the drop structure of the Left Bank Canal of Mirwal Dam during walk-through survey for operation and maintenance planning.

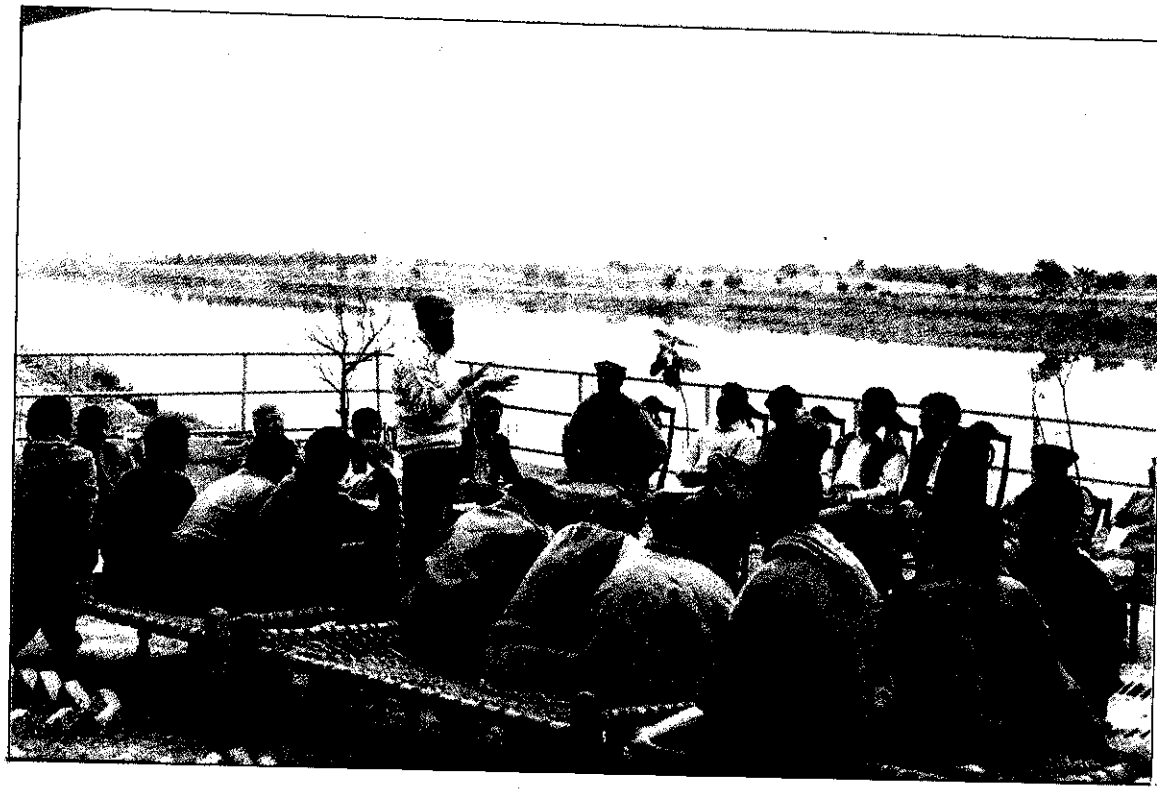
Photograph AA. Participants are inspecting the middle portion of the Left Bank Canal of Mirwal Dam during the walk-through survey. Dr. Akhtar Bhatti is explaining the situation to Professor Skogerboe.

Photograph AB. Dr. Asghar Cheema is delivering the opening remarks and reviewing the project activities during the operation and maintenance plan meeting. Staff from WRRI and Small Dams Organization, along with the farmers and their representatives, at the Mirwal Dam Rest House.

Photograph AC. Mr. M. Akram (IIMI Pakistan Field Team Leader at Fateh Jang) is explaining the agricultural development plan of the project during operation and maintenance meeting with the participants at Mirwal Dam Rest House.



Photograph AD. President, Mirwal Dam Farmers Organization, is raising a question during the operation and maintenance plan meeting with the participants.



Photograph AE. During the operation and maintenance meeting with the participants, Dr. Akhtar Bhatti is explaining the plans to the participants.

ANNEX B

MEETINGS HELD AT SHAHPUR DAMS REGARDING M & O FROM MARCH TO OCT.

A. FLOW MEASUREMENTS AT THE BIFURCATION STRUCTURE

Date: 06-03-1998 Venue: Bifurcation Shahpur Small Dam Main Canal

Participants:

Dr. M. Akhtar Bhatti
Dr. M. Asghar Cheema
Muhammad Akram
Waheed Ahmad

Proceedings:

After meeting with the Project Director, XEN, Small Dams Organization and other project concerned officials of line agencies, Dr. Cheema and Dr. Bhatti, reached the field station Fateh Jang and carried the field team members and apparatus for the purpose of measurement of water flow at the bifurcation structure of Shahpur Dam main channel.

At the point, Dr. Bhatti assisted by Dr. Cheema and the field team, took the bed levels of the main channel, left and right minors from different points and also dimensions of the bifurcation.

During this whole process, Dr. Bhatti also imparted training to the field team about how to adjust the dumpy level and how to read the staff rod and take the measurements.

Dr. Cheema and Dr. Bhatti also visited the office of SDO, and saw the sub-engineer, Mr. Faber and asked him to take levels and other necessary measurements along with the IIMI-field team in order to solve the bifurcation issue on a sound technical basis and with precision. They also briefed him about their next program time. The Sub-engineer assured his cooperation, when and where needed. After that, they briefed the team about their second visit and gave some instructions about work and departed to Lahore.

B. MEETINGS WITH THE WATER USERS TO CLEAN THE PIPES AND BIFURCATION STRUCTURE

Date: March 18 -3-1998 Venue: Village Amir Khan

Proceedings:

In order to carry on this activity of immense importance with consensus of the farmers, the field team remained busy in developing confidence and ensuring the involvement of farmers. In this regard, FO members, SOVs and other shareholders were consulted time and again to participate in this activity. In this concern the FO office bearers were also invited to gather at the Dera of Haji Ashraf on 18-3-98 at 10:00 am.

The field team also consulted the Headman of village Amir Khan, President FO etc., and Khizar Khan (Maintenance Incharge, Shahpur Dam) to arrange labor for cleaning the pipes in the right minor as a first step to calibrate the flow in both of the minors. After concerted efforts, the team succeeded in arranging labor for cleaning the pipes. In the meanwhile, the team also arranged necessary equipment for cleaning of the pipes.

C. MEETING WITH WATER USERS AT VILLAGE AMIR KHAN AND AT BIFURCATION

Date: March 19, 1998 Time: 9:00 am to 2:30 p.m. Venue: Dera Haji Ashraf Khan and Bifurcation structure

Background:

Dr. Cheema and Dr. Akhtar Bhatti arrived at the field station on March 18, 1998. After having a cup of tea with the field team, they discussed the following:

1. Progress of work, especially the bifurcation below Shahpur Dam;
2. Next day program; and
3. Arrangements for cleaning of pipes and other things.

The Fateh Jang Field Team showed the drawing, to Dr. Bhatti, prepared by the sub-engineer, after having levels and other necessary measurements along with field team at Shahpur Dam bifurcation.

Proceedings:

Early in the morning, farmers gathered at the dera of Haji Ashraf Khan. Farmers dispersed after staying at the venue for some time, as they had to attend the death ceremony of someone at village Dhok Balouch. The farmers decided to gather again at the bifurcation when they will return from Dhok Balouch.

However, the field team remained busy in cleaning the pipes with the help of laborers. Sub-Engineer, Small Dams Organization also accompanied the team later on.

When Dr. Cheema and Dr. Bhatti arrived from Islamabad after attending a meeting with PD, Small Dams Organization about the bifurcation, the following farmers again reached at the bifurcation structure to see the progress.

1.	Ikhlaq Ahmad Khan	(President WUO)
2.	Hukam Daad	(Secretary Information WUO)
3.	Qureshi Noor-ul-Haq	(Representative from village Karima)
4.	Qamar Hayat Khan	(Farmer)

Besides these persons, Mr. Gulzar Khan, Master Haider Zaman and Treasurer FO, Mr. Mehmood Khan also visited the site to have an eye view of the work.

The following discussion took place among IIMI-Officials and farmers, while observing the flow after desiltation of pipes in the right minor.

Qureshi Noor-ul-Haq: Opening towards Dhok Balouch Village has greater diameter than that of pipe. Moreover, the level of pipes is not correct (not gradual). If you remove the pipes and open the canal, this problem can be solved. Otherwise, these meetings are useless. The Irrigation Department does not cooperate.

Dr. Bhatti: You should demand your share and try to pay "aabiana". God has blessed us with knowledge and experience. So let us try. Removing of pipes is not only the sole solution to this problem. There are also other options as well. Moreover, removal of pipes will cost a lot of money.

Qureshi Noor-ul-Haq: The Department has funds, but they do not want to spend.

Ikhlaq Khan: If the Department does not cooperate, then what is the use of this FO.

Annex B

Dr. Bhatti: I do not know about the funds with the Department, you should not decide at once about any issue. Before going through a big operation, a doctor tries all prior options to treat the patient. So you should wait. We are doing our best to solve this issue. If your cooperation remains with us, we will succeed "Inshallah".

Qureshi Noor-ul-Haq: If half of the pipes are removed, this can solve the problem. The objective of the FO is to convey the problems to the concerned departments and try to solve them. Before the intervention of IIMI, we had almost forgotten the dam, but with the arrival of IIMI staff, we have started taking interest in the dam water supply and we are hopeful this problem will be solved. Two-thirds of the area is towards right minor and water should be diverted in this 2/3 ratio. To Small Dam personnel it is a 1:2 ratio.

Dr. Bhatti: You will see the same solution without the removal of pipes. You should trust us. By increasing or decreasing the supply to any side unjustly, we have no use of that. So we will try our best for equitable distribution of water according to share.

Dr. Cheema: We will again come on March 30, 1998 and stay here till the justified solution of this issue has been resolved.

Qureshi Noor-ul-Haq: We will wait for another 40 days. The officials of the concerned department fear from the expected conflict. Some sound solution should be sorted out.

Dr. Bhatti: We will measure the supply on March 30, 1998 and will continue to calibrate till distribution in the ratio of 1:2 is reached. Meetings do not mean the immediate solution of the problem. Farmers should unite for a solution. You should not expect a quick solution. We have many solutions to this problem, but we will construct a weir on the left side and will calibrate for adjusting to a 1:2 ratio.

Qureshi Noor-ul-Haq: Farmers will break the structure as the SDO has no powers to halt the farmers.

Dr. Cheema: We should decide by mutual consultation and consensus, not by going to the police.

Dr. Bhatti: First, unite together for a better solution. God will help us for a better solution. We will handle this issue technically and accurately, but the actual thing is to convince the farmers of Dhok Balouch Village, who are receiving more water than their due share.

Ikhlaq Khan: We favor 1:2 distribution between village Dhok Balouch and Karima, respectively, but we (FO) should be granted authority to take action against the violators.

Qureshi: First, prove your worth for this, do better work then powers will come to you and you will be in a position to exercise these powers.

Dr. Bhatti: We always provide slope to pipes for self-cleaning, but these pipes have no slope.

Qamar Hayat: We will request Dr. Qadeer Khan to solve this problem.

Dr. Bhatti: According to the Sub-Engineer, if the officials do not know how to measure water flow then what will be the efficiency of that department. Water is a great blessing. We should not waste it as such without utility; we will try our best to solve this issue justly.

Qureshi: If this issue is settled in the presence of IIMI, then it is all OK; otherwise, we have no hope of its solution.

C. FLOW MEASUREMENT, TRAINING AND DISCUSSION ADJUSTMENTS IN THE BIFURCATION

THIRD VISIT OF DR. CHEEMA AND DR. BHATTI (30-3-98 TO 3-4-98)

Date: 30-03-98 to 03-04-98 Venue: Bifurcation structure, Shahpur Dam

Background:

This visit and its objectives were:

- The adjustment in the bifurcation structure.
- Time to time calibration of the flow.
- Necessary adjustment in the flow.
- Briefing to the farmers about the measurements.
- Training to the staff and farmers about calibration.

So, field team informed almost all of the FO members, SOVs and other farmers by individual contacts and letters in order to ensure their participation and involvement in this activity of vital importance.

Small Dams' officials were also informed about this program.

All necessary preparations, e.g. arrangement of apparatus (Dumpy level, staff rod, measuring tape and bricks) were arranged in advance by the field team.

