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ORGANIZATIONAL PROBLEMS AND THEIR CONSEQUENCES
ON IMPROVED WATERCOURSES IN PUNJAB

WATER MANAGEMENT TECHNICAL REPORT NO. 55

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All reported opinions, conclusions or
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ABSTRACT

Based on an intensive survey of ten improved watercourses in Punjab, this study shows the inadequacy of present forms of social organization of watercourses for insuring their adequate maintenance. Using as the major criterion the quality of maintenance of improved watercourses, the study suggests the following sociological characteristics as conducive to good maintenance under present conditions: a large percentage of landholdings in the 6.5 to 25 acre range; relatively equal distribution of power and influence among farmers on the watercourse; a large percentage of farmers being perceived as having some power and influence; relative "progressiveness" as measured by institutional services available in the community, educational level of the farmers, and percentage of farmers who listen to the radio regularly; previous history of cooperation and lack of recent conflict; single-biraderi social structure; and a small number of watercourse shareholders. Based on this research, the study makes concrete recommendations for improving the present On-Farm Water Management Pilot Project (including selection of watercourses), and presents a detailed proposal for setting up experimental Water Users Associations and monitoring their progress.

FOREWORD

The achieving of national output objectives in the agriculture sector of Pakistan's economy continues to depend largely on the supply and use of mechanical, biological, and hydrological based inputs. Such an approach is indeed logical and conforms to the scientific requirements to achieve the planned output objectives in our agriculture. There is also a recognition of the institutional factors that constrain the optimal use of both conventional and new inputs. This very recognition, however, has yet to be translated into a development policy that institutional input itself is an output-increasing factor and it must receive priority and treatment as is the case of approved and recommended agricultural technologies. Unless resources are secured and allocated to develop appropriate institutions to facilitate, on the one hand, the delivery and use of technologies and, on the other, to condition and transform the human agent to impart the requisite level of management - a critical element to reap the potential of the new technologies that are available to our farmers - the achieving of development objectives in agriculture is likely to remain a dream. Among the major constraints that require an institutional input is, of course, the irrigation water. In order to make the best use of whatever water is available it has become most imperative to thoroughly probe into the mechanisms to mitigate water losses resulting from poor management of watercourses all over the country. Watercourse improvement and maintenance requires a collective decision on the part of the farmers who share it. Thus, there is a need to design, develop,

and diffuse an appropriate institutional arrangement at watercourse or village level to overcome the constraints to production resulting from water losses.

This study has explicitly spelled out some crucial sociological variables of conflict and power/influence which along with their combination with caste and biraderi structure, progressiveness of farmers, and an economically viable landholding have significant bearings on the quality of improvement and maintenance of watercourses. It is an imperative need of the time that the concept of water user association is put to practice through promulgation of a new legislature or amendments in the existing laws like Cooperative Law and Societies Registration Act.

I record my high appreciation for the consistent efforts expended by Mr. Ashfaq Hussain Mirza, Principal Investigator, Mr. Douglas Merrey, Social Anthropologist from Colorado State University and all field team members for completion of this report. This is a pioneering and most commendable work in the Sociology of Water Management in Pakistan and is worth publishing at a large scale, both at national and international level.

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FOREWORD

For a number of years, the staff of the Water Management Research Project have been highly concerned with the topic of organizing farmers into Water Users Associations. Prof. George Radosevich was responsible for investigating existing irrigation associations in many countries. The results of these studies were then utilized in making recommendations pertinent to Pakistan.

Based on field experiences in organizing farmers for improving their watercourse, it was recognized that informal committee arrangements were frequently unsatisfactory. Consequently, this particular research effort was considered one of the highest priority activities under the Water Management Research Project.

As a part of our research activities, we have selected some Pakistanis for graduate academic training at Colorado State University; these individuals then return to Pakistan and complete their thesis or dissertation. The senior author of this report, Prof. Ashfaq Mirza, was the first individual graduated under this program, which occurred in 1974.

This report is a very good start towards developing an understanding of how to effectively organize farmers for continuous improvement of their portion of the irrigation system. Hopefully, these research efforts will be continued. Certainly, the effective organization of farmers is the greatest constraint to long-term agricultural productivity in Pakistan.

Gaylord V. Skogerboe
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As mentioned in the Preliminary Report, Dr. David Freeman of Colorado State University, was closely involved in the initial design of the study, and developed the "power and influence" measure used here; and Dr. Sherry Plunkett, formerly of USAID, offered very useful advice.

We also wish to thank our field team members (Research Officers) whose names are given on a separate page, for their hard work under difficult conditions.

Ch. Rafique Hussain, an Advocate in Faisalabad, gave us useful legal advice on the use of the Societies Registration Act (1860) for organizing Water Users Associations; his report appears here as Appendix IV.

Finally, despite all this help, we alone are responsible for the study; the views expressed in this report are not necessarily those of the supporting agencies.

NOTE TO THE READER

Organization of this Report

The first chapter of this study discusses the objectives of this study, its theoretical background, and the hypotheses guiding the research. Chapter two presents basic sociological background data on the ten sample watercourses to give the reader a better understanding of the social context of the findings. This chapter also proposes criteria for predicting the likelihood of success of an improvement project on particular watercourses. It may be skipped by the reader interested only in the major findings of the report.

Chapter three discusses the process of watercourse improvement on the sample watercourses, including conflict and cooperation patterns, functioning of the "watercourse committees", relationships among farmers and OFWM personnel, participation of shareholders in the project; and farmers' perceptions of the effects of improvement. Chapter four focuses on the quality of watercourse maintenance and how this is affected by various sociological characteristics of the watercourse. Chapter five discusses sample farmers' reactions to the idea of establishing Water User Associations.

The final chapter summarizes the findings, discusses their implications, and makes recommendations both for immediate use by the OFWM Project, and for further research in actively organizing experimental water users associations. The busy administrator may wish to focus his attention on this chapter.

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ORGANIZATIONAL PROBLEMS AND THEIR CONSEQUENCES

ON IMPROVED WATERCOURSES IN PUNJAB

Ashfaq Hussain Mirza and Douglas James Merrey¹

Chapter One

INTRODUCTION

Background: The On-Farm Water Management Project

Until very recently most of the research, planning and development work on Pakistan's irrigation system has been concerned with large-scale systemic problems and their technical solutions. As a result, billions of dollars have been invested in link canals, dams, and public tubewells in order to increase irrigation water supplies and reduce waterlogging and salinity. Although there was an awareness of the need to modernize local water management practices (White House-Department of the Interior, 1964) very little research was done to identify the problems and suggest appropriate solutions.

This trend began to change in the early 1970's. Colorado State University researchers, under contract with the United States Agency for International Development, began initiating research on local water management practices, and on the efficiency of farmers' watercourses. This research was carried out in close cooperation with several Pakistani organizations, including the Mona Reclamation Experimental Project and the Master Planning and Review Division, both part of the Pakistan Water and Power Development Authority (WAPDA), and the University of Agriculture, Faisalabad.

¹/Principal Investigator and Assistant Professor of Rural Sociology, University of Agriculture, Faisalabad, and Assistant Professor and Social Anthropologist, Colorado State University Water Management Project in Pakistan.

Among other important findings, these organizations discovered and documented that average watercourse losses are substantially higher than previously estimated (see Clyma, Ali, and Ashraf, 1975; Corey and Clyma, 1975); and they began experimenting with alternative solutions. Based on this early research, low-cost methods of rehabilitating farmer watercourses were developed, including rebuilding of earthen banks to the proper shape and level, and installation of locally-fabricated pakka nakkas and check structures. Using this relatively low cost, seemingly "appropriate" technology (Schumacker, 1973), water losses were substantially reduced on the early demonstration watercourses. Impressed by these results, the Government of Pakistan, with the cooperation of USAID, launched the On-Farm Water Management Pilot Project (OFWM). Operating as separate Directorates within the Provincial Agricultural Departments of Sind, NWFP, and Punjab, this project aims to test and further develop the technology for improved water management by rebuilding 1500 watercourses throughout Pakistan over a period of five years.

Specifically, OFWM works with farmers to improve their water management by:

1. organizing farmers to rehabilitate and maintain their joint watercourses;
2. aiding farmers in precision leveling of their fields; and
3. encouraging farmers to adopt better irrigation and cultivation practices.

To help farmers reduce their watercourse losses, the Government provides technical advice, pakka nakkas, check structures, and pakka lining on limited sections of the watercourse. The farmers sharing the watercourse must form an executive committee to coordinate their efforts, and

they must provide all labor, including that of masons. In order to qualify for this program, at least 75% of the shareholders on the watercourse must have maximum land holdings of 25 acres or less. The OFWM Project has made considerable progress in Punjab: as of June 30, 1979, the OFWM Directorate (Punjab) claims over 200 watercourses completed or under construction.

This project is specifically directed toward helping small farmers. Because of the small holdings, a relatively large number of farmers usually share each watercourse. Even before the OFWM Pilot Project was initiated, CSU and other researchers recognized that the critical factor determining successful improvement and maintenance of watercourses would be the effectiveness of farmer organization. The watercourses have deteriorated over the years because of inadequate maintenance; and frequent and regular maintenance is if anything even more essential on improved watercourses if the farmers are going to continue reaping the benefits of improvement. The major reason for inadequate watercourse maintenance has been and continues to be the lack of effective local farmer organization.

Review of Literature

There is a growing literature on the problems of organization of irrigation systems (Hunt and Hunt, 1976). Unfortunately, there are very few studies of rural social organization and the organization of irrigation in Pakistan. During the last few years some research, mostly confined to Punjab, has begun to be published. The available studies focusing on the local organization of water management include Mirza (1975); Lowdermilk, Clyma, and Early (1975); Lowdermilk, Freeman, and Early (1978); Freeman and Lowdermilk (1978); Radosevich (1975); Mirza and Merrey (1978); and Merrey (1979). Mirza (1975) surveyed 15 villages in the Lyallpur (now

Faisalabad) area to discover the social structural factors affecting decision-making processes in local water management. Lowdermilk, Clyma, and Early (1975) focused on the physical and socio-economic constraints characterizing one watercourse in Punjab, and farmers' responses to these. Lowdermilk, Freeman, and Early (1978) report on a very comprehensive survey of water management patterns and problems on 40 watercourses in Punjab and Sind, and suggest a number of useful hypotheses concerning the relationships between local social organization and the likely success of water management projects. Based on a survey of Pakistan's water laws in comparison to those of other countries, Radosevich (1975) recommends that Pakistan ought to encourage the development of legally-based Water Users Associations. Merrey (1979), based on an intensive anthropological study of one village, including observation of the problems encountered in organizing farmers to rehabilitate their watercourse, discusses some of the characteristics of Punjabi values and culture that inhibit farmers' ability to cooperate on such projects. All of these studies demonstrate not only that present patterns of farmer organization and cooperation are totally inadequate to promote improved water management, but that without a major effort to build farmer organizations as an integral part of the OFWM Project, this project is likely to fail.

Objectives of this Study

The planners of the OFWM Project envisioned studies and experiments on farmer organization as an integral part of the project. They, therefore, asked the University of Agriculture, Faisalabad, to do a study on farmer organization in Punjab, including establishing experimental Water Users Associations. At the time this study was being planned, the

During Stage two similar research is to be initiated in the other provinces, to be carried out by local institutions under separate contracts.

As of this writing, the future of Phase II, actively organizing associations and stage two, the extension of the project to other provinces, is not certain. This report presents the results of the first phase of the research, the survey of organizational problems on watercourses in Punjab that had been improved, and fulfills the four objectives for this phase listed above. Finally, this report supercedes our preliminary report on the first four watercourses surveyed (Mirza and Merrey, 1978).

Theory and Assumptions

Social scientists in the past, and non-social scientists even today, have often "explained" peasant farmers' behavior in terms of "ignorance", "irrationality", "custom", or "tradition"; that is, peasants are said to behave the way they do "because it is their custom" or "because they are ignorant". However, such "explanations" explain nothing; rather, they prevent one from asking the proper questions which would lead to better insights into the roots of human behavior.

Although individual actors may or may not behave "rationally" in any particular situation, we assume that recurring patterns of behavior are "rational" in the sense that, given a particular ecological, social, economic, and cultural context, recurring patterns and strategies of behavior are instrumental in achieving particular culturally-defined goals, and in the short run at least, in maintaining the human population. If patterns of behavior were not "adaptive" in these senses, they would not continue, or the population would not survive.

Under changing conditions, for example population growth and the need to increase food production, ecological deterioration such as increasing waterlogging and salinity, and changes in perceptions of the quality of the standard of living, previous patterns of behavior that had been reasonably successful in the past may prove non-adaptive. However, unless the socio-economic constraints that produced these behavior patterns also change, the patterns themselves may continue, even when the participants recognize their non-adaptiveness.

Lowdermilk, Freeman, and Early (1978, vol. IV: chapter five) describe the absence of formal local organization in rural Pakistan, and the ineffectiveness of informal means of village organization. Under these conditions the benefits of a "collective good" such as an improved watercourse cannot be denied to an individual who does not cooperate in its improvement; unless all farmers on the watercourse contribute to its improvement and maintenance, it may not be "rational" for any particular individual to make such investments. If he makes such an investment and others do not, the payoff may not be worth the cost; and if many others do undertake it he will share the benefits even if he does little or nothing. This situation, where individuals perceive doing nothing as most "rational" for themselves, even though it leads to decreasing benefits from the "collective good" in the long run, can only be mitigated by an effective social organization which insures participation by all members (ibid.: 178-79).²

²/See also Coward (1979) for an analysis contrasting a well-organized "indigenous" irrigation system in the Philippines to a system imposed by the government (as is Pakistan's) without any local organization and a consequent lack of maintenance.

The high level of conflict characterizing Pakistani villages has also often been noted. However, levels and patterns of conflict vary among different communities (*ibid.*, vol. IV:192-201; Mirza, 1975). The level and patterns of conflict are generated by particular socio-economic structures with cultural values such as the concept of izzat, honor, operating as intermediate variables (Merrey, 1979); these values are themselves ultimately products of particular structural conditions. Under such conditions, that is, socio-economic constraints and cultural values acting to generate conflict and retard cooperation, plus the lack of effective forms of organization, any expectation of an increased level of cooperation for improving and maintaining joint watercourses seems unrealistic unless preceded by fundamental structural changes.

Given, then, that the success of local water management projects as presently conceived will depend to a very large extent on the effectiveness of farmer cooperation to improve, manage, and maintain their watercourses, and given the apparently unfavorable structural atmosphere for promoting such cooperation, a major question this report is concerned with is can any forms of organization succeed under present social conditions? Assuming they can, under what specific conditions are they most likely to succeed? And what form or forms of organization have the best chance of succeeding?

Whatever forms of organization are tried, they must be adapted to the cultural understandings, rules, and assumptions of the members, but must also be designed to neutralize--if not change--structural patterns that inhibit cooperation among the members.