PARTICIPANTS:

IIMI

1. Dr. Muhammad Asghar Cheema
2. Dr. Akhtar Bhatti
3. Mr. Nisar Bukhari
4. IIMI-field team (M. Akram, Shabir Ahmed and Abdul Wahid)

SMALL DAMS ORGANIZATION

1. Sub-Engineer 2. Baildars

WRRI-NARC

1. Dr. M. Shafique 2. Mr. Yasin 3. Mr. Bhatti 4. Others

WATER USERS ORGANIZATION

1.	Ikhlaq Ahmad Khan	President
2.	Muhammad Azam Khan	Vice President
3.	Muhammad Akram	Secretary General
4.	Mehmood Khan	Treasurer
5.	Hukam Daad	Secretary Information

FARMERS

1.	Haji Ashraf Khan	Headman, Village Amir Khan
2.	Sufi Safdar	SOV representative from Amir Khan

Next >>

3.	Master Haider Zaman	Village Shahpur
4.	Azad	Village Karima

After Hallow hi, the following steps were taken by IIMI, WRRI-NARC and Small Dams Organization participants for the calibration of flow.

- Flow measurements in the main channel, right and left minors.
- The discharge found in the main channel was about 6.25 cusecs and right minor was getting around 2.00 cusecs, whereas, supply going through the left minor was about 4.00 cusecs.
- The flow in the right and left minors was in reverse order with respect to their command area.
- Farmers agreed that what will be decided honestly and precisely according to their share, will be acceptable to them.
- Discharge towards left minor (getting more water than its share) was reduced by placing/adjusting bricks in it.
- Water level in the right minor was noted.
- Time to time and side by side discussions with the farmers and explanations to the farmers continued.
- While measuring the discharge, both the float and current meter methods were used. These observations were repeated many times.
- Dr. Bhatti tried his best to develop confidence among the farmers. He, with proficiency, in a very sophisticated and polite manner and quoting Quranic verses, Hadith, tried to improve their thinking and explained every step of the calibration process clearly.
- Dr. Cheema also said to the FO president and other participants that until and unless this issue has been solved, we will not leave the spot and continue to work on it.
- By placing the bricks in the left minor, the water level inside the right minor was noted and measurements with the float and current meter were again repeated in order to adjust the discharge according to shares (i.e. 1:2 ratio) into the left and right minors, respectively. In this way, water at the end of the proceedings on 30-3-98 was roughly flowing in the desired ratio in both minors.

In the evening session, the work was reviewed and planning for the next day was done. It was decided that Dr. Cheema, Dr. Bhatti and Akram will meet the XEN, PD, Small Dams Organization and Director OFWM and also bring a current meter from WRRI-NARC. While the rest of the team members will work at the office during the morning and will reach the bifurcation at 12:00 noon in order to continue the calibration and reach a final accurate distribution at the bifurcation. A meeting with farmers of Dhoke Balouch and Karima villages was also decided.

ACTIVITIES ACCOMPLISHED ON 31-3-98

In the first session of the day, Dr. Cheema, Dr. Bhatti and Akram visited the following line agencies.

1. Small Dams Organization

- A brief meeting with Project Director and XEN was held in order to discuss the bifurcation issue, progress in its solution and Project Director was also consulted about equitably distribution of water at the bifurcation structure.

- About repairing of canal, XEN said that tender has been approved and repair at two reaches (6000 feet) will start immediately after Eid-ul-Azha.
- About the preventive maintenance at Mirwal Dam, XEN said the department has no funds.
- Dr. Cheema and Dr. Bhatti said that minor maintenance will be carried out by the water users with the technical and financial assistance of IIMI-Pakistan on a participatory basis at Shahpur Dam.

2. Visit to the WRRI-NARC

Brief sitting with Dr. Shafiq: Discussion about project activities was carried out. Dr. Shafiq showed interest to demonstrate the judicious use of irrigation water at Shahpur Dam and also wished to introduce the material being produced at WRRI-NARC for the enhancement of green stuff and animal dung into useable form within two weeks.

At the end, Dr. Bhatti, requested Dr. Shafiq to give the current meter in order to carry out the flow measurements at the Shahpur Dam bifurcation.

Sitting with Director OFWM

The following things were discussed with the Director O.F.W.M and his sub-ordinates.

1. Bifurcation issue at Shahpur Dam. The solution was consulted with the OFWM officials.
2. Selection of third pilot site was also discussed. Director, OFWM said that will be finalized within one or two days.
3. Director, OFWM also confirmed five irrigation schemes at each pilot site till June, 1998. He also appointed Mr. Waris from the Office of Coordinators OFWM, District. Attock to join IIMI the next day at Fateh Jang to discuss and visit the site.

EVENING PROGRAM ON 31-3-98

According to plan, Dr. Cheema, Dr. Bhatti and Mr. Akram reached the bifurcation from the office of the Director OFWM and other members of the field team, sub-engineer and baildars, Small Dams Organization were already present at the bifurcation structure.

Dr. Cheema, briefed the Secretary General of FO about yesterday's progress, while Dr. Bhatti assisted by the field team and sub-engineer, Small Dams Organization, continued flow measurements with the purpose to get the precise distribution of supply into the left and right minors, proportionally.

After calibration by Dr. Bhatti, by using both float and current meter methods, it was found that water is flowing almost in 1:2 ratio i.e. about 4.04 cusecs in right minor and 2.66 cusecs in left minor and the main channel discharge was about 6.70 cusecs at that time.

At this stage Dr. Akhtar Bhatti, after consultation with Dr. Cheema, Sub-Engineer Small Dams and field team, decided to raise the bed level of the already existing weir-like structure in the left minor to maintain the sill level according to the approximation. Sub-Engineer and his staff were instructed about that construction to raise the bed (i.e., it will be 2.5 feet down from the benchmark). So it was finalized that construction will be carried out the next day (i.e. on 1.4.98) under the supervision of the IIMI-field team and Sub-Engineer, Small Dams Organization.

At the end of the session, Dr. Cheema also briefed the participants about repairing the main channel after Eid-ul-Azha up to 6000 feet by the Small Dams Organization as revealed by the XEN, Small Dams Organization during a meeting at his office, on the very same day. Dr. Cheema further told that the remaining part of the canal will be repaired on a self-help basis by IIMI and farmers.

On questioning about the cost of repair, the Sub-Engineer, Small Dams Organization estimated that it could be Rs.50-55/foot of canal length.

E. MEETING WITH THE FARMERS OF VILLAGE DHOK BALOUCH TO DISCUSS BIFURCATION ISSUE

Date: 01-04-98 Venue: Dera Haji Karam Daad, Village Dhoke Balouch

Background:

ENGAGEMENTS OF DR. CHEEMA, DR. BHATTI AND FIELD TEAM (MORNING SESSION)

As decided earlier on 31-4-98, Dr. Cheema, Dr. Bhatti and field team leader held a brief meeting with the field officer OFWM in the office of Water Management Specialist, Fateh Jang.

The availability of irrigation schemes to farmers in the two pilot sites, procedure, cost and other aspects were discussed in this morning session and then all of the party moved to the village Dhok Balouch (Shahpur Dam command area) in order to participate in the meeting of the farmers.

During this time, Sub-Engineer Small Dams, his team and the rest of the members of the IIMI-field team remained busy in the construction at the bifurcation.

PROCEEDINGS OF THE MEETING AT DHOK BALOUCH

First of all, it was considered better to see the condition and physical status of the left minor and watercourses irrigating the Village Dhok Balouch.

During this walk the following facts came to be know.

1. A lot of illegal breaches in the watercourses were found.
2. Vegetation and silt was hindering the flow.
3. Even the Left Minor was in a very bad condition and a lot of silt was found inside it.
4. Flow was also found obstructed by the farmers in order to get more water.
5. The size (capacity) was also found irrelevant to the flow in the Left Minor.
6. The size, location and position of the outlets were also found wrong.

Conclusion:

During this walk, the field officer OFWM, Mr. Waris said that these illegal breaches should be stopped. The mogha sizes should be according to the command area and watercourse routes can be changed and some shortcuts and better routes can be adopted for the construction of new watercourses. Similarly, the size and position of the moghas can be re-adjusted according to the command area.

Discussion with farmers at the Dera of Haji Karam Daad

After having first hand information about the physical status of the Left Minor and watercourses, very hot arguments took place among the farmers, Dr. Bhatti and other participants as given below.

- Farmers criticized and condemned the poor construction of the water channel and performance of the Small Dams Organization.

- They criticized again and again, starting the discussion on the bifurcation issue and its solution.
- Even in the beginning they refused to get the supply of dam water and showed no interest in getting the irrigation schemes by OFWM. They were of the view that the government departments entertained only influential persons.
- After hearing all these facets very patiently, Dr. Bhatti, entertained each and every farmer in a very sophisticated, polite and proficient way. Dr. Bhatti, first of all, heard the history of the bifurcation issue from the farmers. After that, Dr. Bhatti told and proved by quoting verses from the Holy Quran that this was not the actual solution of the problem that you did by breaking the structure.
- Dr. Bhatti briefed the farmers that it is the duty of every Muslim to get his share and let others to benefit their share. You (farmers) had to sacrifice some amount of water that you were getting in excess of your share.
- We will compensate that by lining and extending your watercourses by the help of OFWM.
- Moreover, if your cooperation remains with us, we will tell the techniques and methods to increase the efficiency of this available supply. This available supply is enough for you. Believe me, if you make judicious use of this water, you can get maximum benefit from it.
- Dr. Bhatti also pinpointed towards the illegal breaches and very poor condition of the watercourses from a desiltation point of view. He said that it is your moral duty to keep the watercourses in good condition as you benefit from them.
- Mr. Waris (OFWM) also gave a briefing about the procedure, cost, and legal requirement for providing assistance to irrigation schemes. He further added that every person will be treated alike.
- Dr. Bhatti said that the legal requirements will be fulfilled by us and work concerning you (farmers) should be accomplished by you with consensus.
- Answering the question, to increase the supply from the dam and legal status of the FO, Dr. Bhatti told that all efforts of Dr. Cheema and his team are to hand over the O&M of the system to you. But before this, you have to prove your ability to run the system efficiently. You have to prove that you are united, you have consensus and coordination among you.
- Dr. Cheema said that all of these efforts are being done to avoid having you knocking at the doors of the government departments and avoid litigation so that you can solve your problems by sitting together. I believe there is no such problem that cannot be solved by sitting together.
- Sec. General FO (Mr. Akram) and other farmers decided that whatever IIMI will decide honestly about the distribution of water, will be acceptable to them. They also decided to sit together at the same time and same venue in order to chalk out a program for benefiting from the irrigation schemes.

Evening session (1-4-98)

After returning from Dhok Balouch, Dr. Cheema along with other associates went straight to the bifurcation structure in order to observe and monitor the construction work at the bifurcation whether it is according to the plan or not. After discussion with the sub-engineer and other participants about the construction and how much interval is needed for setting of material, it was decided by Dr. Bhatti that the water supply will be opened the next morning (2-4-98) at 6:00 a.m. And again, the flow will be measured in the main channel, Left Minor and at the opening point of the Right Minor.

Annex B

Activities carried out on April 2, 1998

Dr. Cheema and Dr. Bhatti, along with Mr. Waris, after visiting the water harvesting schemes (installed by OFWM in tehsil Jand), reached the bifurcation structure where the field team was already waiting for them.

After a brief discussion with the sub-engineer, Dr. Bhatti again asked the field team and sub-engineer to start the procedure for velocity measurements and then discharge in the canal. Both the current meter and float methods for measuring flow velocity and then discharge was calculated. This procedure was repeated many times. At the end, the discharge calculated was as under:

- Main Channel = 6.70 cusecs
- Left Channel = 2.66 cusecs
- Right Channel = 4.04 cusecs

Seeing these calculations, Dr. Bhatti decided to do some more adjustments in the weir of the left side and on the bed of the sill, in order to reduce the excessive flow into the Left Minor. Then again, the flow was measured. The effect of that adjustment in the left and right channels was:

- Right Channel = 4.10 cusecs
- Left Channel = 2.60 cusecs

Then it was decided to carry on the work the next day for more improvement and accuracy.