Working Hypotheses

It is important to emphasize that this study is essentially an exploratory one. First, when the study was designed, some of the previous studies had not been published. Second, this is the first study of the organization of improved watercourses. Third, most of the previous studies were surveys that depended to a large extent on questionnaires. Questionnaires presume that one already knows the proper questions to ask, and that one knows the range of answers to expect. As explained in the methodological section below, in this study we have tried to use a combination of questionnaires and more informal techniques of inquiry, in the hope that such methods would lead to our discovering behavior patterns and casual connections that had not previously been reported in the literature.

Our major working hypothesis is that social organizational factors do significantly effect farmers' ability to cooperate to improve and maintain their joint watercourse; we expect to find significant and systematic relationships between patterns of organization and conflict on the one hand, and the effectiveness of both the watercourse improvement process and the quality of the subsequent maintenance of the watercourse. Since cooperation among shareholders is essential for effective maintenance, good maintenance is itself an indicator of ability to cooperate. (However, in the absence of effective forms of organization and ability to sanction "free riders" maintenance and operation of the watercourse will still be less than ideal.)

The following are the specific working hypotheses that guided this research:

A. Sociological Factors

1. Effect of size of holdings:

The greater the percentage of small but economically viable holdings (defined here as 6.5 to 25.0 acres) the better will be the quality of maintenance of the watercourse. Such farmers have more incentive for and interest in watercourse maintenance; farmers with very small holdings may see little gain in the effort of improvement and maintenance, and in fact often have supplementary sources of income, reducing their incentive further. Larger farmers tend to get the work done by servants and tenants who have little incentive to work effectively (Lowdermilk, Freeman, and Early, 1978, vol. IV:136-140); also large farmers tend more often to violate sanctions for maintenance and use of the watercourse (ibid., vol. I:71).

2. Effect of inequality of size of landholding:

On watercourses characterized by greater inequality of land holding, carrying out reconstruction of the watercourse may be relatively easier but the likelihood of long term organization for maintenance will be less. The big farmers may be able to make and impose decisions in order to expedite improvement; but in the long run the smaller farmers, under these conditions, may feel they have little stake in its maintenance, since they will have little influence on decision-making and no means to control the whims of the minority (ibid., vol. IV:226-27; they state this hypothesis in terms of relative power and influence; see below).

3. The determinants of power and influence:

Relative size of landholding is the most significant determinant of being perceived as having power and influence. Small land holders will have very little power and influence; relatively large farmers potentially have the most, especially if combined with education and the willingness to use one's power.

4. Effects of the distribution of power and influence on watercourse maintenance:

a) The greater the overall equality of the distribution power and influence among watercourse members, the more effective will be farmer organization for watercourse maintenance (ibid; Freeman and Lowdermilk, 1978).

b) Watercourses characterized by a large percentage of farmers who are perceived as influential by their fellow shareholders will be better organized and maintained than those which have very few or no farmers perceived as influential; if there are no division conflict cleavages (ibid.). This is because a relatively large percentage of the farmers will be in a position to influence decisions; however, there is also more potential for such a watercourse to be divided into antagonistic groups.

5. Effect of biraderi structure:

At both the watercourse and village level, the social unit through which cooperation is mobilized is the biraderi, or "brotherhood kinship group" (Lowdermilk, Freeman, and Early, 1978, vol. IV:185; Alavi, 1972). Patterns of cooperation and conflict are nearly always biraderi-based.

a) Successful organization for improvement and maintenance is more likely on single-biraderi watercourses.

b) Watercourses dominated by two separate biraderis with equal power and influence will be highly polarized, and cooperation will be difficult.

c) Watercourses characterized by a larger number of biraderis, none of which is dominant, are problematical; some may be polarized into two competing coalitions, but if they are not, cooperation is possible, though at a lower level than on single-biraderi watercourses.

6. Effect of social conflict polarization:

Where conflict structures are overlapping -- that is, where social groups are highly polarized, splitting opponent groups along the same lines on various issues -- cooperation on joint projects will be difficult. On the other hand, where conflict patterns are cross-cutting -- that is, where different groups come together and are opposed over various issues, so that there is no single line of cleavage -- the likelihood of cooperation on a collective project is much greater (Freeman and Lowdermilk, 1978).

7. Effect of level of previous conflict:

Watercourses characterized by a high level of previous conflict among groups or among important leaders are less likely to organize successfully for a watercourse program than those characterized by little or no conflict.

8. Effect of previous experience in cooperation:

Where the farmers have cooperated successfully on other community projects (schools, cooperatives, road building) they are more likely to cooperate successfully for improvement and maintenance of their watercourse. Where there is a previous history of conflict and hostility, or failures in past programs, or absence of previous positive cooperating experiences, there will be less cooperation.

9. Effect of location of the watercourse:

We expect that since Middle and Tail farmers tend to benefit proportionally more from improvement and maintenance they will have more incentive to cooperate to carry out maintenance. Therefore, we expect that where influential and powerful farmers are concentrated at the Head of the watercourse, there will be significantly less cooperation for

improvement and maintenance; where they are concentrated at the Tail or even Middle there will be significantly more. Equal distribution of power/influence should also lead to cooperation for watercourse improvement and maintenance.

10. Effect of settlement status:

"Settlers" (families who settled the canal colonies when the canals were built) and "refugees" (families who came from India at Independence) may be better able to cooperate on watercourse work than the original inhabitants ("locals") predating the canal system. For reasons that are not entirely clear, "locals" have a reputation for being more quarrelsome and litigious than others.

11. Effect of number of shareholders:

The larger the number of shareholders on the watercourse, the more difficult it will be for them to organize and cooperate for watercourse work.

12. Effect of "progressiveness":

More "progressive" communities as measured by the availability of institutional services in the village, percent of educated farmers, and exposure to mass media, are more likely to perceive the value of the watercourse improvement project, and more likely to be able to cooperate in its maintenance.

B. Physical Factors

1. Effect of perception of water shortage:

a) Where farmers perceive a shortage of water they are more likely to cooperate to maintain the watercourse.

b) In SCARP areas where water is relatively abundant even though more water is wasted, there will be less cooperation to maintain the watercourse than in non-SCARP areas.

2. Long single-branch watercourses will be relatively well maintained as water must travel further, increasing potential losses, and more farmers will have a greater interest in maintenance; watercourses consisting of several relatively short branches will be relatively less well-maintained.

C. Attitude toward Establishing Legally-based Water Users Associations

1. Farmers with small landholdings, greater education, and with land located toward the Tail of the watercourse, are likely to be more favorable toward establishing formal associations than others.

2. Farmers dissatisfied with the level of cooperation for maintenance of the watercourse are more likely to favor setting up Water User Associations.

Methods

At the time this study was designed, the total number of watercourses claimed as improved by OFWM and the Mona Project in Punjab was quite small. Also, it was obvious that if we wished to carry out intensive research on each watercourse, with our limited time and manpower we could not hope to study very many watercourses. For these reasons, it did not seem practical to try to choose a "random sample" of watercourses.

Instead, we have chosen a "judgement sample". That is, we consciously chose watercourses in order to obtain a sample exhibiting variety along several dimensions. Since we were interested in the quality of maintenance we tried to choose watercourses for which the maximum time elapsed since the completion of improvement. We also tried to choose watercourses in as wide a variety of agronomic areas as possible; hence, we chose two watercourses in the Mona Project (SCARP II) area, and one each from eight other

tehsils (a total of five districts are represented). These eight tehsils also represent eight different OFWM Area Teams. Finally, we chose several watercourses because initial inquiries suggested they were "problem" watercourses in some way; and we chose several others because inquiries suggested they were especially "successful" projects. The rest were chosen without reference to any systematic characteristics.

Two watercourses that we had initially chosen were rejected after a few days of research. One in District Sahiwal was rejected because two or three brothers in fact owned all the land on the watercourse and one of these men operated it; this did not seem to us an appropriate setting for inquiring into levels of group cooperation and the like. Another village in District Sahiwal was rejected after two days' research because our research officers felt endangered by rowdy drinkers in the village.

All of this means that our sample is not "representative" in a statistical sense of all watercourses improved in Punjab; but it does represent some of the variety encountered in ability to cooperate to carry out an improvement project, and maintain it afterwards. If there are systematic sociological differences, for example, between the relatively successful and less successful watercourses, this in itself will be revealing.

For the first five watercourses we were using four questionnaires, but after completing the Interim Report (Mirza and Merrey, 1978), we restructured the questionnaires into six different ones. These are reproduced in the Appendix. One schedule was used for recording basic data on key informants; one used for recording observations of the quality of maintenance of the watercourse; one for data obtained from the OFWM Area Team; two were filled in on watercourse and village-level social data,

including a hundred percent census of watercourse shareholders, using key informants; and finally one questionnaire was administered to a randomly chosen sample of farmers stratified by position on the watercourse.

Table 1.1 gives the total number of farmers and number of sample farmers, on each watercourse, broken down by Head, Middle, and Tail. The total sample is equal to nearly fifty percent of all the farmers on the ten watercourses. The sample farmers represent from twenty-six percent to one hundred percent of all the farmers on each watercourse.

In addition to the questionnaires, we asked our field team members to keep diaries for recording additional data gathered during informal discussions and by observation. Since we were interested in gathering data on patterns of conflict and cooperation, we knew simple survey methods would be inadequate. Our assistants, therefore, stayed in or near the village being studied for about ten to fifteen days, and spent much time in informal discussions with people, trying to gain their confidence and probing for a deeper understanding of the interplay of human relationships of the village and watercourse social life. In the end this method is a compromise; ten days is not enough time to understand these matters completely, yet more time could not be spared if we were to cover a sufficient range of watercourses. Our assistants found this facet of the research most difficult, as they had been trained to use questionnaires; but despite some shortcomings the diaries they kept have proven very valuable in our analysis.

Since we were unable to measure watercourse losses, we had no objective measure of the condition of the watercourse. We, therefore, had our research officers walk the length of each watercourse, and record such things as the number of damaged nakkas, number of trees growing on the

Table 1.1. Sample farmers as percentage of total farmers on each watercourse.

Water- course	Head		Middle		Tail		Total		Sample as % of total
	Sample	Total	Sample	Total	Sample	Total	Sample	Total	
01	5	10	5	10	6	11	16	31	51.6
02	4	6	6	8	6	7	16	21	76.2
03	10	10	4	4	4	4	18	18	100.0
04	4	14	5	15	7	17	16	46	34.8
05	9	33	9	35	8	31	26	99	26.3
06	5	10	5	6	5	5	15	21	71.4
07	7	9	4	6	6	7	17	22	77.3
08	4	16	7	10	5	6	16	32	50.0
09	3	6	7	9	5	6	15	21	71.4
10	4	10	6	18	12	28	22	56	39.3
Total	55	124	58	121	64	122	177	367	48.2

watercourse banks, and estimate the extent of vegetation, rat holes, and bank deterioration. We then converted these observations into numerical scores and ranked them.

The data contained in the 100 percent census, and data gathered from sample farmers, were coded and computer-analyzed. Each watercourse has been assigned a number, and the names of villages and individuals have not been used. In Mirza and Merrey (1978) we designated watercourses by letters. Watercourses A, B, C, and D in that report are numbers 09, 08, 07, and 10, respectively, in this report.

Chapter Two

SOCIOLOGICAL CHARACTERISTICS OF SAMPLE WATERCOURSES

In this chapter we present background data on the sample watercourses and the villages in which they are located. Based on this material, we discuss whether or not these watercourses were good candidates for watercourse improvement.

Sample Villages

Background Data

Table 2.1 summarizes some basic data on the sample villages. Two were improved by the Mona Reclamation Experimental Project while the On-Farm Water Management Project (Punjab) is responsible for the other eight. The watercourses are located in five different districts and nine tehsils representing various agronomic areas in irrigated Punjab. Seven of the villages have more than one improved or under-improvement watercourses; five have had all the village watercourses improved.

Social Structure of Sample Villages

Table 2.2 summarizes the basic social characteristics of the sample villages. In six of the ten villages, the total population is more than seventy percent "agricultural", that is, involved in some way in cultivation of the land either as owners or tenants. In the two villages improved by the Mona Project, both located in Tehsil Bhalwal, District Sargodha, two-thirds or more of the village population are landless; most of these people work as laborers on the owners' land. In all the villages a large

Table 2.1(A). General background data for sample villages.

	01	02	03	04	05
Improving organization	OFWM Punjab	OFWM Punjab	OFWM Punjab	OFWM Punjab	OFWM Punjab
Tehsil District	Chichawatni (Sahiwal)	Sahiwal (Sahiwal)	Toba Tek Singh (Faisalabad)	Khanewal (Multan)	Samundari (Faisalabad)
Name of canal	Lower Bari Link	Lower Bari Doab	Gogera Branch	Lower Bari Doab	Gogera Branch
Name of distributary	12-L	10-L Minor	Moongi	16-L	Samundari Minor
Major Crops	Wheat Cotton Sugarcane	Wheat Cotton Sugarcane	Wheat Cotton Sugarcane	Wheat Cotton Sugarcane	Wheat Maize Sugarcane
Total cultivated area in village (acres)	1475	1950	1448.5	3385.5	1237.5
Total commanded area in village (acres)	1400	1950	1223.5	1482.5	1162.5
Number of moghas in village	3	6	4	4	2
Number of improved watercourses in village	3	3	3	1	2

Table 2.1(B). General background data for sample villages.

	06	07	08	09	10
Improving organization	OFWM Punjab	OFWM Punjab	Mona Project (Scarp II)	Mona Project (Scarp II)	OFWM Punjab
Tehsil District	Chiniot (Jhang)	Faisalabad (Faisalabad)	Bhalwal (Sargodha)	Bhalwal (Sargodha)	Jaranwala (Faisalabad)
Name of Canal	Gogera Branch	Jhang Branch	Lower Jhelum Northern Branch	Lower Jhelum Northern Branch	Rakh Branch
Name of Distributary	Jamal Patti	Khai	Fatehpur	Rattokala	Lakhmana
Major Crops	Wheat Sugarcane Fodder	Sugarcane Wheat Cotton	Kinnu Wheat Sugarcane	Kinnu Wheat Rice	Sugarcane Cotton Maize
Total cultivated area in village (acres)	1282	965	674	1363	5225
Total commanded area in village (acres)	1064	890	674	1363	1825
Number of Moghas in village	3	3	2	2	4
Number of improved watercourses in village	1	3	2	2	1

Table 2.2(A). Summary of social structure of sample villages.

Villages	01		02		03		04		05	
	n	%	n	%	n	%	n	%	n	%
<u>Households</u>										
Agricultural	164	75	100	78	187	79	122	99	637	77
Non-Agricultural	55	25	28	22	49	21	1	1	188	23
Total	219	100	128	100	236	100	123	100	825	100
<u>Tenancy (Households)*</u>										
Owners	135	82	59	59	0	0	74	60.6	599	94
Tenants	9	6	8	8	12	6	48	39.4	9	1
Owner/Tenants	0	0	33	33	0	0	0	0	29	5
Mixed - owners and tenants	20	12	0	0	175	94	0	0	0	0
Total	164	100	100	100	187	100	122	100	637	100
<u>Agric. - Households</u>										
Locals	0	0	0	0	187	100	0	0	10	2
Settlers	147	90	91	91	0	0	100	82	0	0
Refugees	17	10	9	9	0	0	22	18	627	98
Total	164	100	100	100	187	100	122	100	637	100
<u>No. of Agric. Biraderis</u>	10		13		3		11		2	
<u>Largest Biraderi</u>	Jat Kung		Christian		Jat Marth		Christian Protestant		Gujar	
(n, %)	28	18	35	35	175	93	65	53	627	98.4
<u>2nd Largest Biraderi</u>	Jat Kahloon		Jat Dial		Kumhar		Christian Catholic		Jolaha	
	25	15	23	23	10	6	35	29	10	1.6

Source: Key informants' estimates.

*The data on tenancy is number of households in each biraderi for each type of tenancy. For two villages, 01 and 03 where biraderis had both owners and tenants as well as owner/tenants, the number in each category is not clear. Also, generally speaking, tenancy is understated in our data.

Table 2.2(B). Summary of social structure of sample villages.

Villages	06		07		08		09		10	
	n	%	n	%	n	%	n	%	n	%
<u>Households</u>										
Agricultural	102	59	154	55	48	27	70	33	477	73
Non-Agricultural	<u>70</u>	<u>41</u>	<u>127</u>	<u>45</u>	<u>132</u>	<u>73</u>	<u>140</u>	<u>67</u>	<u>181</u>	<u>27</u>
Total	172	100	281	100	180	100	210	100	658	100
<u>Tenancy (Households)*</u>										
Owners	96	94	131	85	37	77	60	86	347	73
Tenants	0	0	3	2	0	0	2	3	0	0
Owner/Tenants	6	6	20	13	11	23	8	11	130	27
Mixed - owners and tenants	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	102	100	154	100	48	100	70	100	470	100
<u>Agric. Households</u>										
Locals	100	98	0	0	0	0	0	0	477	100
Settlers	0	0	153	99	48	100	54	77	0	0
Refugees	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>16</u>	<u>23</u>	<u>0</u>	<u>0</u>
Total	102	100	154	100	48	100	70	100	477	100
<u>No. of Agric. Biraderis</u>	2		3		11		7		6	
Largest Biraderi	Rajput Japey		Jat Rand- hawa		Jat Kahoot		Gujjar		Jat Athwal	
(n, %)	100	98	150	97	16	33	35	50	450	94
2nd Largest Biraderi	Arain		Mochi		Jat Attar		Sayid		Jat Hanjra	
(n, %)	2	2	2	1.2	6	13	13	19	12	3

majority of the farmers are owners and owner-cum-tenants; only one village number 04 in Tehsil Khanewal, has a large percentage (40%) of tenants.³

Six of the villages are inhabited primarily by "settlers", that is, descendants of people who came to these areas from elsewhere at the time the canal system was built. There are three "local" villages, that is, villages inhabited primarily by the pre-canal inhabitants, and only one "refugee" village (persons who came from India at Partition in 1947). In five of the villages the largest biraderi includes ninety percent or more of the total agricultural population. The remaining villages are more evenly divided among several biraderis. These summary data make the point that a considerable variety of village social structural patterns are represented in our study.

Institutional Services Available in Sample Villages

Table 2.3 summarizes the institutional services available in each village. All are reported to have both a girls' and a boys' primary school, but otherwise there is considerable variation among the villages. Two villages, numbers 01 and 07, have all the services listed except a train station and a girls' high school. Village 01, however, also has a connection to a telephone exchange, a village water supply scheme, and is arranging for a village drainage system. Village 06, also having a substantial number of services, has an industrial home for women and paved lanes and drains. On the other hand, villages 03 and 04 have nothing except Primary Schools and Cooperative Societies, while village 02 has only these plus electricity. Only five villages have a resident

^{3/} Village 03 also has a large percentage of tenants but our data are imprecise on this point. See footnote to Table 2.2.

Table 2.3. Institutional services available in village.

Service/Village	01	02	03	04	05	06	07	08	09	10
1. On Pakka road	yes	-	-	-	-	yes	yes	-	yes	yes
2. Bus stop	yes	-	-	-	-	yes	yes	-	-	yes
3. Train station	-	-	-	-	-	-	-	-	-	-
4. Boy's Primary School	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
5. Girl's Primary School	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
6. Boy's Middle School	yes	-	-	-	-	yes	yes	yes	yes	-
7. Girl's Middle School	yes	-	-	-	-	yes	yes	-	yes	-
8. Boy's High School	yes	-	-	-	-	-	yes	-	yes	-
9. Girl's High School	-	-	-	-	-	-	-	-	-	-
10. Medical dispensary	yes	-	-	-	-	yes	yes	-	-	-
11. Veterinary dispensary	yes	-	-	-	yes	yes	yes	-	-	yes
12. Bank Branch	yes	-	-	-	yes	yes	yes	-	yes	-
13. Co-operative Society	yes	yes	yes	yes	yes	yes	yes	-	-	-
14. Post Office	yes	-	-	-	yes	yes	yes	yes	yes	-
15. Fertilizer agency	yes	-	-	-	-	-	yes	-	-	-
16. Resident Field Assistant	yes	-	-	-	yes	-	yes	yes	-	yes
17. Electricity	yes	yes	-	-	-	yes	yes	-	yes	-
Total	15	4	3	3	7	12	15	5	9	6
Kilometers from nearest Mandi*	13	8	8	6	10	10	18	10	13	16

* Market town

field assistant, and two have fertilizer agencies. There is relatively less variation in the distance from each village to the nearest market town, which ranges from 8 to 18 kilometers and appears to be inversely related to the number of institutional services available.

Sample Watercourses

Technical Data

Table 2.4 presents some technical data on the sample watercourses; this table is based on data supplied by the improving agencies. It shows a very wide variation in availability of water per unit of land. Five of the watercourses have private tubewells whose discharges we do not know. There are two watercourses with SCARP tubewells and one with a Cooperative tubewell; these three have substantially more water available than do the other watercourses. This would probably remain true even if the private tubewell discharges were included, though the differences would be reduced; further, since there is unequal access to private tubewells, on these watercourses presumably some people have more water available than others.

The table also shows that on five watercourses the total length of the sarkari khal (sanctioned watercourse) was not improved. On three of these approximately one thousand meters were left unimproved, and in village 05, only about 990 meters out of 7260 meters were improved; for reasons discussed below, this watercourse was never finished.

There is at least a six month interval between the date of completion of improvement and the time of our study except in the case of watercourse 10, with only a four month interval. For three watercourses about a year had passed, and for one, number 09, a year and eight months had passed.

Table 2.4(A). Technical data on sample watercourses.

Watercourse	01	02	03	04	05
Tubewells	8 private	none	4 private 1 missionary	4 private	1 private
Sarkari khal branches	single	multiple	multiple	multiple	multiple
Commanded area sample watercourse (acres)	400	299.75	436	492	575
Mogha discharges (Liters per second)	40.78	25.49*	42	37	46
Tubewell	0	0	0	0	0
Total	40.78	25.49	42	37	46
Total length of watercourse (meters)	4290	2218	5233	5413	7260
Improved length of watercourses & sarkari khal (meters)	4290	2218	5233	4489.7	990 (approx.)
Length of lined section (meters)	636	759	190	641	170
Area irrigated per liter per second (acres)	8.20	11.76	10.37	13.29	12.5
Area irrigated per meter length of W/C (acres)	0.09	0.14	0.08	0.09	0.08
Meter length of W/C per liter per second	105.2	87.01	124.59	146.29	157.82
Date improvement completed	Dec. 1977	Jan. 1978	Feb. 1978	June 1978	March 1978
Date studied	Dec. 1978	Nov. 1978	Dec. 1978	Dec. 1978	Oct. 1978

*Extra water is given during kharif.

Table 2.4(B). Technical data on sample watercourses.

Watercourse	06	07	08	09	10
Tubewells	3 private	1 co-operative	1 SCARP II	1 SCARP II	none
Sarkari khal branches	multiple	single	single	multiple	multiple
Commanded area sample watercourse (acres)	236	290	337	463	375
Mogha discharges (liters per second)	18.69	44.74	31.43	49.84	43
Tubewell	0	39.93	42.48	37.76	0
Total	18.69	84.69	73.91	87.60	43
Total length of watercourse (meters)	2452.5	3000	3048.8	3748.9	5290
Improved length of watercourses & sarkari khal (meters)	2152.5	3000	3048.8	2743.9	4140
Length of lined section (meters)	30.5	387	none	470	60
Area irrigated per liter per second (acres)	12.62	3.43	4.56	5.29	8.72
Area irrigated per meter length of W/C (acres)	0.10	0.10	0.11	0.12	0.07
Meter length of W/C per liter per second	131.21	35.43	41.25	42.80	122.09
Date improvement completed	Nov. 1977	Dec. 1977	May 1977	Oct. 1976	April 1978
Date studied	Sept. 1978	July/Aug. 1978	July 1978	July 1978	Aug./Sep. 1978

At the time we began the study, there were very few watercourses that had been completed a year or more before.

Watercourse Social Structure - Caste and Biraderi

Table 2.5 summarizes our data on the caste and biraderi structure of the sample watercourses. Again, there is a wide variety in the number of households represented, and the number and size of castes and biraderis. The total number of households on the watercourse ranges from 18 to 99. Six are dominated by Jats, two by Gujars, and one each by Rajputs and Christians. The number of separate biraderis represented on each watercourse ranges from two to thirteen. Although six of the watercourses are classified as single-caste (ninety percent or more of the households belonging to one caste), only four (03, 05, 06, 07) are single-biraderi in structure. This means that on six of the watercourses, cooperation across biraderi lines is essential for any successful improvement or subsequent maintenance program.

Watercourse Social Structure - Landholding

We collected data on the amount of land held both on the sample watercourse, and total land in the village, for all of the shareholders on the sample watercourses. Tables 2.6 and 2.7 present these data. Table 2.6 shows that on three watercourses (number 03, 08, and 09) more than one-fourth of the farmers have total landholdings in the village of 25 acres or more. However, this statement alone is misleading: on all watercourses except number 09, there is a very high percentage of holdings that are joint, that is, having several shareholders. This is shown in Table 2.8. Table 2.6 also shows that on two watercourses (05, 10) over seventy percent of the farmers have total holdings of less than

Table 2.6. Total landholding in village of farmers on sample watercourses.*

Water- courses Acres	01		02		03		04		05		06		
	n	%	n	%	n	%	n	%	n	%	n	%	
Up to 6.4	2	6.5	0	0	0	0	15	32.6	71	71.7	4	19.5	
6.5-12.4	2	6.5	9	42.9	0	0	13	28.3	20	20.2	11	52.4	
12.5-18.4	18	58.1	4	19.0	4	22.2	13	28.3	4	4.0	3	14.3	
18.5-25.0	5	16.1	2	9.5	8	44.4	3	6.5	3	4.0	0	0	
Over 25.0	4	12.9	6	28.6	6	33.3	2	4.3	0	0	3	14.3	
Total	31	100.0	21	100.0	18	100.0	46	100.0	99	100.0	21	100.0	
Total	6.5-25.0	25	80.6	15	71.4	12	66.7	29	63.0	28	28.3	14	66.7
Rank - small													
viable													
holdings**													
1			2		4		5		8		4		
Water- course Acres	07		08		09		10		Total		Cumulative		
	n	%	n	%	n	%	n	%	n	%	n	%	
Up to 6.4	4	18.2	5	15.6	4	19.0	41	73.2	146	39.8	146	39.8	
6.5-12.4	5	22.7	0	0	1	4.8	3	5.4	64	17.4	210	57.2	
12.5-18.4	10	45.5	8	25.0	6	28.6	9	16.1	79	21.5	289	78.7	
18.5-25.0	0	0	2	6.3	4	19.0	3	5.4	31	8.4	320	87.1	
Over 25.0	3	13.6	17	53.1	6	28.6	0	0	47	12.8	367	100.0	
Total	22	100.0	32	100.0	21	100.0	56	100.0	367	100.0			
Total	6.5-25.0	15	68.2	10	31.3	11	52.4	15	26.8	174	47.4		
Rank - small													
viable													
holdings**													
3			7		6		9						

*Based on 100% census of farmers on watercourse.

**From highest percentage of farmers with holdings between 6.5 and 25 acres to the lowest.

Table 2.7. Land holdings on sample watercourses.*

Water- course Acres	01		02		03		04		05		06	
	n	%	n	%	n	%	n	%	n	%	n	%
Up to 6.4	2	6.5	1	4.8	0	0	18	39.1	75	75.8	8	38.1
6.4-12.5	2	6.5	8	38.1	0	0	11	23.9	19	19.2	8	38.1
12.5-18.4	22	71.0	8	38.1	4	22.2	13	28.3	2	2.0	2	9.5
18.5-25.0	4	12.9	1	4.8	10	55.6	2	4.3	3	3.0	1	4.8
Over 25.0	1	3.2	3	14.3	4	22.2	2	4.3	0	0	2	9.5
Total	31	100.0	21	100.0	18	100.0	46	100.0	99	100.0	21	100.0

Water- course Acres	07		08		09		10		Total	
	n	%	n	%	n	%	n	%	n	%
Up to 6.4	4	18.2	10	31.3	4	19.0	44	78.6	166	45.2
6.5-12.4	10	45.5	3	9.4	1	4.8	4	7.1	66	18.0
12.5-18.4	6	27.3	15	46.9	8	38.1	7	12.5	87	23.7
18.5-25.0	1	4.5	1	3.1	4	19.0	1	1.8	28	7.6
Over 25	1	4.5	3	9.4	4	19.0	0	0	20	5.4
Total	22	100.0	32	100.0	21	100.0	56	100.0	367	100.0

Table 2.8. Type of farming--sample farmers.

Watercourse	Individual		Joint*	
	n	%	n	%
01	1	6.3	15	93.8
02	8	50.0	8	50.0
03	2	11.1	16	88.9
04	3	18.8	13	81.3
05	11	42.3	15	57.7
06	2	13.3	13	86.7
07	2	11.8	15	88.2
08	0	0	16	100.0
09	10	66.7	5	33.3
10	5	22.7	17	77.3
Total	44	24.8	133	75.2

*Two or more adult male shareholders.

6.5 acres. Overall, if we examine the cumulative percentages in Table 2.6, nearly forty percent of the farmers' total holdings are under 6.5 acres; about 57 percent have reported holdings under 12.5 acres; and 87.4 percent have holdings under 25 acres. It is obvious that the vast majority of people involved in the watercourse reconstruction program are in fact the targeted small farmers.