F. MEETING WITH THE FARMERS OF VILLAGE KARIMA TO DISCUSS BIFURCATION

Date: 03-04-98 Time: 10:00 a.m. Venue: Boys Middle School Village Karima

Background:

Evening session (2-4-98)

The field team went to village Karima to inform the farmers about the next day's meeting in Karima, while Dr. Cheema and Dr. Bhatti moved towards field station. Dr. Bhatti and Dr. Cheema also discussed the legal aspects of the irrigation schemes with the Field Officer, OFWM and Sub-engineer, Small Dams Organization. The Field Officer said that permission in black and white will have to be taken from the XEN, Small Dams Organization in order to demolish the poor watercourses and to construct new lined watercourses. The Sub-Engineer said that a case for 5% recovery that is due from the farmers is already in the court.

So it is unlikely that the XEN will give permission without receiving that recovery. Then, other proposal/options (i.e. to replace the outlets and construct new watercourses) was also considered. It was also decided to see the Small Dams' officials to discuss this matter.

After the arrival of the field team at the field station, criteria and possible questions that can be asked from the farmers in both pilot sites during collecting information about the activities, benefits and performance of the FO/social organization were discussed. At the end, a program for the next day was finalized.

In the late evening, a movie camera team (hired by IIMI-Pakistan) reached the field station, Fateh Jang to have some snaps for the coming Board Meeting. A program to have a few shots from both the pilot sites including bifurcation construction, repairing work, cropping pattern, spillway, NARC, ABAD, and Small Dams Organization was also chalked out with the movie camera team members.

ENGAGEMENTS OF DR. CHEEMA, DR. BHATTI AND FIELD TEAM ON 3-4-98

First of all, the whole team visited the bifurcation structure. The canal was closed at that time. Then, the canal was opened and it was decided to go to Village Karima to hold a meeting with farmers as long as the water reaches the bifurcation. Meanwhile, the movie camera team arrived who took shots of the bare bifurcation and some repairs in the main channel. One member of the field team was left with the camera team to guide them.

Other team members reached the Village Karima, where a meeting was held with farmers, in the boys school at about 11:25 a.m.

Minutes of the Meeting

- Review of work at bifurcation from 30-3-98 to 3-4-98 by Dr. Cheema.
- Farmers narrated the history of the bifurcation issue.
- Farmers appreciated the efforts of IIMI to solve this issue and confessed that water has started reaching Karima tail reach once again.
- To Mr. Mehboob, one of the sitting farmers, water reached Karima village for the first time in 1992 and now in 1998 with IIMI' efforts. Line departments did not bother to solve this issue. Farmers used bags full of silt and rock to stop the supply towards village Karima and the tail reach.

Dr. Bhatti: You (farmers) are responsible for doing such kinds of wrong practices. These farmers deprive others from their due share, which is not lawful for a Muslim. You people don't perform your duties. Persons who obstruct flow are from you. You can solve such problems with mutual consensus by sitting together. You can apply sanctions yourself.

Noor-ul-Haq Qureshi: He praised IIMI' efforts in solving this issue of bifurcation and reviewed the work from 30-3-98 to 3-4-98. He advised the farmers to make use of water systematically and according to their share. He put forward the proposal for warabandi. He stressed that farmers should cooperate with each other and sit together for the solution of such problems.

Qamar Hayat: Every farmer opens up his outlet simultaneously, as a result water does not meet the requirements of all the farmers, especially those in the tail reach of the water channel.

Dr. Bhatti: Five cusecs water is running in the Right Minor. There are eight outlets in Village Amir Khan and eight in Village Karima. You can benefit more by observing warabandi between the two villages rather than opening all of the outlets simultaneously.

Qureshi Noor-ul-Haq: Outlets adjusted in the watercourses by the farmers have the wrong level. Similarly, only sanctioned outlets should be allowed to operate.

Qamar Hayat: Either the water supply should be increased or illegal outlets should be plugged in order to regularize the supply.

Dr. Bhatti: He told farmers that flow in the right channel is for your lands. The fact is that you are not using the water technically and systematically. FO members should sit together and solve such problems. He also clarified the confusion in their (farmers) minds about how this water can meet their needs. Dr. Bhatti quoted examples and also clarified all of these with the help of a blackboard and delivered a very elaborate lecture to the farmers by drawing diagrams of the canal, watercourses and outlets.

Dr. Cheema: Winding up the discussion, told the farmers that now, when the water has reached Karima, it is the duty of farmers to sit together and cooperate with us in order to prepare and implement a warabandi at the watercourse level and village as well.

Dr. Cheema also said to the farmers and the FO members to contribute for opening the joint account of FO and to desilt the Right Minor on a self-help basis.

The farmers at the end of the meeting were looking quite happy and confident and promised to cooperate. They also promised to desilt the Right Minor and watercourses by themselves and to contribute for the joint account.

The camera team also arrived to have shots of the meeting and some orchards and then followed the IIMI-team towards the bifurcation structure after offering "Jumma prayer" at Village Amir Khan.

Evening session at bifurcation

When the flow reached its peak, once again the current meter and float methods were applied to measure the velocity and calculate the flow in the Main Canal and Left Minor. After repeating the procedure several times, the flow measured in the left channel was almost 2.60 cusecs and in the right channel was about 4.08 cusecs.

By observing this situation, Dr. Bhatti advised the sub-engineer and IIMI-field team to raise the sill level one-half inch more after closing the canal next day.

After finishing work, Dr. Bhatti told the FO, president and other farmers from Village Karima that if it is needed, more adjustment will be made in the next tour. With this Dr. Cheema and Dr. Bhatti giving some instructions about work, said goodbye to farmers and IIMI-field team.

G. MEETING AT VILLAGE DHOK BALOUCH

Time: 4:00 p.m. Date : 16-4-98 Venue: Boys Primary School

Agenda:

- Warabandi
- Desiltation of LBC and Watercourses
- Construction of lined watercourses

Background:

As farmers were accustomed to use water with full liberty and choice, after equitable distribution of water, they were feeling as if their supply had been reduced by favoring the farmers on the right channel. Another source of inconvenience was that there came a break in the water flow due to rain in the area. Further, when Small Dams officials started the water supply in a little quantity on request from one or two farmers, these farmers blocked the left channel in order to divert the supply into their outlets. At this, farmers served by the left channel became annoyed that water is running in the canal, but not approaching their fields. This created great unrest among the farmers on the left channel.

Proceedings:

The meeting started with very hot, hard talk. During this session, farmers raised the following points.

1. Why the bifurcation issue is repeated again and again?
2. Why they are not getting their share of supply while the canal is running?.
3. Distribution has been done unjustly.
4. Small Dams officials and IIMI are favoring the Khatars.

5. Secretary General FO suggested that a warabandi allowing 76 hours to farmers on the left channel and 84 hours to farmers on the right channel should be implemented, or the supply of water in the main channel should be increased.
6. Some farmers even intended to contact the DC, Local Politicians to tell about the issue.

After hearing their hue and cry, the field team told them to come to the bifurcation with some hydraulic expert and measure the flow and then to make noise.

They were briefed that repair of the canal is due after a few days and, moreover, their watercourses need lining. Resultantly, the supply will definitely increase. Moreover, after desiltation and repair of the left channel, their amount of water will certainly fulfill their requirements. They were told to clean their watercourses and get their watercourses lined.

H. MEETING WITH FARMERS AT VILLAGE KARIMA

Date: 17-4-98 Time: 2:25 p.m., after Jumma Prayers
Venue: Central Mosque Village Karima

Agenda:

1. Contributions from the farmers to open a joint account of the Farmers Organization.
2. To decide about the meeting with the farmers of Village Amir Khan to make a consensus warabandi between the two villages.
3. To inform the farmers about the repair work at the main canal and closure of the canal for one month.
4. To decide about the watercourses to be lined by the On Farm Water Management Directorate.

Minutes of the meeting:

This meeting was organized by the FO. The venue of the meeting was the central mosque of the village. Farmers were asked to sit in the mosque after their Jumma prayers.

Before the start of the Jumma prayer, Qureshi Noor-ul-Haq informed the farmers about the arrival of the IIMI field team and requested the farmers to stay in the mosque after their prayers. He also briefed the farmers about the agenda of the meeting.

After Jumma prayers, the farmers gathered in the main hall and the meeting was started. The points discussed in the meeting are described below.

Qureshi Noor-ul-Haq: He again informed the farmers about the purpose of the meeting.

Shabir Ahmad (IIMI): He briefed the farmers about the closure of the canal for repair works. Farmers want to make a warabandi with Amir Khan Village. For this purpose, they decided the date to have a meeting with the farmers of Village Amir Khan.

Qureshi Noor-ul-Haq: We will decide the time with Amir Khan Village. The outlets at the start of the minor have large diameter and they suck more water from the canal. The moghas with large diameter should be repaired and all of the moghas will be made of equal size.

Shabir (IIMI): You must request the Small Dam officials for this purpose.

We will install a frame in the mouth of the pipe at the bifurcation structure to stop the farmers from blocking pipe by putting stones in it. The manholes will be covered with lids to prevent the farmers from throwing stones in the manholes.

Annex B

Qureshi Noor-ul-Haq: The size of the outlets should be made according to the official record i.e. 4" and 6".

Shabir (IIMI): First decide the date and time of the meeting to make a warabandi with Amir Khan.

Qureshi Noor-ul-Haq: After consultation with the farmers, he said that we will come on Tuesday at 4:00 p.m. in the primary school Village Amir Khan.

Ikhlaq Khan: From there we will also go on the canal to see the situation.

Shabir (IIMI): As you already know, we had a meeting with water management officials and they are ready to line the watercourses. You have to pay the 30% cost and the rest will be borne by the Govt. The farmers will also do the labor work at the site.

Qureshi Noor-ul-Haq: We will inform all of the farmers about this program and we will convince the farmers to avail this opportunity.

Shabir Ahmad (IIMI): You must call a meeting by yourselves. You have two FO members, Ikhlaq Khan and Hukam Daad, to guide you and they know about the procedure to have a watercourse lined from OFWM. It is very simple: (1) First make a person responsible to do the procedure; (2) Contribute to bear the charges of doing the procedure; (3) Give the authority to a person to do the procedure.

It is very essential for a farmer to be owner of that land which will be irrigated by the respective watercourse.

Try to complete the documents as early as possible.

For this purpose, we will request the Patwari to help the farmers.

Ikhlaq Khan: Mr. Banaras Khan (a local farmer) wants to line his watercourse and there are also other shareholders on this watercourse. There is another watercourse, which has two branches and most of this watercourse is unlined.

Mr. Azad: Almost 50% of the water goes to waste in the unlined watercourses, resulting in more need of water to irrigate the fields.

Shabir (IIMI): The second thing on today's agenda is to make contributions to open a joint account of the FO and it is a prerequisite for the registration of the FO.

Qureshi Noor-ul-Haq: We are ready to contribute and farmers from other villages should also do that.

Shabir (IIMI): The FO and IIMI people will try to convince them.

Qureshi Noor-ul-Haq: What is the minimum limit to open the account?
Shabir (IIMI): The accounts are meant to show that the FO is functional. It has enough funds to carry out the minor works. It has records for some time. It is meant to show the fitness and strength of the FO.

Qureshi Noor-ul-Haq: First of all we will want to see the area of the respective villages to make decisions.

Shabir (IIMI): We have records of the four villages and we will provide you the details of the ownerships.

Qureshi Noor-ul-Haq: He requested the field team to train the farmers about how to measure the flow of water.

Shabir (IIMI): He demonstrated on the paper that how the farmers can measure the flow of water. Later, they were informed that the IIMI field team will train the farmers by demonstration at a watercourse.

I. MEETING WITH FARMERS AT VILLAGE AMIR KHAN

Time: 4:00 p.m. Date : 21-4-98 Venue: Boys Primary School, Village Amir Khan

Participants

1. President (FO)
2. Vice President (FO)
3. Qureshi Noor-ul-Haq (Karima)
4. Mr. Safdar (Amir Khan)
5. and other farmers from villages Karima and Amir Khan.

Agenda:

To discuss and prepare a consensus warabandi between villages Amir Khan and Karima.

Proceedings of the meeting:

First of all, Qureshi Noor-ul-Haq briefed the participants about the philosophy of the project and then the agenda of the meeting. After that, he invited the other participants to express their views about the warabandi between the farmers of villages Amir Khan and Karima, so that the available supply can be used efficiently. Other participants shared their experiences as described below:

Azam Khan (Vice President FO): Farmers of Amir Khan and Karima should avail the supply on alternate days.

Ikhlaq Khan (President FO): Water turns should be adjusted such that farmers of both the villages should use water continuously for two days.