Table 2.7, which gives the breakdown of landholdings on the sample watercourse, shows that the holdings at the watercourse level are smaller than the farmers' total holdings. Table 2.9 presents a breakdown of the percentage of farmers' total landholdings located on the sample watercourse. Overall, more than eighty percent of the farmers have seventy-five percent or more of their land on the sample watercourses; only on one watercourse, number 08, do a majority of the farmers have less than

Table 2.9. Percentage of farmer's total land holding located on sample watercourse.*

Percent of Holding:	01		02		03		04		05		06	
	n	%	n	%	n	%	n	%	n	%	n	%
100%	27	87.1	13	61.9	12	66.7	39	84.8	89	89.9	12	57.1
75-99%	0	0	1	4.8	4	22.2	0	0	1	1.0	2	9.5
50-74%	2	6.5	4	19.1	2	11.1	6	13.0	7	7.1	4	19.1
Less than 50%	2	6.5	3	14.3	0	0.0	1	2.2	2	2.0	3	14.3
Total	31	100.0	21	100.0	18	100.0	46	100.0	99	100.0	21	100.0

Percent of Holding:	07		08		09		10		Total	
	n	%	n	%	n	%	n	%	n	%
100%	12	54.5	14	43.5	19	90.5	44	78.6	281	76.6
75-99%	4	18.2	1	3.1	0	0.0	3	5.4	16	4.4
50-74%	5	22.7	2	6.5	0	0.0	2	3.6	34	9.3
Less than 50%	1	4.6	15	46.9	2	9.5	7	12.5	36	9.8
Total	22	100.0	32	100.0	21	100.0	56	100.0	367	100.0

*Based on 100% census data

half of their total holdings on the sample watercourse. Many farmers on this watercourse have large holdings; scattered in several places in the village.

Table 2.10 shows there are very few tenants on the sample watercourses. This may be because most of the farmers on these watercourses are small farmers; however, we suspect tenancy is understated in our data. More than half of all the owner-cum-tenants we recorded on the ten watercourses are located on one watercourse, number 05.

On most of the watercourses, the land is distributed among the biraderis proportional to the population of these biraderis; this is shown in Table 2.11. On the four watercourses classified as "single-biraderi", that is, over ninety percent of the watercourse shareholders belong to one biraderi, these ninety percent also own more than ninety percent of the land. On watercourse 02, the largest biraderi has 42.9 percent of the shareholders but holds 54.2 percent of the land; the rest of the people and land are distributed among several smaller biraderis. The second largest biraderi on both watercourses 04 and 08 holds proportionally considerably more land on the watercourse per household than do the others. On seven of the watercourses (02, 03, 05, 06, 07, 09, 10) the largest biraderi owns half or more of the land and on another, 04, the largest owns 47 percent of the land. This means these eight are to a large degree dominated by single biraderis, though translation of this potential into real dominance depends on other factors, such as leadership and unity of the biraderis.

Table 2.12 shows the relative concentration of landholding on each watercourse. On two watercourses (01 and 03) the land is quite equally distributed, with over 40 percent of the farmers accounting for the first

Table 2.10. Tenancy on sample watercourses.*

Type Tenancy	01		02		03		04		05		06	
	n	%	n	%	n	%	n	%	n	%	n	%
Owners	31	100.0	14	77.7	17	94.4	40	87.0	62	62.6	20	95.2
Owner-cum- Tenants	0	0	6	28.6	0	0	1	2.2	36	36.4	0	0
Tenants	0	0	1	4.8	1	5.6	5	10.9	1	1.0	1	4.8
Total	31	100.0	21	100.0	18	100.0	46	100.0	99	100.0	21	100.0

Type Tenancy	07		08		09		10		Total	
	n	%	n	%	n	%	n	%	n	%
Owners	16	72.7	25	78.1	19	90.5	56	100.0	300	81.7
Owner-cum- Tenants	2	9.1	5	15.6	0	0	0	0	50	13.6
Tenants	4	18.2	2	6.3	2	9.5	0	0	17	4.6
Total	22	100.0	32	100.0	21	100.0	56	100.0	367	100.0

Table 2.11(A). Land holdings on sample watercourses by biraderi.

Watercourses	01		02		03		04		05	
	% House- holds	% Land*	% House- holds	% Land	% House- holds	% Land	% House- holds	% Land	% House- holds	% Land
Largest Biraderi	25.8	22.2	42.9	54.2	94.4	91.4	58.7	47.0	97.7	97.9
Second Largest Biraderi	19.3	20.0	14.3	12.1	-	-	10.9	26.5	-	-
Third Largest Biraderi	16.1	15.6	9.5	6.3	-	-	8.7	3.3	-	-
Fourth Largest Biraderi	9.7	9.4	9.5	6.5	-	-	4.3	4.6	-	-
Remaining Biraderis	29.0	32.8	23.8	20.8	5.6	8.6	17.4	18.6	2.0	2.1

*Percent of total land on watercourses held by members of each biraderi.

Table 2.11(B). Land holdings on sample watercourses by biraderi.

Watercourses	06		07		08		09		10	
	% House- holds	% Land*	% House- holds	% Land	% House- holds	% Land	% House- holds	% Land	% House- holds	% Land
Largest Biraderi	95.2	95.8	91.0	93.8	31.2	30.5	71.4	83.0	82.1	80.4
Second Largest Biraderi	-	-	-	-	15.6	28.6	9.5	7.6	10.7	13.0
Third Largest Biraderi	-	-	-	-	9.4	4.1	4.8	2.7	3.6	2.5
Fourth Largest Biraderi	-	-	-	-	9.4	10.2	4.8	2.4	1.8	3.3
Remaining Biraderis	4.8	4.2	9.1	6.2	34.3	26.5	9.5	4.3	1.8	0.8

*Percent of total land on watercourses held by members of each biraderi.

Table 2.12. Concentration of land holding on sample watercourses.

Household/Watercourse	01	02	03	04	05	06	07	08	09	10
Total No. Households	31	21	18	46	99	21	22	32	21	56
Total No. Households owning first 58% of land on watercourses*	13	7	8	12	24	5	7	9	6	13
Percent households owning first 50% land	41.9	33.3	44.4	26.1	24.2	23.8	31.8	28.1	28.6	23.2
Concentration Ranking**	2	3	1	7	8	9	4	6	5	10

* Calculated after listing households starting from the largest holding and proceeding in order to the smallest.

**In order from least concentrated to most concentrated.

fifty percent of the land. On the other hand, on six of the sample watercourses the first fifty percent of the land is concentrated in the hands of fewer than thirty percent of the farmers. This indicates, then that even though a majority of the farmers on the sample watercourses are relatively small farmers, the land is still quite highly concentrated. This unequal distribution of land has important consequences for the distribution of power and influence and ultimately ability to cooperate on the watercourse.

Watercourse Social Structure - Power and Influence

Freeman and Lowdermilk (1978; 1976; see also Lowdermilk, Freeman, and Early, 1978, vol. IV:201-36) in their earlier surveys developed a method for ascertaining the distribution of power and influence in communities. We have used their method with some modifications. Following Freeman and Lowdermilk (1978) we do not try to distinguish between the concepts of power and influence since, in the Punjabi context, they are so intimately related anyway. Rural Pakistanis are very aware of who in their community has influence, and who does not.

Unlike Freeman and Lowdermilk, we distinguished between power/influence within the biraderi and village, and power/influence with government officials. A person having influence with officials is one who has contacts in the bureaucracy and can get things done both for himself and others. A person having power/influence in his community is one whose point of view is generally accepted or deferred to by others, and who can convince or pressure others to follow him. Influence with government officials is one source of influence in the community but the reverse is probably not true. "Power/influence", then is a partial measure of a broader concept in Punjabi culture, the concept of "izzat"

(reputation, prestige, status, honor; see Merrey (1979) for a discussion of the relevance of "izzat" to problems of organizing farmers). Although power/influence on the two measured parameters is highly correlated, the differences in scores are also revealing.

We asked all of our sample farmers to rate all the other farmers on the watercourse, one at a time, on these two parameters, and converted their responses to numerical scores on a 0 to 4 basis; 4 means "highly influential", 2 means "some influence", 1 means a "little influence", and 0 "no influence". The scores of each farmer were summed, and converted to a percentage of his possible score. Although Freeman and Lowdermilk asked each respondent to rate his own power and influence, we found people reluctant to do this and therefore did not ask them to rate themselves.

Table 2.13 and 2.14 present the distribution of power and influence scores on each watercourse for each of the two parameters. Persons scoring in the 0 to 33 percent range have very little power and influence; persons in the 34 to 66 percent range have some but not a lot, while those scoring 67 percent or more have relatively substantial power and influence. Total scores across watercourses are probably not comparable, but the distribution of the scores is comparable and revealing. It is striking that, as Table 2.13 shows, on six of the watercourses about two-thirds or more of the farmers have no real power and influence within their community; on only three watercourses (02, 03, 06) do a third or more of the farmers have a fairly high level of power and influence.

The distribution of power and influence with government officials is even more skewed: on eight of the watercourses more than two-thirds of the farmers have no real influence and on four of these over ninety percent

Table 2.13. Distribution of power/influence scores - Biraderi Level

Water - Course	Score*	0-33%		34-66%		67-100%		Total	
		n	%	n	%	n	%	n	%
01		21	67.6	8	25.8	2	6.5	31	100
02		10	47.6	3	14.3	8	38.1	21	100
03		1	5.6	9	50.0	8	44.4	18	100
04		37	80.4	8	17.4	1	2.2	46	100
05		80	80.8	13	13.1	6	6.1	99	100
06		9	42.9	5	23.8	7	33.3	21	100
07		33	13.6	13	59.1	6	27.3	22	100
08		26	81.3	6	18.8	0	0	32	100
09		16	76.2	2	9.5	3	14.3	21	100
10		37	66.1	15	26.8	4	7.1	56	100
Total		240	65.4	82	22.3	45	12.3	367	100

Table 2.14. Distribution of power/influence score - Government Official Level

Water- course	Score*	0-33%		34-66%		67-100%		Total	
		n	%	n	%	n	%	n	%
01		29	93.5	1	3.2	1	3.2	31	100
02		14	66.7	4	19.0	3	14.3	21	100
03		7	38.9	7	38.9	4	22.2	18	100
04		44	95.7	0	0	2	4.3	46	100
05		88	88.9	6	6.1	5	5.1	99	100
06		11	92.4	8	38.1	2	9.5	21	100
07		14	63.6	6	27.3	2	9.1	22	100
08		29	90.6	3	9.4	0	0	32	100
09		17	81.0	1	4.8	3	14.3	21	100
10		47	83.9	6	10.7	3	5.4	56	100
Total		300	82.0	42	11.2	25	6.8	367	100

*Converted to percent of possible score.

have no influence. On one watercourse (number 09) about twenty-two percent of the farmers are said to have substantial influence with government officials; on the rest very low percentages have such power.

Freeman and Lowdermilk (1976:706-709) state that power and influence is significantly associated with size of landholdings, mass media exposure, high adoption of improved technology, and more knowledge of available irrigation and agricultural services, though they later qualify these correlations (see Lowdermilk, Freeman, and Early, 1978, vol. IV:203-20). We found that power and influence on our sample of ten watercourses is very highly associated ($P < .001$) with landholding on the watercourse. This is true for both parameters of power and influence, as Tables 2.15 and 2.16 show. However, it is noteworthy that a large landholding is no guarantee of power/influence: the majority of farmers with holdings over 25 acres had medium or no power/influence, as these Tables also show.

Both parameters are also highly correlated ($P < .01$) with educational level, as Tables 2.17 and 2.18 show. Again, it is notable that the few highly educated sample farmers (F.A. and B.A. and above) are not very influential on either parameter; a larger sample might even show a curvilinear relation between education and power/influence at least at the community level.⁴ It is significant that even though all of these associations have very little likelihood of occurring by chance, the low value of "C" indicates the relationships are weak; there are a multiplicity of independent variables operating behind the power/influence scores.

⁴/Educational level and land holding are very highly correlated ($P < .001$) also; both of these are undoubtedly related sources of power and influence, along with other factors such as one's kinship network and personality factors.

Table 2.15. Land on watercourse by power/influence at biraderi village level.

Land holdings in acres	Power/influence scores			Total
	Low 0-33	Medium 34-66	High 67-100	
Up to 6.4	131	31	4	166
6.5-12.4	39	14	13	66
12.5-18.4	57	20	10	87
18.5-25.0	9	10	9	28
Over 25.0	4	7	9	20
Total	240	82	45	367

 $\chi^2=63.4728$ $df=8$ $P<.001$ $C=0.384$

Table 2.16. Land on watercourse by power/influence with Government officials.

Land holdings in acres	Power/influence scores			Total
	Low 0-33	Medium 34-66	High 67-100	
Up to 6.4	155	9	2	166
6.5-12.4	48	13	5	66
12.5-18.4	75	5	7	87
18.5-25.0	16	8	4	28
Over 25.0	6	7	7	20
Total	300	42	25	367

 $\chi^2=74.3063$ $df=8$ $P<.001$ $C=0.410$

Table 2.17. Education and power/influence in Biraderi/Village.

Education Categories	Power/Influence Scores			Total
	Low 0-33	Medium 34-66	High 67-100	
No Schooling	54	20	8	82
Up to Primary	12	7	5	24
Up to Middle	13	10	8	31
Up to Matric	9	9	14	32
College Education (F.A., B.A., & above)	3	4	1	8
Total	91	50	36	177

$$\chi^2 = 22.9171 \quad df = 8 \quad P < 0.01 \quad C = 0.338$$

Table 2.18. Education and power/influence with Government Officials.

Education Categories	Power/Influence Scores			Total
	Low 0-33	Medium 34-66	High 67-100	
No Schooling	69	11	2	82
Up to Primary	18	3	3	24
Up to Middle	18	7	6	31
Up to Matric	15	8	9	32
College Education (F.A., B.A., & above)	5	1	2	8
Total	125	30	22	177

$$\chi^2 = 23.4740 \quad df = 8 \quad P < 0.01 \quad C = 0.342$$

The distribution of power and influence on a watercourse may be analyzed in terms of two concepts, concentration of power/influence, and centrality of power/influence (see Freeman and Lowdermilk, 1978).

1. "Concentration of power/influence" defines the extent to which power/influence is equally distributed among farmers on the watercourse: proceeding downward from the highest score, this tells us how many farmers it takes to reach fifty percent of the sum of all power/influence scores. The more farmers scores required to reach this score, the greater is the equality of power/influence.
2. "Centrality of power/influence" is the percentage of farmers on a watercourse who score some specified amount of the potentially highest influence score. Farmers who score high are more "central" in the watercourse decision-making network - i.e., have more power/influence and are therefore in some sense "leaders" or potential leaders. It is conceivable though unlikely that everybody on a watercourse could score very high (or very low). We have arbitrarily chosen seventy percent as the criterion for high centrality.

Table 2.19 presents the concentration scores of each of the watercourses, and ranks the watercourses on this dimension, from one to ten. If this table is compared to Table 2.12, the concentration of landholding on the sample watercourses, it is obvious that power and influence is even more concentrated - the distribution is even less equal - than is true for land. This is true for seven of the ten watercourses.

Table 2.20 compares the rank of each watercourse in concentration of land and concentration of power and influence. Surprisingly enough, despite the high overall correlation of size of landholding and power/influence, the correlation of the ranking of concentration of the two variables is not statistically significant.⁵ This and the comments

⁵/For all rank correlations among watercourses in this report (N=10), the standard for accepting correlations as significant at the 0.05 level is 0.564 and if a value is equal to or higher than 0.746 it is significant at 0.01 level (Siegel, 1956).

Table 2.19. Concentration Score: Percentage of farmers possessing half of the total power and influence on each watercourse.

Water-Course	Total No. of share-holders	Government Official level		Biraderi level		Ranking*	
		n	%	n	%	Biraderi level	Govt. Official level
01	31	3	9.4	9	28.1	4	9
02	21	4	19.0	5	23.8	6	4
03	18	5	27.7	7	38.8	1	2
04	46	10	15.2	10	15.2	9	6
05	99	8	8.1	14	14.1	10	10
06	21	6	28.6	7	33.3	3	1
07	22	5	22.7	8	36.4	2	3
08	32	5	15.6	7	21.9	7	5
09	21	3	14.3	4	19.0	8	8
10	56	8	14.3	15	26.8	5	7

*From most equal distribution to least equal distribution of power and influence.

Table 2.20. Rank correlation of concentration of land on watercourse and power/influence in biraderi/village.

Watercourse	Concentration	
	Land holding rank	Power/influence rank
01	2	4
02	3	6
03	1	1
04	7	9
05	8	10
06	9	3
07	4	2
08	6	7
09	5	8
10	10	5

$$r_2 = 0.42 \quad P > 0.05$$

above suggest concentration of landholding cannot be used directly as a measure of concentration of power/influence; a large holding is a necessary but not sufficient basis for power/influence.

Table 2.21 presents the "Centrality" scores of each of the ten sample watercourses. On only two watercourses (numbers 02 and 03) do a third or more of the shareholders obtain at least seventy percent of the possible score on the biraderi parameter; six score under twenty percent with two of these having no one who achieved a seventy percent score. The percentages of farmers scoring high in centrality on the government official parameter are even lower than on the biraderi parameter; this indicates how few people are viewed as having any real influence with government officials.

Table 2.22 presents the average power/influence scores for each watercourse by position on the watercourse. It shows that there are significant differences among the watercourses in relative concentration of power/influence on different watercourse positions. On five watercourses (02, 04, 07, 08, and 10) the average Tail score is less than the average Head score, suggesting the Tail farmers are less influential than the Head farmers. On the other hand, on three watercourses (03, 06, 09) the Tail farmers are relatively more powerful than the Head farmers. We would expect better maintenance on these three watercourses than on the five mentioned above.

"Progressiveness": Education, Media Use, and Availability of Institutional Services

Educational level and use of mass media - here frequency of radio listening - are measures of at least potential contact with sources of

Table 2.21. Centrality Score: Percentage of farmers scoring 70% or more of possible power and influence score.

Water-course	Total No. of share-holders	70% +				Ranking*	
		Biraderi level		Govt. official level		Biraderi level	Govt. official level
		n	%	n	%		
01	31	2	6.2	1	3.1	7	7
02	21	8	38.1	3	14.3	1	2
03	18	6	33.3	4	22.2	2	1
04	46	0	0	2	4.3	9	6
05	99	6	6.1	2	2.0	8	8
06	21	4	19.0	2	9.5	3	4
07	22	3	13.6	3	13.6	5	3
08	32	0	0	0	0	9	9
09	21	3	14.3	2	9.5	4	4
10	56	6	10.7	5	8.9	6	5

*From highest to lowest score.

Table 2.22. Watercourse wise average power/influence on head, middle, tail.*

Watercourse	Position on watercourse			Overall average
	Head	Middle	Tail	
01	14.6	42.0	15.4	23.7
02	57.7	56.5	7.0	45.0
03	54.0	64.2	83.0	62.7
04	19.0	15.3	10.1	14.7
05	15.7	22.1	17.1	18.3
06	38.8	52.0	50.4	45.3
07	56.0	57.2	35.2	50.6
08	16.5	23.5	7.2	17.2
09	11.2	32.0	38.7	27.9
10	41.6	25.6	30.2	30.7

*Biraderi/village parameter.

new ideas and perspectives, and are indirect measures of exposure to, if not knowledge of, new ideas. Institutional services are usually present in the village because there was a demand for them, as well as sufficient influence to get them. We have tried to combine these three parameters to measure "progressiveness" of communities.

Education

Table 2.23 summarizes the educational level of sample farmers on the ten watercourses, and ranks the watercourses on the basis of percentage of farmers with better than a primary education. Nearly half (46.3 percent) of all the sample farmers have no education at all. The watercourses vary considerably in educational attainments: on four watercourses, over fifty percent of the farmers have no education; on one of these only two men out of a total of twenty-two have any education at all. On the other hand, on four watercourses fifty percent or more of the farmers have better than a primary education.

Radio Listening

Table 2.24 shows that except for watercourse number 10, between one-fourth and one-half of the sample farmers are frequent listeners of the radio. Watercourse number 10 is remarkable because over 90 percent say they never listen to a radio. Tables 2.25 and 2.26 give some indication of the types of programs listened to by sample farmers. Farm programs are the first preference for about 56 percent of all farmers, but there is a great deal of variation in this by watercourse. World news is a distant second preference followed by musical programs. When sample farmers were asked specifically about frequency of listening to farm radio programs, over half said they never listen while fewer than thirty percent said they frequently listen to farm programs (see Table 2.26).

Table 2.23. Educational level of sample farmers.*

Water-course	None		Up to primary		Up to middle		Up to matriculation		Above matriculation		Total Above primary		Rank Educational Level**
	n	%	n	%	n	%	n	%	n	%	n	%	
01	5	31.3	3	18.8	4	25.0	4	25.0	0	0	8	50.0	4
02	9	56.3	1	6.3	4	25.0	2	12.5	0	0	6	37.5	5
03	8	44.4	6	33.3	3	16.7	1	5.6	0	0	4	22.3	9
04	11	48.8	1	6.3	1	6.3	2	12.5	1	6.3	4	25.1	8
05	11	42.3	1	3.8	7	26.9	6	23.1	1	3.8	14	53.8	3
06	8	53.3	2	13.3	0	0	4	26.7	1	6.7	5	33.4	6
07	2	11.8	1	5.9	7	41.2	5	29.4	2	11.8	14	82.4	1
08	4	25.0	7	43.8	1	6.3	3	18.8	1	6.3	5	31.4	7
09	4	26.7	2	13.3	2	13.3	5	33.3	2	13.3	9	59.9	2
10	20	90.9	0	0	2	9.1	0	0	0	0	2	9.1	10
Total	82	46.3	24	13.6	31	17.5	32	18.1	8	4.5	71	40.1	

*Heads of households.

**From highest percentage of farmers with an education above primary level, to lowest percentage.

Table 2.24. Watercourse-wise radio listening by sample farmers last week

Water-course	Total sample	Never listened		Sometimes listened		Frequently listened		Rank*
		n	%	n	%	n	%	
01	16	7	43.8	4	25.0	5	31.3	4
02	16	8	50.0	2	12.5	6	37.5	5
03	18	5	27.8	4	22.2	9	50.0	1
04	16	9	56.3	1	6.3	6	37.5	7
05	26	11	42.3	2	7.7	13	50.0	3
06	15	9	60.0	2	13.3	4	26.7	8
07	17	7	41.2	2	11.8	8	47.1	2
08	16	9	56.3	1	6.3	6	37.5	7
09	15	8	53.3	3	10.0	4	26.7	6
10	22	17	77.2	2	9.1	3	13.6	9
Total	177	90	50.8	23	13.0	64	36.2	

*From lowest percent who never listened, to highest percent of non-listeners.

Table 2.25. Watercourse-wise radio programs: first preference.*

Water-course	Musical		Farm		World News		Local		Religious		Total
	n	%	n	%	n	%	n	%	n	%	
01	0	0	6	66.7	3	33.3	0	0	0	0	9
02	0	0	5	62.5	2	25.0	1	12.5	0	0	8
03	4	30.8	9	69.2	0	0	0	0	0	0	13
04	0	0	4	57.1	3	42.9	0	0	0	0	7
05	2	13.3	9	60.0	2	13.3	2	13.3	0	0	15
06	1	16.7	5	83.3	0	0	0	0	0	0	6
07	1	10.0	5	50.0	1	10.0	3	30.0	0	0	10
08	0	0	2	28.6	5	71.4	0	0	0	0	7
09	2	28.6	1	14.3	3	42.8	0	0	1	14.3	7
10	1	20.0	3	60.0	0	0	1	20.0	0	0	5
Total	11	12.6	49	56.3	19	21.8	7	8.0	1	1.1	87

*Percentages calculated based on 87 who said they had listened to the radio (Table 2.24).

Table 2.26. Watercourse-wise farm radio listening time.

Water-course	Never		Sometimes		Frequently		Total	
	n	%	n	%	n	%	n	%
01	7	43.8	6	37.5	3	18.8	16	100
02	8	50.0	3	18.8	5	31.3	16	100
03	6	33.3	3	16.7	9	50.0	18	100
04	9	56.3	1	6.3	6	37.5	16	100
05	18	69.2	0	0	8	30.8	26	100
06	9	60.0	2	13.3	4	26.7	15	100
07	7	41.2	4	23.5	6	35.3	17	100
08	10	62.5	0	0	6	37.5	16	100
09	8	53.3	4	26.7	3	20.0	15	100
10	19	86.4	0	0	3	13.6	22	100
Total	101	57.1	23	13.0	53	29.9	177	100

Table 2.27. "Progressiveness" ranking.

Parameter/Ranking	1	2	3	4	5	6	7	8	9	10
Available Institutional Services	01*	07*	06	09	05	10	08	02	03 ^x	04 ^x
Educational Level	07	09	05	01	02	06	08	04	03	10
Frequency Radio Listening	03	07	05	01	02	09	04 ^{\$}	08 ^{\$}	06	10
Overall Rank	07	01	05	09	06	02	03	08	04	10
(Score)	(28.5)	(23.5)	(22.0)	(21.0)	(15.5)	(15.0)	(13.5)	(10.5)	(8.5)	(7.0)

Derived from Tables 2.3, 2.23 and 2.24.

Scoring: For each watercourse, each instance of rank no. 1=10, 2=9, 3=8, 4=7, 5=6, 6=5, 7=4, 8=3, 9=2, and 10=1 points. These points are summed for each watercourse. The maximum possible score is 30 (rank number one, 3 times), the minimum is 3.

In three cases (marked *, x, \$) two watercourses had equal scores; both are given an average of two adjacent scores:

* Equal rank - give 9.5 each ($\frac{10 + 9}{2}$).

x Equal rank - give 1.5 each ($\frac{2 + 1}{2}$).

\$ Equal rank - give 3.5 each ($\frac{4 + 3}{2}$).

"Progressiveness" Ranking

The institutional services available in each village, and the ranking of the communities on this parameter, were presented in Table 2.3. Table 2.27 gives the rank of each watercourse on three parameters, availability of institutional services, educational level, and frequency of radio listening. Each watercourse is awarded points depending on its rank on each parameter, and a total score is arrived at by adding these. These scores are then ranked. Out of a maximum possible score of 30, the range of scores is from 28.5 to 7.0. This ranking will be used in subsequent sections for testing hypotheses concerning likelihood of success of collective water management efforts.

Sample Farmers' Evaluations of Government Services

In our interim report we included as a measure of "progressiveness" attitudes toward the helpfulness of government services (Mirza and Merrett 1978). On further reflection, this inclusion seems inappropriate, even though it does not change the ranking significantly; it is conceivable that very progressive people may perceive government services as inefficient and more of a hindrance than a help. Therefore, we are treating this topic separately in this report.

We asked sample farmers to rate the helpfulness of the following: Agricultural Officer; Field Assistant; Bank/Credit personnel; Cooperative Department; Revenue Patwari; Canal Patwari; Zileadar; Canal SDO; Overseer On-Farm Water Management Area Team; and the Watercourse Committee. The responses were converted to numerical scores ranging from 4 for very helpful to 0 for harmful; 2 is scored for a neutral response. Their sum is used as an overall measure of attitudes toward the helpfulness of government services. A score of 22 or less indicates the respondent does not perceive government services as helpful. Table 2.28 presents these data.

Table 2.28 Evaluation of helpfulness of institutional services

Water-Course	Not Helpful						Helpful						Rank of helpfulness perception*
	0-11		12-22		Total		23-33		34 plus		Total		
	n	%	n	%	n	%	n	%	n	%	n	%	
01	0	0	6	37.5	6	37.5	9	56.3	1	6.3	10	62.6	1
02	5	31.3	10	62.5	15	93.8	1	6.3	0	0	1	6.3	9
03	0	0	16	88.9	16	88.9	2	11.1	0	0	2	11.1	8
04	11	68.8	3	18.8	14	87.6	2	12.5	0	0	2	12.5	7
05	4	15.4	13	50.0	17	65.4	8	30.8	1	3.8	9	34.6	5
06	4	26.7	6	40.0	10	66.7	4	66.7	1	6.7	5	33.4	6
07	0	0	7	41.2	7	41.2	9	52.9	1	5.9	10	58.8	2
08	9	56.3	7	43.8	16	100.0	0	0	0	0	0	0	10
09	3	20.0	6	40.0	9	60.0	5	33.3	1	6.7	6	40.0	4
10	3	13.6	8	36.4	11	50.0	8	36.4	3	13.6	11	50.0	3
Total	39	22.0	82	46.3	121	68.3	48	27.1	8	4.5	56	31.6	

*Ranked from highest percentage rating Government services as helpful, to lowest percentage.

It is remarkable that more than two-thirds of the sample farmers rate government services as "not helpful" overall. There is again, considerable variation by watercourse: on eight of the sample watercourses, fifty percent or more of the farmers rate government services negatively, while on only three watercourses, fifty percent or more rate them positively. Only eight farmers out of the sample of 177 rated government services as very helpful (over 34 points out of 44). Perception of helpfulness of Government services are correlated with education, size of landholding on the watercourse and power/influence score. Table 2.29 shows that education is very highly correlated ($P < .001$) with perceiving government services as helpful; this presumably reflects the greater access of educated people to these services. Examination of the table shows that while all three of the above - B.A. respondents rate government services as helpful, four of the five intermediate-educated respondents perceive them as unhelpful; and nearly 80 percent of those with no education perceived the Government as not helpful.⁶

Table 2.29 Education and helpfulness of institutional services

Education Categories	Unhelpful 0-11 & 12-22	Helpful 23-33 & 34-44	Total
No Schooling	65	17	82
Up to Primary	18	6	24
Up to Middle	13	18	31
Up to Matric	21	11	32
Up to College (F.A., B.A., & above)	4	4	8
Total	121	56	177
$\chi^2 = 20.5685$	df=4	$P < 0.001$	C=0.323

⁶/Nevertheless, watercourse 10, with only 2 farmers having any education at all, ranks third in perceiving government services as helpful.

Land is also significantly correlated with perceptions of the helpfulness of the government, but the association is not as strong as is education ($P < .05$; see Table 2.30). Perception of helpfulness is more highly correlated with power/influence at both the biraderi and government official level ($P < .01$ and $< .02$ respectively; see Table 2.31 and 2.32). However, close examination of the over twenty-five score category in Table 2.30, and the high power/influence categories in Table 2.31 and 2.32, shows that these attributes are no guarantee of a positive attitude toward government services. Very large percentages of respondents even in these categories (range: 45.4 to 77.8 percent) rate government services as relatively unhelpful. This is the reason the value of "C" is very low. All of these data suggest a widespread dissatisfaction with the present level of government services in rural areas. This negative attitude undoubtedly affects the farmers' willingness to cooperate with the government of development projects.