Azam Khan: As farmers grow vegetables that need irrigation frequently, so it is more feasible that water turn should be fixed on alternate days.

Farmer (Village Amir Khan): What is your opinion? He asked Mr. Safder (SOV from Village Amir Khan).

Mr. Safdar: It is ok to me.

Khalil (farmer Amir Khan): But water should not be blocked (obstructed) along the way.

Akram (IIMI): You (farmers) should mention the defaulters to the FO and the FO should apply appropriate sanctions against them.

Mr. Ayub (School teacher): As the level of the outlets don't match the water level, that is why farmers are compelled to obstruct the water.

Mr. Safdar: Water will also move into the Karima portion of right channel in the turn of Village Amir Khan. This will reduce the flow and water cannot be diverted into the moghas.

Annex B

Azam Khan: This will make no difference, when there will be full supply, water will ultimately rise to the level of the moghas.

Mr. Safdar: There should be some obstruction in the canal to divert the flow into the moghas.

Akram (IIMI): If a warabandi is implemented in letter and spirit at the watercourse/mogha level, this saves the farmers from many inconveniences and water can be used more efficiently.

Mr. Safdar: He raised the question that who will close/plug the moghas after a turn.

Akram (IIMI): This is very simple. The concerned beneficiary will close his mogha after his turn.

Mr. Safder: The area of Amir Khan that falls on the Karima portion of right channel, from where that will get water?

Azam Khan: That is not being irrigated by canal water as it is situated at a higher level.

Shabir (IIMI): We should not divert from the point for which we are gathered here.

Qureshi Noor-ul-Haq: The first four moghas should be operated on the first day and the other four should receive water on the other alternate day.

Mr. Safdar: All of the farmers on eight moghas want to irrigate their fields simultaneously and this will create unrest among the farmers.

Qureshi Noor-ul-Haq: In this respect, the village committee should sit together and solve this problem effectively. Another important point that needs to be noted is that Village Karima is situated far from the main channel. And it takes four hours for water to reach the tail, whereas Village Amir Khan is very close to the main channel.

Azam Khan: We are not responsible for that. This is not our sin.

Qureshi Noor-ul-Haq: We are all wise persons. We should deal with it technically.

Azam Khan: Let us allocate the last day's supply to the farmers of Village Karima. Then Mr. Safdar, and farmers proposed the water turns for Amir Khan and Karima as listed below:-

Day of week	Turn of Village
1. Sunday	Amir Khan
2. Monday	Karima
3. Tuesday	Amir Khan
4. Wednesday	Karima
5. Thursday	Amir Khan
6. Friday	Karima
7. Saturday	Karima

All of the participants approved this warabandi with consensus and signed an agreement prepared by the IIMI field team leader, later on.

Shabir (IIMI): This is a temporary warabandi. This can be adjusted later on according to the situation.

Mr. Safdar: We want to implement a packa warabandi.

Qureshi Noor-ul-Haq: Let it work. When Dr. Cheema and Dr. Bhatti will come then it will be reconsidered. Dr. Bhatti has promised to separate the share of both the villages.

Mr. Safdar: If both the villages will get a separate supply, then there will be a shortage of water.

Qureshi Noor-ul-Haq: This problem can be solved by implementing a warabandi at the mogha level.

Mr. Safdar: Without defining water turns, water will never reach the tail-enders.

Akram (IIMI): This will be carried out later. Let us try to practice the warabandi on alternate days.

Shabir (IIMI): This problem will not be solved within one or two days. Refinement will come slowly and slowly through experience. We will sit with the patwari, Small Dams Organization again and water turns will be fixed.

Akram (IIMI): By practicing warabandi at the mogha level, more area can be brought under irrigation and water can be managed and used more efficiently and effectively.

Mr. Safdar: Warabandi should be implemented on the moghas, which off-take from the main channel.

Qureshi Noor-ul-Haq: This will be done. This is our responsibility.

Shabir (IIMI): As the repair of the canal is due, so the main channel will be closed for 10 to 12 days. We will inform you accordingly.

Khaleel (Farmer): We have planted seedlings of vegetables. The canal should be opened for four days and then closed.

Shabir (IIMI): You should bear little loss if you had to do so. We have tried very hard to get the funds for repair.

Mr. Safdar: We will request Mr. Khizar Khan (Maintenance Incharge Small Dams Organization) to release water in intervals during the repair work.

Khizar Khan. I will try to open the supply after repairing the first reach of canal.

Azam Khan: Farmers of Karima need no water at this stage, as they have not planted vegetables.

Ikhlaq Khan: If water is given to farmers of Village Karima for the next fifteen days, farmers can plant seedlings easily.

Mr. Safdar: As farmers have grown chilies, so the canal should remain open for a few days.

Khizar Khan: This is not possible, as the canal bed does not get dry within a day or two. We should tolerate some loss and get this canal repaired. I have also planted chili seedlings.

Shabir (IIMI): The material will be used in the ratio of 1:4, so you should visit the canal and check the repair work daily.

Azam Khan: We are bound to do so. However, we can spend one or two hours daily to monitor the repair work.

Shabir (IIMI): If you cannot sit there, then who will watch the repair work.
Mr. Safdar: Turns should be defined to monitor the work.

Shabir (IIMI): Let us fix your duty first of all.

Mr. Safdar: OK

Farmer: Material was also used in the ratio of 1:4 previously.

Qureshi Noor-ul-Haq: Not at all. That was just verbally.

Farmers: The farmers of the Dhok Balouch and Shahpur villages should also come to monitor the repair work.

Akram (IIMI): They have already been informed. They have promised to come.

Ikhlaq Khan: This is just because of IIMI-Pakistan staff that we are sitting here at one platform and these productive activities are going on. Otherwise we had forgotten the dam.

Mr. Safdar: One farmer wants to lift water and construct a lined watercourse.

Akram (IIMI): Complete the documents and come to our office. We will help you in this regard.

Mr. Safdar: We have already submitted the documents to SDO.

Qureshi Noor-ul-Haq: You should contact the FO and then proceed further in this respect.

Shabir (IIMI): How can the decision taken today be conveyed to other farmers?

Mr. Safdar: Through announcement on loudspeaker of village mosque.

Shabir (IIMI): This can also be conveyed through distributing letters containing this warabandi decision.

Meeting reached an end with a prayer for success by Headmaster Qureshi Noor-ul-Haq.

J. Meeting at Village Dhok Balouch:

Time: 5 p.m. Actual Start: 6.30 p.m. Date: 25-6-98

Venue:Boys primary school, Dhok Balouch.

Agenda of the meeting: To discuss the shortage of water.

Background:

After the solution of the water distribution issue at the bifurcation structure below Shahpur Dam main channel, farmers of Village Dhok Balouch on LBC were having ill-feeling as if their water share has been decreased. Moreover, with the continuation of repair work, the supply of water in the channel remained less. So, farmers of Dhok Balouch became annoyed due to water not coming in the Left Branch. Resultantly, they started thinking about not using the dam supply.

Proceedings:

In the start of the meeting, all of the farmers started shouting that water is not according to their needs, so they have decided to quit.

Even one of the farmers said that Govt. Officials have taken a bribe from the farmers of Amir Khan and Karima villages and diverted the water towards the right channel. Similarly, some farmers criticized the construction of the weir, which is supplying water according to the command area.

Dr. Bhatti asked the farmers to talk one by one. At this, all of the farmers asked Mr. Akram (FO Secretary General) to talk.

Akram (Secretary General, FO): The supply in LBC is very little so all of the farmers have decided not to use water. When the wheat harvesting was there, farmers of villages Shahpur and Amir Khan received water, but we did not receive a drop of water. Our vegetables have been destroyed due to a shortage of water.

Dr. Cheema: We have chalked out a warabandi schedule. By using the water according to that schedule, your land requirements will be surely fulfilled.

Dr. Bhatti: The distribution of water at each distribution point is according to your command area and its share. Moreover, this has been done by taking you people into confidence.

Mr. Akram and other farmers: This amount of water is not acceptable to us. So we are ready to write down that our supply should be sealed permanently.

Dr. Bhatti: Okay, give us in black and white, what you are saying. We will seal your supply.

Mahmood Khan (SOV): This is not the true story. A majority of the farmers want to use water. The farmers, who do not want to use water, please give their signatures and go away. Let others use water.

Haji Karam Daad: He told the farmers that water is a great blessing of God. Don't be foolish. Think about it seriously and talk sensibly.

M. Akram (IIMI): LBC has been damaged at many points. A lot of water is being lost along the way. The supply has increased after the repair work. Farmers have picture of the supply before the repair work. So, it is better to walk along the LBC to the distribution point in order to clear the picture in the minds of farmers.

So it was decided to conduct a walkthrough of LBC.

Walk-through at LBC

Dr. Cheema, Dr. Bhatti, IIMI-field team, Sub-divisional Officer, Sub-Engineer, Small Dams, accompanied by 30 farmers, conducted a walk-through of LBC and the following facts became known.

1. A lot of water is being lost through leakage.
2. The watercourses and LBC is filled up with silt and debris, etc.
3. LBC has been broken at some points.
4. The physical status of LBC was found very poor.
5. The supply in LBC has been blocked at some points by the farmers of Shahpur Village.

Dr. Bhatti's address to farmers at Bifurcation:

First of all, Dr. Bhatti said sorry for the losses due to crop damage because of canal closure during the repair work. Dr. Bhatti said that there was a problem of funds available. Funds were sanctioned by the government in the last week of April, so in order to carry on repairs, the supply had to be cut. Now, as you have seen, water is enough in LBC. Please clean your watercourses and use the water according to the warabandi schedule. The bifurcation issue has been solved with your cooperation.

This is not the way that you sit in your houses and say we do not need water. Please come forward, claim your share and let others to enjoy their share.

Annex B

Sitting at Dhok Balouch:

After conducting the walk through, when the gathering reached the venue, farmers again backed out, who looked confident at the bifurcation.

At this stage, Dr. Bhatti told the farmers to come forward for repair and desiltation of watercourses and LBC. We will try to manage funds. You people prepare yourself for labor work. Then, you people will act upon a warabandi and tell us about your problems. Farmers agreed to do labor work for desiltation and repair work at LBC.

Dr. Cheema: Sub-divisional Officer is present here. He will take severe action against the violators of warabandi if reported by FO.

Sub-divisional Officer (Small Dams Organization): We are ready to cooperate with you. I will extend full cooperation if you approach me. Irrigate your fields with water and try to implement the warabandi.

K. FARMERS MEETING AT DHOK BALOUCH VILLAGE, SHAHPUR DAM

Date: 24-7-98 Time: Juma Prayers Venue: Mosque, Village Dhok Balouch

Participants:

Dr. Muhammad Asghar Cheema
Dr. Muhammad Akhtar Bhatti
Muhammad Akram
Shabir Ahmad
Waheed Ahmad
Muhammad Nazir
Farmers

Background:

This meeting was organized to motivate the farmers for desiltation and repair of the Left Minor. This minor supplies water to Dhok Balouch Village. Previously, the farmers showed their willingness to do all of the labor work at the canal to save money, which was arranged by IIMI to repair the Left Minor.

Minutes of the meeting

The meeting was started with a general discussion. The main points are listed below.

Malik Bashir Ahmad (Member FO): I am fully satisfied with the current situation.

Farmers: Our demands were not fulfilled in the past. All of the lands are without water. You had not fulfilled our demands, which were noted by your staff in the past two years.

Dr. Bhatti: He introduced IIMI by saying that IIMI is a non-government organization.
It is a welfare institute. IIMI has no powers to do the works instantly.

Haji Karam Daad. Forget the views of the farmers and do what you want.

Dr. Bhatti. He continued his speech to clear the doubts of the farmers. IIMI is a non-government welfare research organization. It has its offices all over Pakistan. It has its head office in Lahore. We

do our works with the collaboration of different departments. We guide the farmers in problem solving. These are all welfare works.

We do not want anything from the farmers. These guys are visiting you from the last two years and the purpose is to organize you so that you can solve your problems by yourselves.

Farmers. They said we would give you the water for irrigation.

Ghulam Farid. Tell us clearly what is your main purpose of staying here for the last two years.

There is a rumor in the village that they are demanding Rs. 3 lakhs, then they will provide the water to the farmers.

Dr. Bhatti. I do not mind the allegations against us. I have cleared the entire situation to you. By doing these efforts of social organization we will succeed in providing the water to every farmer in the command area. This is our motto and our purpose to visit you. We will arrange your meetings with On Farm Water Management officials for the lining of watercourses. They explained the procedures and estimates. We have no concern over your benefits. We are here to save you. No one can do fraud with you in our presence.