Conflict Polarization

Freeman and Lowdermilk (1978) suggest a method for determining the patterns of cleavage and polarization of a community. Their method involves taking each issue that has led to division of the community into different groups (excluding petty personal quarrels), and examining the nature of the groups formed. If the same groups oppose each other on every issue, the community may be said to be highly polarized, and is probably not a good candidate for a cooperative project. If different groups form for each issue, so that the lines of cleavage are cross-cutting, then the community may be a good candidate for a watercourse improvement project. Lowdermilk, Freeman, and Early (1978, Vol. IV: chapter 5) applied this method successfully to some villages in their sample.

Table 2.30 Land on watercourse owned by sample farmers and helpfulness of institutional services

Land Holding Categories	Unhelpful 0-11 & 12-22	Helpful 23-33 & 34-44	Total
Up to 6.4 acres	40	12	52
6.5 - 12.4	21	8	29
12.5 - 18.4	35	17	52
18.5 - 25.0	11	15	26
Over 25.0	14	4	18
Total	121	56	177
$\chi^2 = 11.0275$ $df=4$ $P<0.05$ $C=0.242$			

Table 2.31 Power/Influence in biradari possessed by sample farmers and helpfulness of institutional services.

Power/Influence Score	Unhelpful 0-11 & 12-22	Helpful 23-33 & 34-44	Total
0 - 33	72	19	91
34 - 66	31	19	50
67 - 100	18	18	36
Total	121	56	177
$\chi^2 = 11.4159$ $df=2$ $P<0.01$ $C=0.246$			

Table 2.32 Power/Influence in government possessed by sample farmers and helpfulness of institutional services

Power/Influence Score	Unhelpful 0-11 & 12-22	Helpful 23-33 & 34-44	Total
0 - 33	93	32	125
34 - 66	18	12	30
67 - 100	10	12	22
Total	121	56	177
$\chi^2 = 8.4176$ $df=2$ $P<0.02$ $C=0.213$			

We attempted to follow their method, but discovered that it was difficult to get a list of issues from respondents, and even more difficult to get data on the divisions over these issues. In the end we failed to get the kind of data required for this type of analysis even for "issues" relating to watercourse improvement. Based on our experience, we suggest their methodology may be inappropriate for Pakistani villages for two reasons.

First, informants in many villages - especially those with the most conflict, it seems - were reluctant to discuss conflict in the village. In several instances pressing such questions further would obviously have made it difficult to gather other data. This type of data can only be gathered if the researcher spends a fairly long period in the village and succeeds in gaining good rapport.

Second, unlike American patterns of politics, issues are not the salient features of Pakistani local conflicts. American political conflict usually does revolve around issues, and the method is therefore quite suited for an American community. However, conflicts in rural Pakistan often have very little to do with any particular issue; rather they are based on personal and social relations; people do not choose sides on a particular "issue", if one arises, based on their perception of the issue itself. Hence a man may oppose a watercourse reconstruction program, not because he is against the program itself or sees no advantage to improving his watercourse, but because he wishes to prevent his opponents from getting benefits, even if he has to forgo any benefits for himself. This is discussed more fully in Merrey (1979).

Villages and Watercourses: Cooperation and Conflict Before Watercourse Improvement

Up to this point we have taken various topics such as power/influence or land holdings and compared the sample watercourses, looking for general patterns. In this section we combine some of this material with our diary data to give a very brief picture of each watercourse. The social organization of any particular community is enormously complex and no complete description is possible. The objective of these brief paragraphs is to help answer the question of whether these watercourses were in fact good candidates for improvement project.

Watercourse 01

This community, located in Tehsil Chichawatni (District Sahiwal), exhibits an unusually high level of cooperation, and we found no evidence of serious conflict, past or present. Even though it is classified as "multi-biraderi" in Table 2.2, the diaries emphasize that there is no tension among these; most people are Jats from Hoshiarpur (East Punjab) and often refer to themselves collectively as "Hoshiarpuri". Aside from having most of the amenities on our "institutional services" list (Table 2.3), this community also has a telephone exchange connection, a drinking water supply system, and while our researchers were present, they were organizing a village drainage project. Although it ranks low in "centrality" (the percentage of farmers having substantial influence), the village does have two major leaders, both numerdars and both relatives who are trusted by others and who provide leadership for various projects. The village Cooperative Society is said to be working satisfactorily; there is a profit-making Credit Society (both established in the 1920's and 1930's), and in 1978 a new society was formed to help students financially with their education, and to work to better the village.

examination of the previous tables shows the community ranks very high compared to the others in equality of landholding, having small but viable-sized holdings, equality of power/influence, and "progressiveness". The sample watercourse is a "single-branch" one. Influential farmers are concentrated on the Middle portions. All three watercourses in this village have been improved.

Watercourse 02

This watercourse is located in Tehsil (and District) Sahiwal. Although the largest group in the village is Christians, who own a little land and are otherwise tenants and renters, the largest biraderi on the sample watercourse is the Jat-Dial. The Dial form one of the two major parties in the village; the other consists of an alliance of the other Jat subcastes/biraderis. Our diaries show there is a great deal of tension and competitiveness between these two groups, although there have been no serious incidents in recent years. The Dial especially have a reputation for aggressiveness. There is also considerable tension between the larger land owners and the kamis, ostensibly over distribution of land for housing in the "five marla scheme", and between the larger owners (Dials) at the head of the sample watercourse, and the Christian small owners and tenants at the Tail. The boys' primary school has collapsed and the villagers have not been able to overcome their differences to get it repaired; similarly, the Cooperative Society is not active, and a religious institution established by the Dial gets no support from the other groups. Nevertheless, an examination of the previous tables shows this watercourse ranks high to medium on the parameters discussed, except that the Head and Middle farmers have a near monopoly on power/influence in the village.

Watercourse 03

This watercourse is located in Tehsil Toba Tek Singh, District Faisalabad. Both the village and the sample watercourses are dominated by one subcaste, the Marth; there are no recognized sub-division of this group. These are relatively large farmers: no one on the watercourse has less than 12.5 acres either total or watercourse holding; on the other hand, 33 percent of the farmers on the watercourse have total holdings larger than 25 acres. This village also has the most equal distribution of landholdings in our sample: the first 44.4 percent of the farmers hold 50 percent of the land. Except for the boys' and girls' primary schools and a Cooperative Society this village has none of the other institutional services on our list; because of the lack of electricity the farmers have diesel-powered tubewells and complain of their expense. The village has an Islahi Committee but it is said not to be active; however, there is a "religious committee" that operates both a religious school and a mosque. There is no evidence of serious conflict or tension in this village past or present. There are no single outstanding leaders, but many people do have influence in the biraderi. There is a felt water shortage due, according to the farmers, to a mogha that is too small, but they have been unsuccessful in their negotiations with the Irrigation Department. Except for our "progressiveness" scale (especially the educational level and institutional services components), this village ranks in the top three on the other measured parameters (percentage of small economically viable holdings; equality of land holdings and power/influence, centrality of power/influence), has the smallest number of shareholders, and a concentration of power/influence at the watercourse Tail. Three of the four watercourses in this village have been improved.

Watercourse 04

Located in Tehsil Khanewal, District Multan, the majority of the farmers in this village are Christians. Their land holdings are generally small. They are further sub-divided into Protestants and Catholics, and the Protestants are themselves subdivided into two antagonistic groups. The Catholics are relatively poor, and either have small holdings or are laborers and tenants. The two Protestant groups are very competitive and in open conflict with each other. There are court cases between them, and our researchers were present on Christmas Day when they each used loudspeakers to try to disrupt the other's celebrations. There are also a few Muslims in the village, relatively large land owners with their land at the Head of the watercourse. There are two Muslim leaders, one an aggressive obstructionist who is involved in a court case with some kamis,⁷ (whose land he is alleged to have grabbed) and the other a cooperative man who is popular with all groups. A few years ago he was responsible for setting up a successful Cooperative in the village. On most of the parameters discussed above this community ranks quite low: the distribution of land and power/influence is very concentrated; few farmers have significant power/influence; education and "progressiveness" levels are comparatively low; and most of the power/influence is concentrated at the Head of the watercourse. Only one of the four watercourses in the village is improved.

Watercourse 05

This watercourse, located in Samundri Tehsil, District Faisalabad, is the largest in our sample in terms of length, commanded area, and

⁷/Village servants and craft specialists such as blacksmiths, potters, etc.

number of shareholders (99). Both the village and the watercourse are overwhelmingly dominated by one caste of refugees from India, Gujars. Although there are named subdivisions based on their ancestral origin, in fact, these divisions have no practical consequence; this is a single-biraderi watercourse and village. We found no evidence of social conflict or cleavage at either the village or watercourse level. On the other hand there was also no evidence of ability to cooperate, except for a functioning Cooperative Society. The community seems to lack leadership; the few men with influence are said to pursue only their own interests. As in village 04, over eighty percent of the shareholders scored less than thirty-three percent of the possible power/influence scores on both the biraderi and government official levels. This is related to the high percentage of farmers with very small holdings (almost 72 percent of the watercourse shareholders have less than 6.5 acres of land), and the low percentage of farmers having significant power and influence (centrality score). The concentration of both land and power/influence in a few hands is very high, but power/influence is fairly evenly distributed, and very low, throughout the length of the watercourse. This community ranked third in educational level and third in overall "progressiveness" score. Both the watercourses in this village have been at least partly improved.

Watercourse 06

This village, located in Tehsil Chiniot, District Jhang, is "settled" by "locals"; that is, the dominant subcaste, Rajput-Japey, migrated from near by Shahkot to this village at the time the canal was built. The village and watercourse are completely dominated by the Japey. They are in fact subdivided into three subgroups, "Dare Ke", "Hamid Ke", and "Baluch Ke". The Dare Ke are slightly dominant in that

the most influential leader in the village is from this group, and this group is closer to the Hamid Ke than to the Baluch Ke. The reason for this is that about thirty years ago, some Baluch Ke murdered two men associated with the Dare Ke, including the younger brother of the present Dare Ke leader; three men were hung for this and a fourth got life imprisonment. All informants insisted there is now no tension, as the executions satisfied the victims' families. We did not get a breakdown of the membership in these three groups, partly because questions about divisions and conflict appeared to our assistants to be endangering their rapport with the villagers. The Dare Ke leader is very influential - even feared - in the village, but is also "progressive"; he is a former chairman of the Union Council, and organized the village to build paved lanes and drains in the village. The farmers on the sample watercourse feel their water is very short, and claim to have paid large sums to Irrigation Department officials to get their mogha (outlet) redesigned, but to no avail. This community ranks fourth in percent of farmers having small but viable holdings (6.5 to 25 acres), but land holdings are relatively concentrated. The distribution of power and influence is relatively equal, and a relatively high percentage of farmers have significant power/influence (high centrality); further, power/influence on the watercourse is concentrated at the Middle and Tail sections. It is also a relatively small watercourse, with a single biraderi. On the "progressiveness" scale the watercourse ranks fifth. Only one of the three watercourses in the village is improved.

Watercourse 07 (Watercourse C in Interim Report)⁸

This community is located in Tehsil and District Faisalabad. It is an overwhelmingly single-biraderi village and watercourse. Each of the three watercourses is improved, and each has a Cooperative tube-well at its Head. Aside from the institutional services listed in Table 2.3, on which this village ranks first, the village also has veterinary services available, a government dispensary, and is the location of the Integrated Rural Development Program Project Manager's Office. There has been some conflict between two related leaders apparently competing for prominence, which has reduced the effectiveness of the Cooperative, and led to a court case. However, only one of these has land on the sample watercourse. The sample watercourse has only one branch, and power/influence is greater at the Head and Middle than at the Tail. On all the other parameters discussed above this watercourse ranks high to medium.

Watercourse 08 (Watercourse B in Interim Report)

This village is located in Tehsil Bhalwal, District Sargodha in the Mona Project area. Although the sample watercourse is single-branched, the village and watercourse are subdivided into several biraderis among whom the level of tension and hostility is very high. However, as noted in our Interim Report (Mirza and Merrey, 1978), the villagers were reluctant to discuss these matters and we did not get many details on their disputes. Aside from, and related to, the inter-biraderi hostilities, there was also considerable tension between small and big farmers, and the Tail and other farmers. The Middle and Head farmers are relatively more influential than the Tail farmers. The

⁸/See Mirza and Merrey (1978) for a more detailed discussion of water-courses 07-10.

complete absence of any influential leaders is also very significant, and related to the strong cleavage. This community ranks medium to low on all of the parameters discussed above.

Watercourse 09 (Watercourse A in Interim Report)

Also located in the Mona Project area (Tehsil Bhalwal, District Sargodha), this village is also a multi-biraderi village. However, the existing factions are not based completely on this caste or biraderi structure. There are two leaders in the village who have organized factions around their personalities. One is a religious-minded Gujar who is interested in welfare-oriented projects; all of his land is on the other watercourse. He seems to get much of his support from small farmers and kamis.

The other major leader is a Malik-Khokar who is a graduate (B.A.) and projects an image of "progressiveness". Most but not all of his land is also on the other watercourse. He has very good relations with various government officials, and in general, has the support of the other larger farmers. The Gujar are divided in their support between the Gujar leader discussed above and a third aspiring leader allied to the Malik-Khokar. All of this man's land is on the sample watercourse, so he is not forced to cooperate or compete with the other two on watercourse work.

The tension between these two groups is active but not open and has not prevented them from cooperating on various projects aside from the improvement of both watercourses in the village. There is also a related undercurrent of tension between the small and big farmers on the watercourse, but this also has not prevented them from cooperating. Power/influence on the sample watercourse is greater at the Tail and

Middle than at the Head, and the watercourse scores medium on all the parameters discussed above.

Watercourse 10 (Watercourse D in Interim Report)

This watercourse is located in Tehsil Jaranwala, District Faisalabad. One Jat subcaste, the Athwal, is very dominant in the village, and is by far the largest group on the sample watercourse. However, it is divided into two factions. The larger group is led by one of the four numberdars in the village. Though he has the nominal support of perhaps ninety percent of the Athwal, much of it is apparently not very committed. The other, smaller, faction is led by an obstructionist who is willing to use force to intimidate others and achieve his ends; and he is said to have a great deal of influence with the police. Most people are, therefore, afraid of him; there have been incidences of violence and court cases between these groups. Both these men are on the sample watercourse. There is a second numberdar, also on this watercourse, who projects an image of "progressiveness" and is credited by some with trying to get improvements for the village, but like the first numberdar he is rather weak. The tensions and hostility not only between the factions, but even within the factions and among individuals makes it difficult for the villagers to cooperate on any collective project. Power/influence on this watercourse is concentrated at the Head; and such a large percentage of the farmers have total land holdings under 6.5 acres (about 73 percent) that this community ranks last on percentage of small viable holdings, last on equality of land holdings, and medium to high on the other parameters discussed. Only one of the four watercourses in the village is improved.