Farmers. You said earlier that you would give 3-4 minutes of water per kanal. How it is possible to irrigate one kanal of land in 3 or 4 minutes.

Dr. Bahatti. It is around 3 cusecs of water in the left channel. You are getting your share of water. It has been diverted from the bifurcation structure, which is coming in your canal. Now the question is how to distribute this water among the shareholders so that every shareholder can get an equal share of water. You must spare some time for the repair work at the canal. Cooperate with us and I assure you that you will benefit from it. Please come early in the morning at the bifurcation structure to desilt the canal.

Yaqoob Khan. All what you are saying is right. I divided the water in the past and we had warabandi among us. When you placed the concrete in the bifurcation, then the water shortage occurred. If after the repair the water shortage remained the same, then you must breakdown the structure to the previous position.

Dr. Cheema. I will break that structure if water does not come after the repair.

Haji Ashraf (Farmer). If water comes in sufficient amount, then all of the farmers will be happy.

Yaqoob Khan (Farmer). We will do the work at the canal. It is for our benefit. We will assign the duties to the farmers.

Dr. Cheema: All of the farmers should come to the bifurcation at 6:00 a.m. Farmers agreed with the time and assured that they will be at the bifurcation at the decided time.

Muhammad Shafi (Farmer). I have planted the chilies in my field with a cost of Rs. 2000. Now, the canal will remain closed for so many days due to repair work. What will happen if the water does not come within two or three days and who will bear that loss?

Dr. Bhatti. All of the farmers have problems. All of the farmers need water, but now the question is at what time we can do this. Every time there will be some farmers who will say that they are in need of water. If we listen to all of the farmers then, it is impossible to close the canal for desiltation and repair.

We will try to provide the water during the repair work. We will try to adjust the time and we will stop the repair work after two or three days and you will be given the time to irrigate your fields. You can do it during the nighttime and in the morning we will close the canal.

Haji Karam Daad. We have allotted the duties to the farmers and they have agreed to come in the morning.

Dr. Cheema briefed about the repair as: First of all, we will clean the canal by removing silt and debris. Then we will repair the damaged parts of the canal.

Dr. Bhatti. We will make arrangements to dispose of rainwater and we will place a structure in the canal that can be opened when excess water/rainwater will come in the canal. We have arranged cement and other materials for you. We will do the repair work on a self-help basis by doing the labor work at the canal. Now again, I remind you that we will be there at 6:00 a.m. Dr. Bhatti requested Haji Karam Daad, the village elder, to come on the canal to supervise the work.

L. FARMERS MEETING AT VILLAGE DHOK BALOUCH TO DISCUSS THE REPAIR AND EXTENSION OF THE WATERCOURSES

Date: 23-10-98 Time : 4:00 PM Venue :Dera Haji Karam Daad

PARTICIPANTS

Dr. Asghar Cheema, Muhammad Akram, Shabir Ahmad, Waheed Ahmad

Farmers	
Haji Karam Daad	SOV
Haji Ashraf	SOV
Kala Khan	Farmer
Mahmood Khan	SOV
Sardar Khan	
Muhammad Bashir	Member FO
Muhammad Rafiq	SOV
Hamayat Ali	Farmer
Arif Khan	Farmer
Mahboob	SOV
Malik Sarfraz	Farmer
Haji Dilawar	Farmer
Raja Iqbal	Farmer
Sajid Ali	Farmer
Rehmat Ali	Farmer
Ahmad Khan	Farmer
Muhammad Shafi	Farmer

Proceedings

Review of Repair Work

First of all, Dr. Cheema inquired from the farmers about the quality of repair work on LBC and watercourses and its impact on the supply of irrigation water. All of the farmers admitted that the repair work accomplished is of high quality and the water reaching their fields is enough.

The other things discussed in this meeting are described below.

Extension of Watercourse 6-R

According to the farmers, there are two ways to extend the watercourse:
1) from the center of the village; or
2) from the north of the village.

Dr. Cheema told the farmers that the watercourse can be extended through underground pipes and then onward an open channel can be constructed. But, the farmers would have to share the cost according to the rules of the OFWM.

Mr. Mahmood Khan, we all are ready to cooperate with you in this regard. Your cooperation in this matter will be highly appreciated.

Mr. Mahboob. He raised the question that what will be the solution if someone will not contribute in the above said work.

Dr. Cheema. First of all, try to convince that person; otherwise, don not let him use water unless he has paid his share.

CONCLUSION

It was decided that a design and cost estimate of the watercourse will be carried out by the field team with the collaboration of the Sub engineer of Small Dams Organization and OFWM.

Farmers will participate in the survey and then construction work will be started on a participatory basis.

ANNEX C

WARABANDI SCHEDULE FOR SHAHPUR DAM COMMAND AREA, MAIN CHANNEL

Watercourse No. 2-L (Village Shahpur)

S.No.	Shareholders	Area (Kanals)	Time (Minutes)
1.	Mahmood Khan etc.	14-15	0-25
2.	Sardar s/o Shahya	48-9	0-82
3.	Mahboob Jan s/o Jalal	00-07	36sec
4.	Amanat Khan s/o Fazal	70-9	1-59
5.	Ashiq and Cinghar etc.	24-9	0-42
	Total area =	158-9	

Watercourse No. 3-L (Village Shahpur)

1.	Allah Daad s/o Nawab	194-19	5-31
2.	Manzoor Elahi s/o Gohar	85-5	2-25
3.	Muhammad Ajmal, Ali Sadiq etc.	85-5	2-25
4.	Mahmood Khan s/o Hayat Khan	101-15	2-53
5.	Mrs. Bhagh Sultan etc d/o Akbar	41-9	1-10
6.	Ghulab s/o Nawab	32-12	0-55
7.	Inayat Ali Khan s/o M. Akbar Khan	65-13	1-52
8.	Muhammad Ali Khan s/o Akbar Khan	25-18	0-44
9.	Rahim Daad etc. S/o Sikander Khan	53-4	1-30
10.	Mrs. Taj etc Widow of Nawab Khan	5-11	0-9
11.	Riasat Khan s/o Nadir Khan	16-17	0-28
12.	Fatta etc s/o Mulkh	8-18	0-15
13.	Dullah etc s/o Mulkh	3-12	0-6
14.	Dilawar s/o Mulkh	3-12	0-6
15.	Mrs. Ghulab Jan	176-1	4-59
	Total Area =	899-12	

WARABANDI SCHEDULE FOR SHAHPUR DAM COMMAND AREA RIGHT CHANNEL

(Village Amir Khan)

Watercourse No. 1-L

S. No.	Shareholders	Area	Time
1.	Feroz Din (Temporary Allottee) C/O Sardar s/o Sooba	3-12	0-6
2.	Sooba s/o Ghulam Muhammad	11-7	0-20
3.	Iqbal s/o Allah Bukhsh	8-6	0-14
4.	Siraj s/o Lal	5-2	0-9
5.	Sardar s/o Shahya	29-12	0-50
6.	Sadiq s/o Mirza	2-8	0-4
7.	Fatta s/o Noor Ahmad	0-09	46 sec
8.	Nawab s/o Ditta	12-8	0-21
9.	Ashfaq	2-18	0-5
10.	Mr. Fahmida d/o Aziz Khan	2-01	0-3
11.	Ghulab s/o Shahya	18-17	0-32
12.	Gul Sher s/o Noor Muhammad	7-01	0-29
13.	Mohabbat s/o Gul Hussain	10-09	0-18

14. Ghulab Sarwar s/o Shahya	5-11	0-9
15. Muhammad Hussain (Temp. Allottee) c/o Sooba s/o Ghulam Muhammad	2-00	0-3
16. Ali Khan s/o Ahmad Khan	0-09	46 sec
17. Mian Khan s/o Ghulam Muhammad	17-00	0-29
18. Habib Anwar s/o Muhammad Anwar	3-00	0-5
19. Sultan s/o Nasir Din	13-10	0-23
20. Rahmat Bibi etc	11-11	0-20
21. Amir Afzal Khan etc	35-19	1-01
22. Muhammad Arshad Khan	48-06	1-22
23. Mrs. Fazal Jan	5-19	0-10
24. Amanat and Bahadur s/o Fazal	34-17	0-59
25. Khu Dadad Khan etc	69-6	1-58
26. Faza Daad s/o Ahmad Khan and Ali Khan s/o Ahmad Khan	5-8	0-9
27. Nur Muhammad s/o Gul Sher	3-5	0-6
28. Sher Bahadur, Ajmal s/o Cinghar	10-18	0-19
29. Muhammad s/o Noor Muhammad	3-04	0-5
Total Area =	395-13	

Watercourse No. 2-L (Village Amir Khan)

1.	Sadiq s/o Mirza	10-17	0-18
2.	Sardar, Ghulab s/o Shahya	16-09	0-28
3.	Daadoo s/o Dost Muhammad Khaki s/o Ahmad	6-14	0-11
4.	Muhammad Irshad s/o Muzaffer	0-08	41sec
5.	Muhammad Zaman s/o Mir Zaman	22-03	0-38
6.	Elahi Bukhsh s/o Ghulam Muhammad	113-07	3-13
7.	Irshad s/o Muzaffer	1-11	0-3
8.	Dullah s/o Mulkh	0-05	26sec
9.	Sardar, Cinghar s/o Ghulab	0-07	36sec
10.	Faqir Muhammad etc.	25-13	0-44
11.	Nawab s/o Shah Nawaz	1-11	0-3
12.	Feroz Din (Temporary allottee)	16-13	0-28
13.	Sultan Mahmood etc	2-05	0-4
14.	Muhammad Ali Khan etc.	56-08	1-26
15.	Iqbal s/o Allah Bukhsh	3-16	0-6
16.	Khu Daad etc.	8-01	0-14
	Total Area =	286-8	

Watercourse No. 3-R (Village Amir Khan)

1.		9-0	0-15
2.	Amir Afzal Khan etc.	17-05	0-29
3.	Mrs. Nabi Begum etc.	24-03	0-41
4.	Mahboob Khan etc.	29-08	0-50
5.	Imtiaz Begum	53-14	1-31
6.	Mrs. Rifat Jan etc.	16-18	0-28
	Total Area =	150-8	

Watercourse NO. 4-L (Village Amir Khan)

1.	Mrs. Fazlaan etc.	19-15	0-33
2.	Ghulam Farid etc.	99-09	2-49
3.	Iqbal Akhtar etc.	22-08	0-38
4.	Mauli Daad s/o Faqira	3-17	0-6

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Annex C

5.	Nadir etc.	6-14	0-11
6.	Muhammad Aslam s/o M. Amir Khan	146-6	4-08
7.	Sardar s/o Hassoo Khan	56-01	1-35
8.	Fatta etc.	26-05	0-44
9.	Muhammad Sadiq etc.	13-06	0-22
10.	Habib Anwar and Nawaz Khan	7-05	0-12
11.	Mrs. Jeuni etc.	4-10	0-8
12.	Muhammad Ashraf Khan	30-10	0-52
13.	Fazal Daad, Ali Khan s/o Ahmad Khan	5-08	0-9
14.	Miss Zuhra Jan etc.	18-03	0-31
15.	Mrs. Feroz Khanum d/o Nawab	4-18	0-8
16.	Muhammad Hussain etc.	40-12	1-09
17.	Cahanan Bibi etc	0-07	0-1
18.	Nur Muhammad s/o Gul Sher	0-18	0-2
19.	Sooba s/o Ghulam Muhammad	0-05	26sec
20.	Safder Iqbal s/o Godar Khan	4-18	0-8
21.	Cinghar etc.	12-08	0-21
22.	Ibrahim s/o Mahndi Khan	12-08	0-21
23.	Dullah s/o Jaffer	13-00	0-22
24.	Nur Khanum w/o Manzoor Elahi	1-05	0-2
25.	Bukhsh s/o Faqira	7-11	0-13
26.	Amir Alam etc	23-19	0-41
27.	Bhagan w/o Mir Zaman	0-09	0-1
28.	Ghulam Haider etc.	40-18	0-8
29.	Amir Afzal etc.	9-13	0-16
30.	Mrs. Raini Khanum w/o Aziz Khan etc.	1-00	0-2
31.	Amir Nishan etc.	4-10	0-8
32.	Khu Daad Khan etc.	5-10	0-9
33.	Muhammad Zaman etc.	23-09	0-40
34.	Sardar, Mahboob, Nur Elahi	21-00	0-36
35.	Mrs. Fazal Jaan etc.	17-11	0-30
36.	Elahi Bukhsh, Karim Bukhsh s/o Ghulam Haider	3-12	0-6
37.	Jalal Din s/o Ghulam Muhammad	21-06	0-36
38.	Mrs. Shamshad Begum etc.	23-00	0-39
40.	Muhammad Nawaz s/o Nawab	2-01′	0-3
	Total Area =	728-8	

Watercourse No. 5-L (Village Amir Khan)

1.	Muhammad Sultan s/o Taj Mahmood	13-9	0-23
2.	Sultan s/o Nasir Din	22-19	0-39
3.	Nazir Begum etc.	2-12	0-4
4.	Mrs. Roshnai etc.	26-2	0-44
5.	Razzaq, Mushtaq s/o Nawab	0-09	0-1
6.	Muhammad Bukhsh s/o Alya	13-03	0-22
7.	Iqbal Akhtar etc.	24-09	0-42
8.	Maola Bukhsh s/o Muhammad Bukhsh	12-04	0-21
9.	Mauli Daad s/o Faqira	4-17	0-8
10.	Amir Afzal s/o Ali Gohar	17-02	0-29
11.	Faqir s/o Gazan	5-05	0-9
12.	Allah Daad etc.	3-10	0-6
13.	Ali Khan etc.	23-14	0-40
14.	Dullah s/o Jaffer	3-03	0-5
15.	Rahmat Bibi etc.	15-04	0-26
16.	Nabi Begum etc.	24-06	0-41

17.	Mrs. Zuhra Jaan etc.	26-10	0-45
18.	Muhammad Ashraf Khan etc.	37-15	1-04
19.	Mrs. Kher Khanum d/o Nawab	3-15	0-6
20.	Muhammad Aslam Khan etc.	5-07	0-26
21.	Haleem s/o Nadir	18-17	0-32
22.	Muhammad Ali Khan etc.	10-00	0-17
23.	Amanat, Bahadur s/o Fazal	7-05	0-12
24.	Rahim Daad s/o Faqira	40-09	1-09
25.	Samundar etc.	21-11	0-37
26.	Noor Jahan	19-18	0-34
27.	Mir Haider etc.	4-01	0-7
28.	Imtiaz Begum etc.	9-02	0-15
29.	Roshan Din etc	9-19	0-17
30.	Muhammad Akbar s/o Ali Gohar	0-15	0-01
31.	Ghulam Haider etc.	4-08	0-7
32.	Waris s/o Jaffer	1-18	0-3
33.	Jeuni etc.	5-16	0-10
34.	Bhagan w/o Mir Zaman	0-02	10 sec
35.	Sher Afzal etc.	11-07	0-19
36.	Sarwar Khan etc.	0-07	36 sec
37.	Muhammad Din etc.	3-10	0-6
38.	Abdul Jalil etc.	2-10	0-4
39.	Qazi Sher Ahmad s/o Mahboob Ahmad	14-08	0-24
40.	Ali Bahadur etc.	3-03	0-5
41.	Mrs. Hamid Begum etc.	2-05	0-4
42.	Muhammad Hayat s/o Godar Khan	6-11	0-11
43.	Umar Hayat etc.	24-14	0-42
44.	Sultan Mahmood etc	2-11	0-4
45.	Nur Muhammad s/o Faiz Ali	7-09	0-13
	Total Area =	528-09	

Watercourse No. 6-L (Village Amir Khan)

1.	Mrs. Zuhra Jaan etc.	40-02	1-08
2.	Shah Iqbal etc.	9-16	0-17
3.	Ashiq s/o Ghulab	0-12	0-01
4.	Mrs. Feroz Khanum etc	28-04	0-48
5.	Mrs. Bibi Noor etc	35-10	1-00
6.	Manzoor Hussain, Talib Hussain etc	7-00	0-12
7.	Bibi Shah Jeuni etc	14-01	0-24
8.	Iqbal Akhtar etc.	43-03	1-13
9.	Sultan Mahmood Khan etc.	3-00	0-05
10.	Muhammad Ashraf Khan	30-02	0-51
11.	Nur Muhammad s/o Hazir	1-10	0-03
12.	Mrs. Nazir Begum etc.	4-09	0-08
13.	Khaki Jaan s/o Ali Gohar	1-10	0-03
14.	Zulfiqar s/o Bahadur, Rahim Daad s/o Faqira	18-0	0-31
15.	Rahim Daad s/o Faqira	10-00	0-17
16.	Dullah s/o Mulkh	36-09	1-01
	Total Area =	283-08	

Watercourse No. 7-L (Village Amir Khan)

1.	Mrs. Feroz Khanum	28-04	0-48
2.	Amir Afzal Khan etc.	9-16	0-17

Annex C

3.	Ashiq s/o Ghulab	39-14	1-07
4.	Shah Iqbal s/o Fazal Iqbal	4-17	0-08
5.	Roshan Din etc.	3-02	0-05
6.	Mrs. Jeuni etc.	2-06	0-04
7.	Faqir s/o Hazir	40-07	1-08
8.	Nawaz s/o Faqira	0-14	0-01
9.	Feroz Din s/o Faqira	39-17	1-07
10.	M. Zaman, Nasir-ud-Din s/o Faira	4-0	0-07
11.	Sultan Ali etc.	4-12	0-08
12.	Muhammad Ashraf Khan etc.	26-10	0-45
13.	Hayat Muhammad	3-0	0-05
14.	Nur Muhammad (Temporary Allottee)	30-09	0-52
15.	Jalal Din etc.	4-09	0-08
16.	Chirag Din (Temporary Allottee)	38-05	1-05
17.	Banaras s/o Faqira	3-19	0-07
18.	Mrs. Nazir Begum etc.	41-02	1-10
19.	Maula Bukhsh (Temporary Allottee)	10-06	0-18
20.	Nazir, Nawab s/o Nadir	2-00	0-03
21.	Sajjad Shah s/o Sadiq Shah	23-08	0-40
22.	Siffat Shah s/o Nawab Shah	41-12	1-11
23.	Nawab s/o Ditta	2-15	0-05
24.	Rafiat Bibi etc.	2-01	0-03
25.	Mrs. Bibi Noor etc.	20-10	0-35
26.	Jalal Din etc.	4-09	0-08
27.	Ghulam Abbas etc.	3-18	0-07
28.	Muhammad Hussain s/o Raj Muhammad	2-02	0-04
29.	Faqir Muhammad etc.	2-08	0-04
30.	Safder Shah s/o Gulab Shah	39-03	1-06
31.	Shah Manzoor Hussain s/o Talib Hussain	4-11	0-05
32.	Sher Afzal etc.	6-00	0-10
33.	Nadir etc.	5-00	0-09
34.	Muhammad Hussain s/o Khushi Muhammad	7-00	0-10
35.	Chanan Bibi etc.	40-13	1-09
36.	Ghulab s/o Dost Muhammad	2-10	0-04
37.	Ghulam Farid Khan etc.	1-07	0-02
	Total Area =	447-00	

Watercourse No. 7-L (Village Karima)

1.	Amir-un-Nissa etc. (Qureshi Nur-ul-Haq)	23-03	0-39
2.	Raqaya Begum etc.	51-10	1-28
	Total Area =	74-13	

Watercourse No. 8-L (Village Karima)

1.	Jahan Daad etc.	27-04	0-46
2.	Muhammad Hayat etc.	8-07	0-14
3.	Anwar Khan etc.	20-13	0-35
4.	Muhammad Arshad etc.	2-18	0-05
5.	Kanwar Sultan etc.	41-05	0-70
6.	Boostaan etc.	14-11	0-25
7.	Sajjad Nawaz Khan etc.	54-00	1-32
8.	Akbar s/o Shera	20-11	0-35
9.	Ejaz Ahmad etc.	2-09	0-04
10.	Muhammad Ashraf etc.	8-05	0-14
11.	Nawaz Khan etc.	25-10	0-43

12.	Rab Nawaz etc.	5-14	0-10
13.	Khizar Hayat Khan etc.	10-17	0-18
14.	Raja s/o Fateh Muhammad	32-16	0-56
15.	Maqsood Khan etc.	12-00	0-20
16.	Muhammad Bashhir s/o Gulam Qadir	2-0	0-03
17.	Falak Bibi	21-02	0-37
	Total Area =	310-4	

Watercourse No. 9-L (Village Karima)

1.	Yaqoob Khan etc.	27-19	0-48
2.	Manzoor Elahi etc.	9-01	0-15
3.	Muhammad Arshad Khan etc.	3-00	0-05
4.	Jahan Daad etc	5-0	0-09
5.	Hayat Khan etc.	27-09	0-47
6.	Ejaz Ahmad etc.	2-19	0-05
7.	Safder Khan etc.	50-19	1-27
8.	Muddat Khan s/o Sooba Khan	15-17	0-27
	Total Area =	142-4	

Watercourse No. 10-L (Village Karima)

1.	Yusuf Sultan etc.	97-12	2-46
2.	Muhammad Arshad Khan etc.	54-00	1-32
3.	Begum Jaan etc.		
4.	Taj Bibi etc.	8-12	0-15
5.	Khuda Bukhsh etc.	9-14	0-16
6.	Zumurad Khan etc.	8-03	0-14
7.	Muhammad Hayat Khan etc.	41-04	1-10
8.	Manzoor Elahi etc.	17-04	0-29
9.	Jumma Khan s/o Gama Khan etc.	18-03	0-31
10.	Jahan Daad etc.	39-02	1-06
11.	Safder Sultan etc.	19-07	0-33
12.	Amir-un-Nissa etc.	21-16	0-37]
13.	Muddat, Chanan etc.	1-06	0-02
14.	Azam Khan etc.	18-05	0-31
15.	Kanwar Sultan etc.	7-13	0-13
16.	Ghulam Aisha etc.	245-18	6-58
17.	Mrs. Musarat Akhtar Begum etc.	29-00	0-49
18.	Muhammad Amir etc.	51-09	1-27
19.	Niaz Begum etc.	30-03	0-51
20.	Maula Daad s/o Jumma Khan	4-15	0-08
21.	Muddat s/o Sooba Khan	9-16	0-17
22.	Ejaz Ahmad etc.	0-06	31 sec
23.	Raqaya Begum etc.	5-09	0-09
24.	Safder Khan etc.	2-13	0-05
25.	Abdul Hamid Khan etc.	20-09	0-35
26.	Akbar s/o Sardar	10-13	0-18
	Total Area =	772-12	

Watercourse NO. 11-L (Village Karima)

1.	Muhammad Amir etc.	15-06	0-26
2.	Karam Daad s/o Jumma Khan	7-00	0-12
3.	Sumundar etc. Shareholders	8-02	0-14
	Total Area =	30-08	

Annex C

Watercourse NO. 11-L (Village Karima)

1.	Ghulam Aisha etc.	45-02	1-17
2.	Muhammad Amir etc.	44-11	1-16
	Total Area =	89-13	

Watercourse NO. 13-L (Village Karima)

1.	Ghulam Aisha etc.	65-06	1-51
2.	Hairat Akhtar Begum etc.	0-06	31 sec
3.	Muhammad Amir etc.	23-09	0-40
	Total Area =	89-01	

Watercourse NO. 14-L (Village Karima)

1.	Muhammad Hayat etc.	6-00	0-10
2.	Begum Jan etc.	4-01	0-07
3.	Ghulam Aisha etc.	91-06	2-35
4.	Raqaya Begum etc.	2-18	-05
5.	Muhammad Amir etc.	71-01	2-06
6.	Fazal Elahi etc.	19-09	0-33
7.	Aziz Ahmad Khan etc.	0-06	31 sec
7/1.	Amir-un-Nissa etc.	3-05	0-06
8.	Khizar Hayat Khan etc.	1-16	0-03
9.	Jahan Daad etc.	3-01	0-05
10.	Hasan Jan (1/2), Godar etc (1/2)	4-04	0-07
11.	Nur Hussain etc.	1-16	0-03
12.	Feroz Khan etc.	39-18	1-08
13.	Amir Khan etc.	6-12	0-11
14.	Kala Khan etc.	6-07	0-11
15.	Ali Bahadur etc.	17-11	0-30
	Total Area =	279-11	

Watercourse NO. 15-L (Village Karima)