Conclusion

One purpose of this chapter has been to present background data on our sample watercourses; much of this material will be used in the remaining chapters to analyze the reasons for differences among the watercourses in relative success of the watercourse improvement and subsequent maintenance. The other purpose of this chapter is to present sufficient background material to enable the reader to judge whether each of these watercourses was a good candidate for a watercourse improvement project or not. Given that OFWM now has substantial demand for watercourse improvement, those watercourses ought to be chosen where the likelihood of a successful project, especially good maintenance, is high; communities that, under present improvement conditions, are unable to cooperate sufficiently for completing an improvement project, and then maintaining the watercourse, are unlikely to reap any benefits; and in such cases, the limited resources of the nation are simply wasted. This final section briefly reviews the criteria for choosing watercourses with a high likelihood of success, and then classifies the sample watercourses accordingly.

The criteria are implicit in the working hypotheses presented in Chapter One. The following characteristics are suggested as being conducive to farmers' successful cooperation on a collective watercourse project:

1. Single-biraderi structure;
2. equality of landholding;
3. equality of power/influence;
4. high centrality of power/influence (that is, a high percentage of farmers having substantial power/influence);

5. location of relatively influential farmers at the Tail or Tail and Middle of the watercourse;
6. degree of previous cooperation on other projects.
7. minimum of conflict among watercourse shareholders;
8. high degree of "progressiveness";
9. high percentage of small economically viable land holdings (i.e. neither too small or too large) defined as between 6.5 and 25 acres;
10. small number of shareholders;
11. single-branch main watercourse;
12. Settlers and Refugees as opposed to "Locals"; and
13. water shortage.

Obviously no watercourse can be or should be expected to fit all of these criteria; but the more of these characteristics possessed by a watercourse, the greater likelihood of success of the project.

Table 2.33 summarizes where each of the sample watercourses fit for each of the above characteristics. Based on this table, we would classify the watercourses as follows:

high likelihood of success (low risk): 01, 03, 06, 07, 09;

success possible but risky: 02, 05;

low likelihood of success (high risk): 04, 08, 10.

High likelihood of Success

These five watercourses rank high to medium in most of the parameters identified. Watercourse 01 possesses nearly all the characteristics hypothesized as conducive to success; even though it is not classified here as single-biraderi, one could argue that it should be. Similarly, 03, 06, 07 and 09 compared to the other sample watercourses, possess a large percentage of the hypothesized prerequisites for success.

Parameter/Watercourse	01	02	03	04	05	06	07	08	09	10
1) Single-biradari structure	no	no	Single	no	Single	Single	Single	no	no	no
2) Equality of land-holding	2	3	1	7	8	9	4	6	5	10
3) Equality of power/influence (biradari)	4	6	1	9	10	3	2	7	8	5
4) Centrality of power/influence (biradari)	7	1	2	9	8	3	5	9	4	6
5) Location influence on watercourse	M	H,M	T, M, H	H, M	about equal	M, T	M, H	M, H	T, M	H
6) Previous cooperation	Yes	no	little	little	no	Yes	Yes	no	Yes	no
7) Previous conflict	no	Yes	little	Yes	no	little	little	Yes	little	Yes
8) "Progressiveness"	2	5	6	8	3	5	1	7	4	9
9) Small viable holdings (total holdings)	1	2	4	5	8	4	3	7	6	9
10) Small number shareholders	4	2	1	6	8	2	3	5	2	7
11) Single-branch watercourse	single	no	no	no	no	no	single	single	no	no
12) Settler/Refugee/Local	S	S	L	S	R	L	S	S	S	L
13) Water shortage measure, excludes tubewells	7	4	5	1	3	2	10	9	8	6

*Derived from previous tables and discussion in this chapter. Numbers are ranks; the lower the number, the closer is the watercourse to having promising characteristics.

A. Success Possible but Risky

Two watercourses, 02 and 05, are classified as doubtful. Watercourse 02 ranks high to medium on the rankable parameters, but it remains a doubtful case because there is no evidence of previous cooperation; it is multi-biraderi; there is evidence of previous conflict among these biraderis; and influence is concentrated at the Head and Middle. In the case of 05, it is a single-biraderi watercourse with no evidence of previous conflict; but except for "progressiveness" it ranks quite low on most of the other parameters, and there is no evidence of previous successful cooperation.

B. Low Likelihood of Success (High Risk)

Three watercourses, 04, 08, and 10 rank consistently low on most parameters, and are characterized by previous conflict and little previous cooperation. They are multi-biraderi, and except for 08, multi-branched watercourses. Influence on the watercourses is concentrated at the Head and Middle. We would definitely have recommended against improvement of these three watercourses at the present time.

In the next few chapters the process of watercourse improvement, and the success of subsequent maintenance on these watercourses, are discussed in the light of these "predictions"; and our hypotheses about the prerequisites of a successful watercourse project are tested.

Chapter Three

THE PROCESS AND RESULTS OF WATERCOURSE IMPROVEMENT

A basic principle underlying the OFWM Project is that farmers must be closely involved in the improvement process, in order to encourage the attitude that the watercourse is the farmers' responsibility, not the Government's. When a new Area Team is established, the OFWM personnel must go out and convince farmers to improve their watercourses; but after a few watercourses have been completed, farmers on other watercourses usually begin applying for improvement. The first written application may be signed by only a few farmers, or by all of them. Farmers and OFWM personnel report that generally the farmers are instructed to remove all the trees located on the sanctioned watercourse; only when this is done is the survey carried out and improvement begun. Successful removal of trees is taken as an indication of both the commitment of the farmers to the project and their ability to cooperate. However, the presence of unremoved trees on some watercourses suggests this is not a consistent requirement.

The farmers are also asked to form a "Watercourse Committee". There are no formal procedures for choosing the members of this committee, and it has no legal status. This committee is meant to coordinate the work of the farmers and the OFWM personnel; it is in charge of organizing the labor, raising the money for paying the masons (and sometimes laborers), and negotiating with both OFWM and farmers in order to make decisions about location of out turns (nakkas), buffalo baths, labor shares, tree removal, etc.

We asked key informants on the sample watercourses how the committees had been chosen. None were chosen by any formal procedure such as voting; the answers were in terms of "mutual decisions by farmers" (six cases), "influentials decided" (3 cases), and "influentials and Government decided" (1 case). In this latter case (Watercourse 06), a second committee had to be chosen after the first failed to get farmers out working; the first committee had consisted of several highly educated men with jobs outside the village who had hoped to increase their prestige through membership on the committee. The second committee was more successful.

Our informants' answers indicate the "consensual" nature of decision making (see Merrey, 1979), in which the key participants are the more influential persons on the watercourse. No informant answered that the committee was consciously chosen on the basis of biraderi or position on the watercourse, though in fact, on multi-biraderi watercourses, each important biraderi does tend to be represented. In general, as Table 3.1 shows, most of the committee members are persons with relatively high power/influence, and relatively large landholdings. On seven of the watercourses a committee chairman was designated; but even on the others, except for village 08, one man acted as the main spokesman.

Table 3.2 shows how long watercourse improvement took on each of sample watercourses, from the date the farmers began uprooting trees, to the installation of pakka nakkas. Three watercourses were finished in two months or less; three in three to four months; three in five months; and one took a full eight months. The mean time required for the process of improvement to be completed was 3.9 months. Delays are often caused by factors not under the control of OFWM or the farmers, such as

Table 3.1 (A) Characteristics of watercourse committee members.

Water- course	Member	Biradari	Land holding (acres)		Position on W/C	Power/Influence		Other Position
			Vill- age	Water- course		% Biradari	% Govt. Official	
1	2	3	4	5	6	7	8	9
01	1	Laisa	12.5	12.5	M	61	33	-
	2	Haira	29.0	12.5	M	73	47	-
	3	Laisa	12.5	12.5	M	60	32	-
	4	Kang	50.0	14.0	T	100	100	Chairman
02	1	Dial	33.0	33.0	H	100	91	-
	2	Dial	31.25	25.0	H	100	60	-
	3	Walah	39.5	27.0	H,M	83	45	-
	4	Dial	20.0	13.5	M	70	28	-
03	1	Marth	32.0	25.0	H	68	44	-
	2	Marth	25.0	25.0	H	97	97	-
	3	Marth	25.0	25.0	M	94	91	-
	4	Marth	18.25	12.5	T	100	97	-
04	1	Pathan	75.0	43.0	H,T	07	84	-
	2	Pathan	87.5	50.0	H,T	68	97	-
	3	Christian- Protestant	9.5	9.5	T	48	17	Chairman
05	1	Gujar	25.0	25.0	H	32	27	-
	2	Gujar	8.0	8.0	H	03	02	-
	3	Gujar	10.0	5.0	H	35	21	-
	4	Gujar	21.0	21.0	M	86	70	-
	5	Gujar	6.0	6.0	M	83	72	-
	6	Gujar	10.0	10.0	M	64	43	-
	7	Gujar	11.0	11.0	M	81	63	-
	8	Gujar	12.5	6.5	M	96	96	Chairman
	9	Gujar	14.5	14.5	M	86	80	-
	10	Gujar	5.0	5.0	T	30	16	-
	11	Gujar	22.0	22.0	T	47	35	-
06	1	Jappay	10.5	6.0	H	79	59	-
	2	Jappay	12.5	10.0	M	82	66	-
	3	Jappay	62.5	37.5	T	93	93	Chairman

Table 3.1 (B) Characteristics of watercourse committee members.

1	2	3	4	5	6	7	8	9
07	1	Randhawa	15.5	12.0	H	91	92	-
	2	Randhawa	6.25	6.25	H,T	41	25	-
	3	Randhawa	37.5	37.5	M,H	88	75	Chairman
	4	Randhawa	30.5	25.0	M	84	66	-
08	1	Borey	38.5	38.5	M	57	40	-
	2	Tiwana	31.0	31.0	H	42	35	-
	3	Jatriana	50.0	14.5	H	16	11	-
	4	Mekan	50.0	40.5	M	50	28	-
09	1	Gujar	37.5	37.5	M	48	32	-
	2	Gujar	29.0	29.0	M	91	89	Chairman
	3	Sayed	18.0	18.0	T	96	93	-
10	1	Athwal	25.0	25.0	H	100	100	Chairman
	2	Athwal	4.0	4.0	T	53	47	-
	3	Athwal	23.0	8.0	T	74	69	Numberdar
	4	Athwal	6.0	6.0	T	37	20	-
	5	Athwal	4.0	4.0	T	46	29	-
	6	Athwal	17.0	8.0	T	89	88	Numberdar
	7	Athwal	12.5	12.5	T	42	23	-

Table 3.2 Time required to complete the improvement process.

Watercourse Activity	01	02	03	04	05	06	07	08	09	10
Date uprooting of trees began	10/77	11/77	07/77	09/77	12/77	07/77	08/77	02/77	09/76	11/77
Date Katcha improvement completed	12/77	12/77	09/77	04/77	04/78	10/77	10/77	03/77	10/76	02/78
Date of completion of pakka nakka installation	12/77	01/78	10/77	05/78	03/78	11/77	12/77	05/77	11/76	04/78
Total time required (Months)	2	1.5*	3.5	8**	5**	5***	4	3	2	5****

* One badly needed culvert at tail not supplied, and a small portion of the tail not improved.

** Have unfinished portions of sanctioned watercourse.

*** Farmers feel this is unfinished because promised buffalo bath was not installed.

****Some nakkas and culverts originally planned were not installed.

nonavailability of cement; nevertheless, nearly four months per watercourse does seem excessive.

Five of these watercourses are in fact not completed, in the farmer and our opinion. Watercourse 02 has a road crossing where no culvert was supplied. This is located near the Tail and the Tail farmers, mostly tenants and small farmers, did not have sufficient influence to get a culvert installed. The watercourse banks are badly damaged at this point. Tail farmers also pointed out a 300 meter section at the Tail which they feel should have been improved.

On Watercourse 10, according to OFWM personnel, some nakkas and culverts were not installed when farmers refused to pay for the masons. Farmers on Watercourse 06 feel the work is incomplete because promised buffalo baths were not built.

On Watercourse 04 and 05, substantial portions of the Middle and Tail sections of the official watercourse (sarkari khal) were not improved. Work on about 1,000 meters of Watercourse 04 could not be completed because of the obstructionist behavior of one farmer, a committee member. Other farmers said they had hoped making him a member of the committee would induce him to cooperate but this tactic failed. He is far more powerful than the small farmers at the Tail, who are therefore helpless to oppose him.

On Watercourse 05, only 790 meters out of a total length of 7,280 meters of sarkari khal were improved. There are various reasons for this. One is OFWM made a tactical error by building the silt tank and a lined section on the Head before any of the other work was completed. They also installed some nakkas near the Head. Work was stopped in April 1978, when some farmers insisted that one more section should be lined,

but OFWM insisted the earthen improvement be finished first. The farmers, according to OFWM personnel, then stopped working, even though the extra section was sanctioned. The farmers say that in fact all but two of them worked well until harvest season, but stopped work to harvest their wheat. The problem seems to have been poor leadership: a few influential farmers irritated OFWM with unreasonable demands for lining and nakkas for themselves, and spoiled the project for all.

Issues and Decisions During Improvement

We systematically gathered information from key informants on major issues that could have delayed or disrupted the reconstruction process, the pattern of cleavage if any on each issue, and the resolution of the issue. Based on this data we have classified the watercourses according to the degree of conflict characterizing the improvement process.

On Watercourse 01 informants claimed there was no difference of opinion or conflict over any issue. On Watercourses 02, 03, 06, 07, and 09, one man on each watercourse raised one issue, causing some delay. On three of these watercourses, the issue was re-routing of a section of the watercourse. On watercourses 02 and 06, the objecting farmer, located at the Head in both cases, withdrew his objection; on watercourse 09, WAPDA straightened the route of the watercourse despite the objections of a farmer with land at the Head and Middle.⁹ On Watercourse 03 a dispute over nakkas caused by one Head farmer was settled after the

⁹/In the case of Watercourse 09, although there was little conflict among the farmers of this village during improvement, there was considerable dissatisfaction among farmers of another village located at the Tail of this watercourse. They are small and poor farmers, lacking in influence, and feel they got no benefit from the project even though they did contribute labor. See Mirza and Merrey (1978) for details.

police became involved, while on Watercourse 07, a farmer with land at the Head and Tail objected to uprooting a valuable fruit tree, but did so after biraderi members applied social pressure.

Mirza and Merrey (1978) describe the improvement process on Watercourse 10 in some detail: here a disagreement over the route of the watercourse and some labor problems led to short delays; but the major problem as described in that report, arose between the farmers and certain OFWM personnel.

On three watercourses, 04, 05, and 08, there was considerable conflict among farmers over several issues. Tables 3.3, 3.4, and 3.5 summarize the conflict patterns on these three watercourses. On Watercourse 04, as discussed above, one relatively powerful man obstructed the project; he opposed straightening the watercourse, refused to pay his share for the nakkas, stopped work on the pakka section, and ultimately was responsible for the project not being completed. On Watercourse 05, also, a few relatively powerful men imposed their will on several issues, and ultimately were responsible for the project not being completed. The farmer who refused to cut his trees, and later opposed straightening the route, won concessions both times; and the three who wanted extra lining had it sanctioned even though it was never installed.