1.	Musurrat Afza Begum etc.	5-01	0-09
2.	Ghulam Aisha etc.	71-11	2-01
3.	Ikhlaq Ahmad Khan etc.	19-12	0-28
4.	Muhammad Amir etc.	26-14	0-45
	Total Area =	122-18	

Left Channel/Minor Watercourse No. 1-L (Village Shahpur)

1.	Mrs. Ghulab Jan (Mahmood Khan etc)	23-0	1-37
2.	Rahim Daad s/o Shahya	20-00	1-24
3.	Sher Ahmad, Bostan, Ghulab s/o Dost Muhammad	3-16	0-16
	Total Area =	46-16	

Watercourse No. 2-L (Village Shahpur)

Mahmood Khan s/o Hayat Khan		9-2	0-38
Watercourse No. 3-R (Village Dhok Balouch)			
1.	Mrs. Chanani Begum	32-8	2-16
2.	Muhammad Afzal, Amir Afzal etc	11-13	0-49

3.	Muhammad Aslam etc.	1-12	0-7
4.	Mrs. Sufaidan Bibi etc.	1-08	0-6
5.	Kala Khan etc.	44-13	3-7
6.	Banaras etc	8-05	0-35
	Total Area =	99-19	

Watercourse No. 4-L and 5-L (Village Dhok Balouch)

1.	Muhammad Akram	58-0	4-04

Watercourse No. 6-L (Village Dhok Balouch)

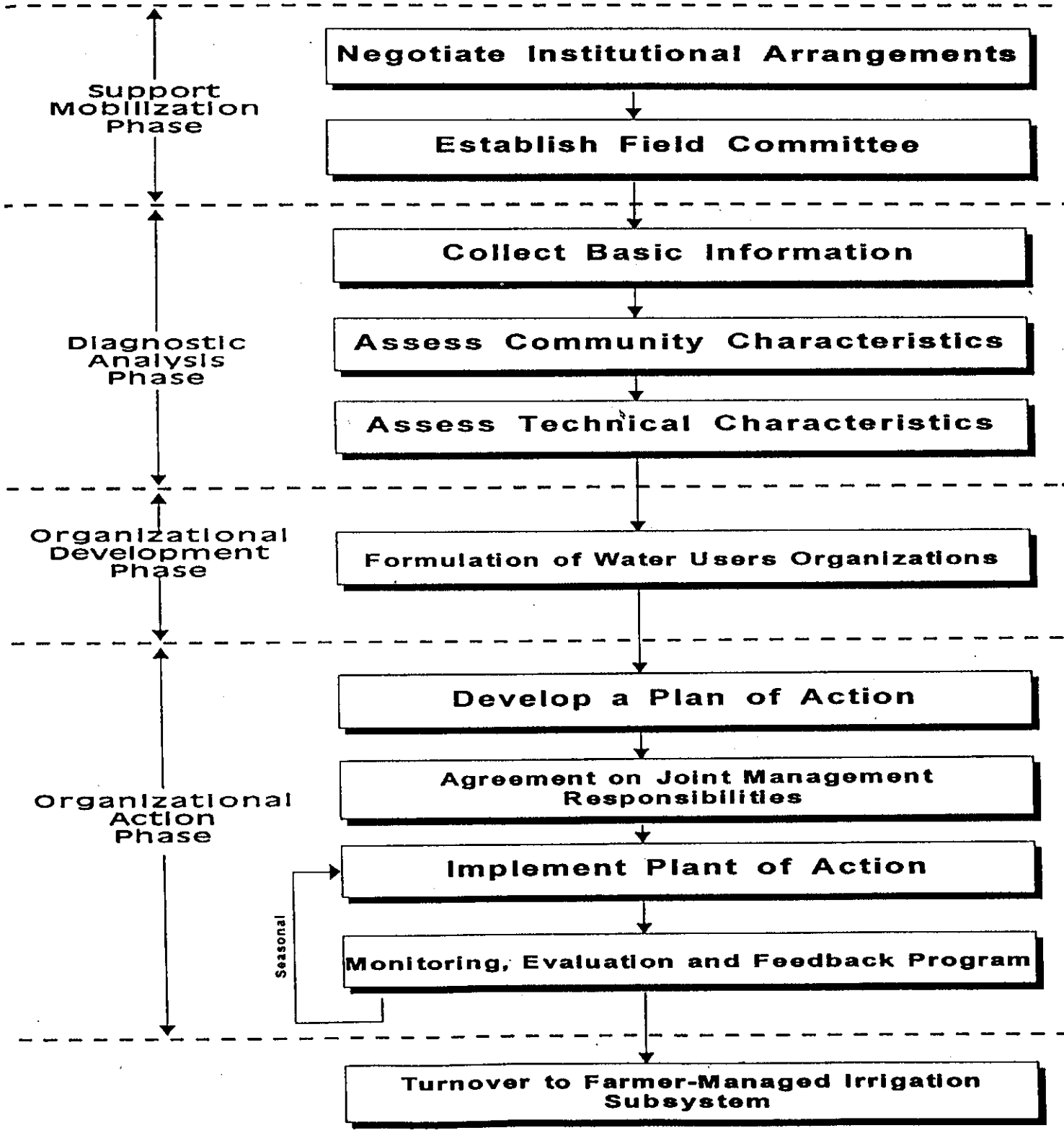
1.	Safder Hayat etc.	45-06	3-10
2.	Mrs. Ghulam Sughran etc.	25-04	1-46
3.	Zulfiqar Ali Shah etc.	152-15	10-41
4.	Mrs. Chanani etc.	420-0	29-24
5.	Mrs. Karam Jan etc.	84-15	5-56
6.	Sardar Afzal Hayat Khan etc.	29-05	2-00
7.	Bashir etc.	184-0	12-53
8.	Muhammad Aslam Khan	42-10	2-58
9.	Mrs. Ghulab Bano etc.	49-2	3-26
10.	Mrs. Kher Khanum etc.	20-16	1-27
11.	Provincial Government	1-10	0-6
	Muhammad Amir s/o Mian Khan (Occupants)		
12.	Karam Daad s/o Nawab Sadullah Khan	24-07	1-42
13.	Sardar etc	32-00	2-15
14.	Muhammad Ashraf s/o Godar	16-11	1-09
15.	Shamlat, Farman etc Shareholders	0-05	0-1
16.	Shah Farman s/o Hussaini Mir Shah	3-05	0-13
17.	Ghulab etc	13-8	0-56
18.	Mian Khan etc.	0-11	0-3
19.	Mrs. Chan Khanoo etc.	5-12	0-24
20.	Mrs. Sufaidan d/o Lal	58-4	4-04
21.	Nawab s/o Lal	18-8	1-17
22.	Banaras s/o Sumundar	38-13	2-42
23.	Bhag Sultan etc.	13-17	0-57
24.	Muhammad Nawaz etc	162-11	11-22
25.	Mir Alam etc.	3-15	0-16
26.	Raja s/o Zikri	12-16	0-53
27.	Sunahran Bibi etc.	113-03	7-55
28.	Amir Afzal s/o Dost Muhammad	13-14	0-57
29.	Mrs. Kaniz Bibi	5-08	0-2
30.	Ghulam Khan etc.	49-15	3-28
31.	Umar Hayat Khan etc.	24-11	1-42
32.	Jaffer etc	1-06	0-6
33.	Habib Anwar etc.	2-18	0-12
34.	Muhammad Siddique s/o Sher Zaman	11-00	0-46
35.	Tasawar Khanum Khan etc.	2-12	0-10
36.	Shamlat, Amir, M. Aslam. M. Afzal	5-17	0-24
37.	Jaffer s/o Bostan etc.	1-11	0-6
38.	Bashiran etc.	16-04	1-20
39.	Bhagh Bhari	10-14	0-45
40.	Bhag Sultan etc.	8-4	0-34
41.	Khan Bahadur etc.	8-12	0-35
42.	Sardar etc.	1-17	0-7
43.	Haq Nawaz etc.	9-14	0-40

Annex C

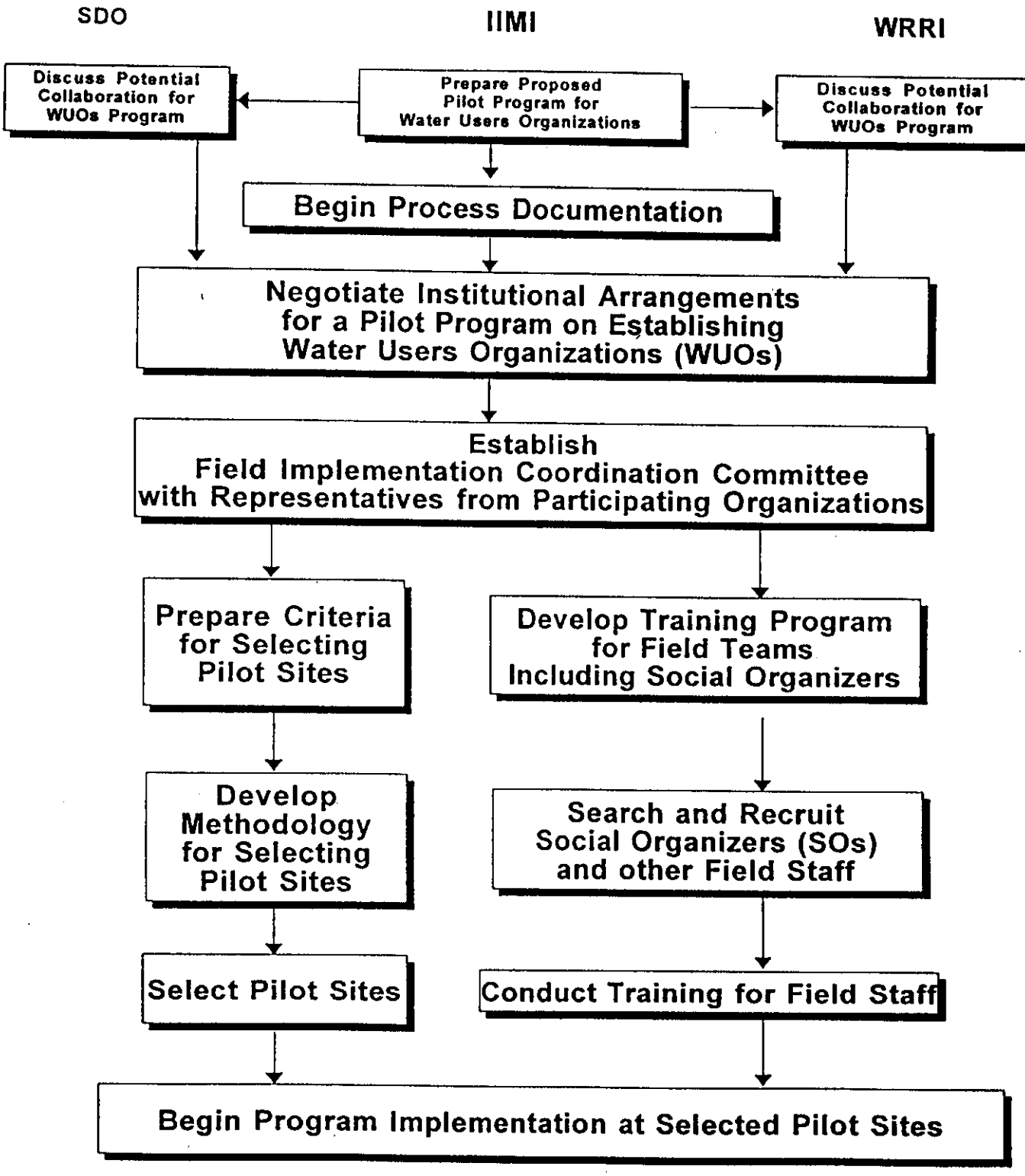
44.	Sher Zaman etc.	3-07	0-14
45.	Gulam Haider etc.	935-10	2-28
46.	Waris, Banaras s/o Sultan	00-07	0-2
47.	Karam Daad s/o Nawab Saadullah Khan	1-13	0-7
48.	Nur Khanum etc.	8-13	0-36
49.	Dilawar s/o Mulkh	30-04	2-06
	Total Area =	1825-08	

Watercourse No. 7-L (Village Dhok Balouch)

1.	Amir Alam etc.	10-00	0-42
2.	Muhammad Nawaz etc.	35-04	2-27
3.	Mrs. Chanani etc.	63-13	4-27
4.	Sher Ahmad Khan etc.	35-16	2-30
5.	Muhammad Aslam etc.	15-07	1-04
6.	Mrs. Ghulab Bano etc.	25-05	1-15
7.	Safaidan etc.	7-12	0-31
8.	Kala Khan etc.	17-06	1-12
9.	Karam Jan etc.	33-13	2-21
10.	Safder Hayat Khan etc.	11-12	0-49
11.	M. Amir Khan s/o Hayat Khan	0-10	0-2
12.	Ghulam Khan s/o Ali Gohar	6-07	0-26
13.	Mrs. Nur Khanum etc.	58-06	4-04
14.	Khan Bahadur etc.	1-19	0-8
15.	Ali Khan s/o Ahmad Khan	31-10	2-12
16.	Muhammad Ashraf s/o Godar	1-19	0-8
	Total Area =	355-19	



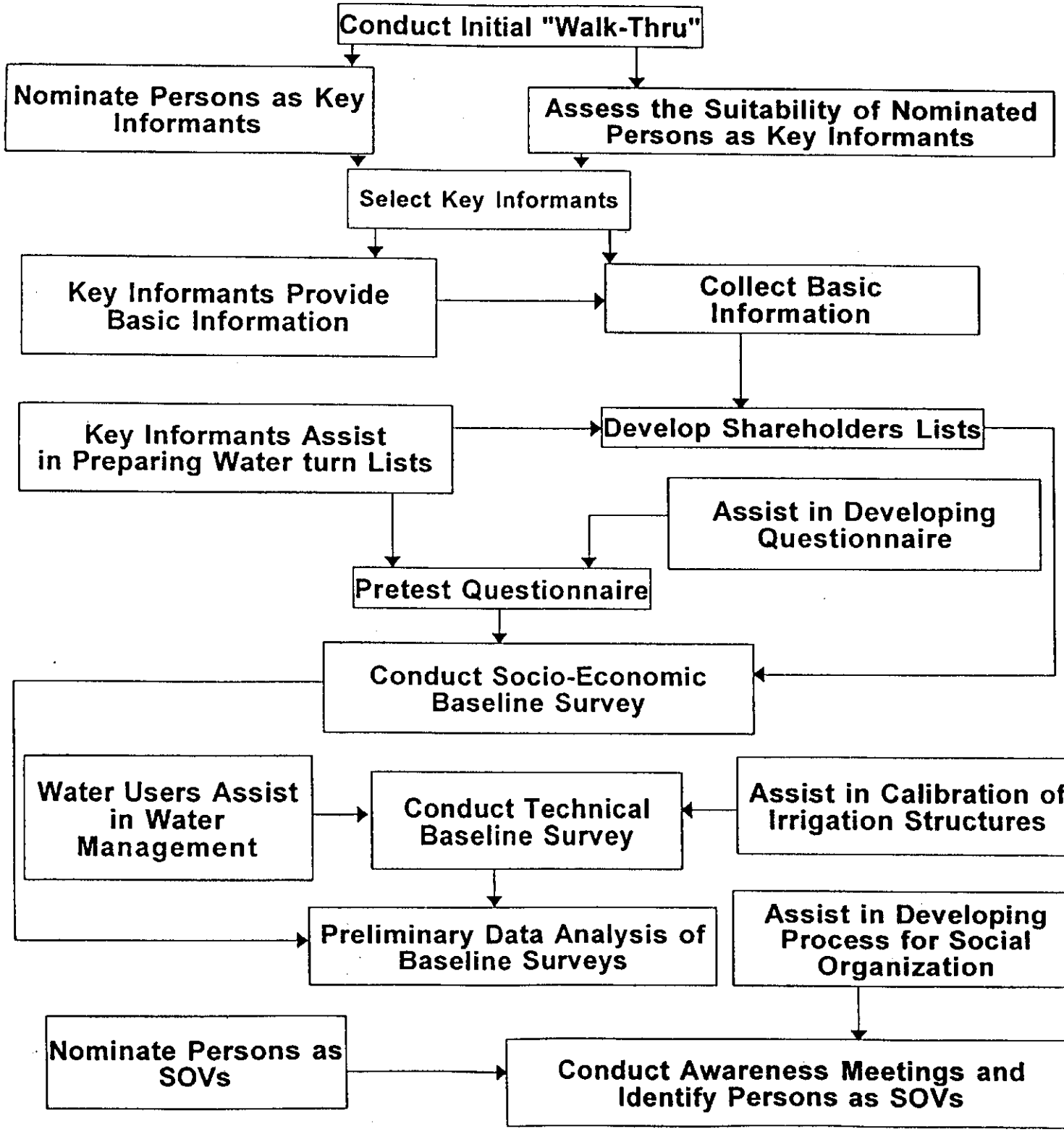
Process for creating sustainable water users organizations in Small Dam Pilot Projects.



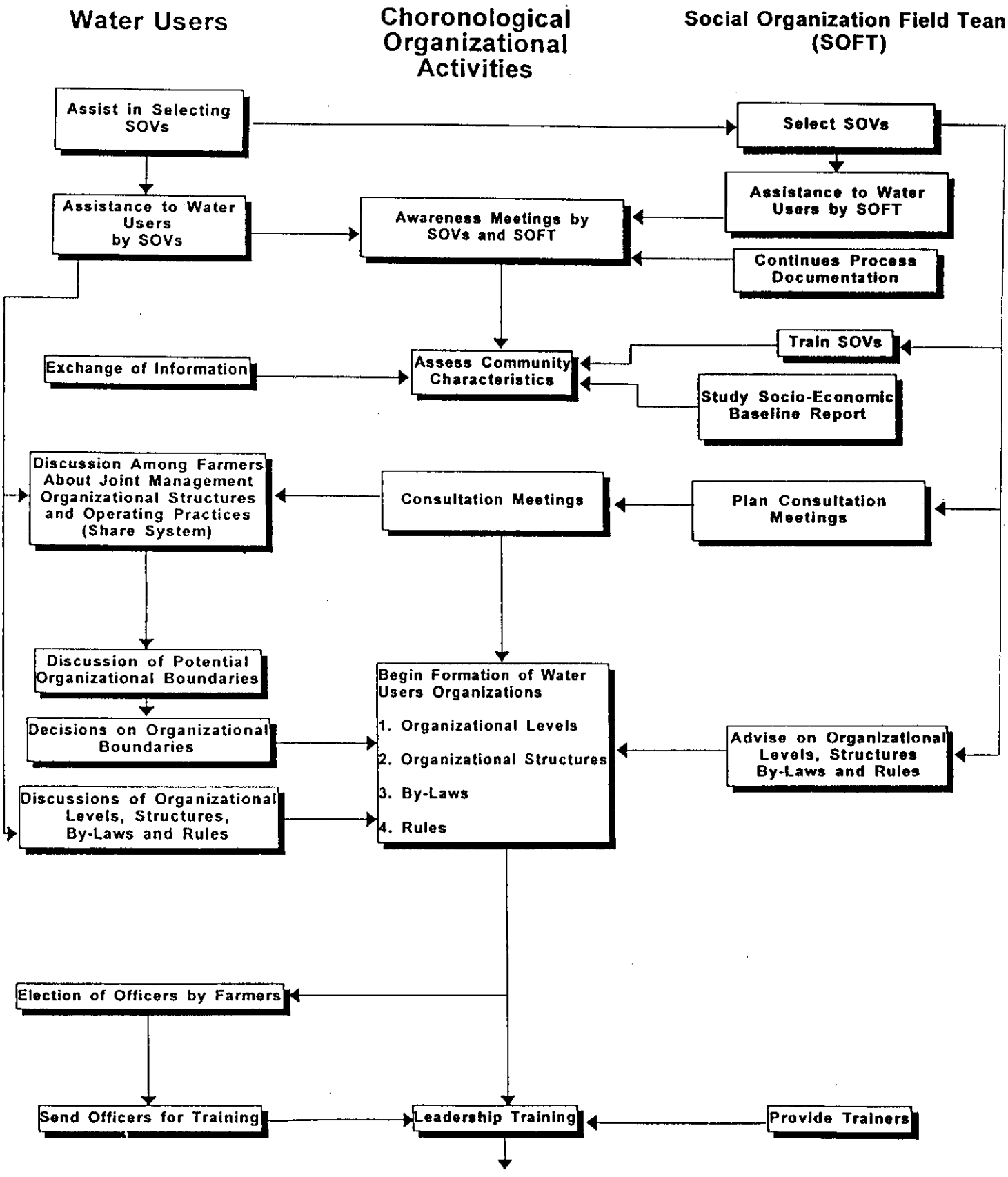
Phase 1: Support Mobilization.

Water Users

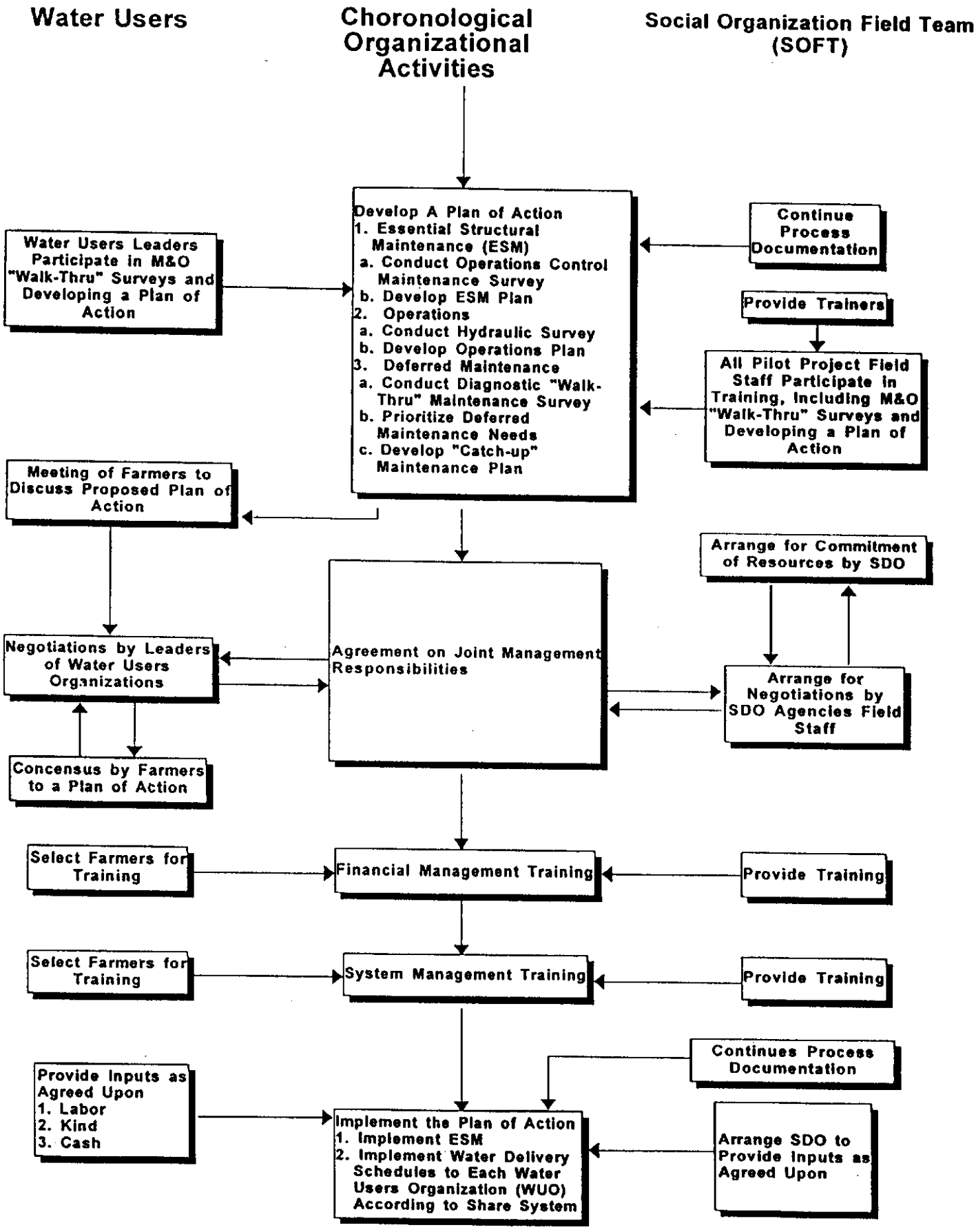
Social Organization Field Team (SOFT)



Phase 2: Diagnostic Analysis.



Phase 3: Organizational Development.



Phase 4: Organizational Action.

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