The conflict pattern during improvement on Watercourse 08 is described in Mirza and Merrey (1978). In every dispute at least one Kahoot biraderi member is involved in the opposition; even though this is the largest biraderi, it was surprisingly not represented on the Watercourse Committee. Most of the "opposition" farmers have relatively large holdings, and are located at the Head and Middle of the watercourse, giving them a strategic advantage. This watercourse project was characterized by the greatest degree of conflict of any of the sample watercourses.

Table 3.3 Watercourse improvement issues: Watercourse 04

Issue	Supporters/ Gainers	Opposition			Position	Result
		Farmer No.	Biradari	Land (acres)		
Uprooting Trees	All	None	-	-	-	
Point from which digging to start	All	None	-	-	-	
Rerouting watercourse	All others	1	Pathan Khatki	75.0	Head- Tail	On the request of other farmers he withdrew- work resumed.
Nakka Location and No.	All others	1	Pathan Khatki	75.0	Head- Tail	Refused to pay his share or to work - others continued on.
Division of Work	All	None	-	-	-	
Section to be lined	All others	1	Pathan Khatki	75.0	Head- Tail	Did not allow pakka section to be made through his land. The work remained at a stop for a month.

Table 3.4 Watercourse improvement issues: Watercourse 05.

Issue	Supporters/ Gainers	Opposition			Position	Result
		Farmer No.	Biradari	Land (Acres)		
Uprooting trees	All others	1	Gujar	25.0	Head	OFWM left the matter to the farmers, who settled it mutually. His trees were not removed*.
Point from which digging to start	All	None	-	-	-	
Rerouting watercourse	All others	1	Gujar	25.0	Head	He opposed straightening the route - settled by giving him extra nakkas.
Nakka location and No.	All	None	-	-	-	
Division of work	All	None	-	-	-	
Section to be lined	All others	36	Gujar	14.5	Middle	They wanted lining extended 1100 more feet to their land; this was sanctioned but work stopped and never resumed.
		37	Gujar	21.0	Middle	
		38	Gujar	6.0	Middle	

* Several trees on this watercourse were not uprooted, and the Revenue Department objected to uprooting of others; see Niazi, Yasin, Merrey, and Holje (1979).

Table 3.5 Watercourse improvement issues: Watercourse 08.

Issue	Supporters/ Gainers	Opposition				Results
		Farmer	Biradari	(Acres)	Position	
Uprooting trees	All others	1	Kahoot	50.0	Head	All but No. 1 cut his trees.
		19	Badhore	25.0	Middle	
		20	Marth	50.0	Middle	
		31	Kahoot	50.0	Tail	
Point from which digging to start	All others	1	Kahoot	50.0	Head	Acceptance of WAPDA decision to start at tail.
		2	Tiwana	80.5	Head	
		3	Qasai	2.0	Head	
		13	Badhore	12.5	Head	
Rerouting watercourse	No. 11 Bore (a committee member) and others	13	Badhore	12.5	Head	Acceptance of Irrigation Department decision in favor of No. 11.
		16	Badhore	25.0	Head	
		22	Kahoot	29.0	Middle	
Nakka location and No.	All others	1	Kahoot	50.0	Head	Compromise with WAPDA.
		16	Badhore	25.0	Head	
		22	Kahoot	29.0	Middle	
Division of Work	All	None	-	-	-	(2 did not work; others did their share).
Section to be lined	-	-	-	-	-	No section lined.

Table 3.6 classifies the watercourses according to the degree of conflict during the improvement process, and thus summarizes the above discussion. There was no conflict on Watercourse 01; on Watercourses 02, 06, and 07, there was some conflict but it was resolved easily; on Watercourses 03 and 09 there was also a little conflict, but in both cases an authoritarian solution was imposed by an outside authority (the police in one case, WAPDA in the other). On Watercourse 10, there was some disputes among the farmers, but more important, there was considerable conflict between the farmers and some of the OFWM personnel. Watercourses 04 and 05 were left unfinished because of conflict while the improvement process on 08 was characterized by a very high degree of conflict.

Table 3.6 Degree of conflict during improvement process of sample watercourses.

Watercourses	Degree of Conflict
01	No conflict reported.
02, 06, 07	Some conflict reported (one man, one issue each), but resolved easily.
03, 09	Some conflict (one man, one issue each) and resolution imposed by authoritarian means.
10	Several issues raised among farmers, but main conflict was farmers versus OFWM personnel.
04, 05	Not finished due to conflict either among farmers or between farmers and OFWM.
08	Highest degree of conflict.

OFWM Personnel -- Farmer Relationships

Overall, farmers praised OFWM personnel, and their relationships with farmers seem to be very good. Nevertheless, on four of the eight watercourses in our sample improved by OFWM, some farmers made what appear to us to be legitimate complaints. On Watercourse 02, the small Tail farmers complained OFWM favored the big farmers by giving them extra nakkas (25 nakkas and 15 check structures were installed on a watercourse irrigating 12 squares¹⁰), by not supplying a culvert for a crossing at the Tail, and by not improving the final 300 meters of the watercourse.

As discussed above, Watercourse 05 was not completed, and many farmers felt that OFWM is at least partly responsible; one informant pointed out this was the first village to agree to improvement in this area, and they were taking a risk; they feel that despite the problems the watercourse should still be completed.

At Watercourse 06, the farmers mistook us as an inspection team at first, and began complaining about the quality of their improved watercourse. They claimed that the water flow had actually declined since improvement because of silting (they were not able to keep their silt tank clean); they also felt that OFWM had not kept its promises to install a buffalo bath, and to provide help in maintaining their watercourse; and they pointed out the poor construction of some of their nakkas.

The complaints of the farmers at Watercourse 10 have been described in detail in Mirza and Merrey (1978) and will not be repeated here. The point of this section is to make it clear that although OFWM personnel generally have good relations with farmers, there is still room for improvement. In particular, they ought to try to avoid appearing to favor particular farmers, especially the most influential.

10/A square (maraba) is equal to 25 acres.

Farmers' Perceptions of the Impact of Watercourse Reconstruction

We were unable to obtain from OFWM their water loss measurements before improvement; and no such measures exist for watercourses after improvement. We did not have the manpower or expertise to measure losses, but we did evaluate the quality of watercourse maintenance; this will be presented in the next chapter. In this section we present data on farmers' perceptions of the effect on losses of watercourse improvement.

After completion of our Interim Report, we added a question in which we asked sample farmers to estimate the percentage of water lost before and after improvement. Table 3.7 summarizes the results of four watercourses. We do not claim the farmers' estimates are necessarily accurate; they reflect the farmers' perceptions of the difference improvement has made. While most farmers perceive that losses were very substantial before improvement, all but one respondent claimed losses after reconstruction had been reduced to one-fourth or less; over eighty percent of the farmers even claim no water is lost - which is undoubtedly an exaggeration.

We asked sample farmers about the sources of water losses before and after improvement, and also asked them to rank these sources in terms of importance. Table 3.8 summarizes these data. If we compare the percentages saying "no losses" before and after improvement, the contrasts are striking; except for rat holes, there is a very large increase in the number of farmers saying these various sources are not a source of losses after improvement. They (realistically) perceive rat holes as a source of water loss about equally before and after improvement. Similarly, if we compare the percentage of farmers perceiving each

Table 3.7 Farmer estimates of water losses before and after improvement.*

Water-course		Losses before improvement					Losses after improvement					Total
		None	1/4	1/2	3/4	Over 3/4	None	1/4	1/2	3/4	Over 3/4	
01	n	-	-	6	8	2	12	3	-	-	1	16
	%			37.5	50.0	12.5	75.0	18.8			6.3	100
02	n	1	-	12	3	-	16	-	-	-	-	16
	%	6.3	-	75.0	18.8		100.0					100
03	n	-	-	15	3	-	18	-	-	-	-	18
	%			83.3	16.7		100.0					100
04	n	-	2	5	7	2	9	7	-	-	-	16
	%		12.5	31.3	43.8	12.5	56.3	43.8				100
Total:	n	1	2	38	21	4	55	10			1	66
	%	1.5	3.0	57.6	31.8	6.1	83.3	15.2			1.5	100

*Based on sample farmers' responses on the last four watercourses surveyed; this question was added after the first six watercourses had been completed.

Table 3.8 Sources of water losses.

Source	No. of respon- dents	Prior to Improvement Percent Responses			No. of respon- dents	After Improvement Percent Responses		
		No Losses	Important* source	Minor source		No Losses	Important* source	Minor source
Spills	174	20.11	45.98	33.91	172	89.53	4.64	5.83
Seepage	165	46.06	13.93	40.01	168	92.85	2.38	4.77
Water in Ditches	165	44.24	15.76	40.00	170	95.29	1.17	3.54
Silting	173	21.81	33.75	44.44	169	77.51	17.15	5.34
Nakkas	66	25.76	40.91	33.33	68	94.11	5.88	0.01
Illegal cuts	85	18.82	54.12	27.06	83	87.95	12.04	0.01
Rat Holes	74	56.75	4.05	39.20	74	52.70	24.32	22.98
Livestock crossings	74	16.21	18.90	64.89	77	88.31	7.78	3.91
Vegetation	174	17.81	29.30	52.89	171	91.81	3.51	4.68

* Sum of those responding "most important source" and "second most important source".

source as an "important", and "minor" source, before and then after improvement, it is again obvious that except for rat holes there is a significant decline in perceptions of losses. Rat holes increase as a perceived source of loss. These data, as well as farmers' comments to the researchers, show that farmers do perceive watercourse improvement as very beneficial.

We have one more measure of the perceptions of the benefits of watercourse improvement. We asked sample farmers how long it used to take to irrigate a unit of land before improvement, how long it took immediately after improvement, and how long it takes at present. These answers were converted into minutes required per kanal¹¹. It is important to emphasize this is not an accurate measure of changes in efficiency of the watercourse; rather it is a measure of farmers' perceptions. Perceptions, however, are as important as actual changes to the future of the project; if farmers do not perceive any substantial improvement, they are unlikely to be interested in watercourse improvement programs.

Table 3.9 shows the mean minutes per kanal for each watercourse before improvement, immediately after, and at present. On eight watercourses, farmers perceive an increase in water after improvement, as the time to irrigate decreases; several of these are substantial improvements while on one watercourse (10) the perceived improvement is not significant. On watercourses 06 and 08 the farmers perceive a decline in water supply; on 06 the decline after improvement is substantial (confirming farmers' and informants' statements) and there is a further large decline in perceived water supply since the completion of improvement.

¹¹/One kanal = one-eighth of an acre.

Table 3.9 Mean minutes required to irrigate one canal* before improvement, soon after, and presently, by watercourse.

Watercourse	Prior to Improvement	Soon After Improvement	Presently	Percent Improvement Prior/Present**
01	36.27	15.40	17.07	52.9
02	12.88	9.21	9.30	28.5
03	26.73	21.98	21.98	17.8
04	28.05	14.65	18.18	35.2
05	14.98	8.53	9.74	35.0
06	19.69	22.83	32.13	-63.2
07	23.11	17.59	16.11	30.3
08	15.34	14.69	16.43	-7.0
09	24.08	16.75	15.96	33.7
10	18.89	18.84	17.68	6.4

* One canal = 1/8th acre

** $\frac{\text{Minutes prior} - \text{minutes presently}}{\text{minutes prior}} \times 100$

Table 3.10 shows the mean minutes per kanal for all watercourses combined, by Head, Middle, and Tail. On all three positions, water supply has increased as a result of improvement, but declined somewhat since improvement. Table 3.9 is actually the more interesting table since it indicates the wide variation among watercourses in farmers' perceptions of improvement.

Table 3.10 Mean minutes required to irrigate one canal before improvement, soon after, and presently by position on watercourse.

Position on watercourse	Prior to improvement	Soon after improvement	Presently
Head (51)	17.58	14.01	15.95
Middle (54)	19.61	14.18	15.54
Tail (56)	27.18	19.33	21.13

N = 161. Twelve farmers were excluded because they had land on several watercourse locations, 3 very extreme cases were excluded, and for one there was no information.

Conclusion

At the end of Chapter Two we classified the sample watercourses in terms of the likelihood of success of an improvement project; these predictions were made based on various sociological characteristics of the watercourses. Table 3.11 compares these predictions and the quality of the improvement process, based on the completeness of the watercourses reconstruction, and the degree of conflict characterizing the process. Four of the five watercourses where the likelihood of success was rated as high were completed; the fifth was completed except for a promised buffalo bath. On the other hand, none of the watercourses rated as

Table 3.11 Predictions of likelihood of success compared to watercourse improvement process quality (completeness and conflict).

	Likelihood of Success*		
	High	Possible (risky)	Low (highest risk)
Completeness of improvement			
Complete	01, 03, 07, 09	-	08
Not Complete	06**	02, 05	04, 10
Conflict in improvement***			
None	01	-	-
Some	03, 06, 07, 09	02	10
High	-	05	04, 08

* Taken from Chapter two.

** Watercourse 06 is complete except for a promised buffalo bath.

*** "Some" conflict means there was no serious disruption. "High" means there was disruption. Watercourse 10 was characterized by "Some" conflict among farmers, but "High" conflict between farmers and OFWM personnel.

"success possible but risky" or "low likelihood of success" were completed. Similarly, none of the five rated as highly likely to be successful were disrupted by conflict among farmers, while three of the five rated as risky or low likelihood were characterized by a high degree of conflict; a fourth (number 10) is a borderline case in which there was considerable conflict between some farmers and OFWM personnel. This and watercourses 04 and 05 were not completed because of conflict; watercourse 08 was completed, but not easily, because of a very high level of conflict. On watercourse 02 the small Tail farmers were too weak to indulge in open conflict with others.

A major problem facing watercourse reconstruction projects is that under present conditions it is difficult to insure that all the potential beneficiaries of improvement will cooperate and do their share. There are no mechanisms for dealing with "free riders", or, more important, "obstructionists". OFWM has no legal authority to deal with persons who obstruct the program and must negotiate with them and often make concessions that other, cooperative, farmers perceive as unfair. Many OFWM personnel express the opinion that they should have some legal authority to deal with such problems.

The farmers, too, lack effective informal mechanisms for dealing with recalcitrant or obstructionist farmers, especially if those farmers are influential. This problem of inadequate social controls also affects the level of watercourse maintenance, the subject of the next chapter.

Chapter Four

MAINTENANCE QUALITY OF SAMPLE IMPROVED WATERCOURSES

It is difficult to say whether the quality of the cleaning and maintenance of watercourses was better in the past than at present. On the one hand, over the years the average cropping intensity has increased. This is partly due to an increase in the amount of water available as tubewells and dams have been built; but in many areas, such as those where tubewells are not feasible because of poor quality of groundwater, the increase in cropping intensity cannot be attributed to improved water supplies alone. As cropping intensity increases, one would assume that maintenance of the watercourse becomes more important than it might have been in the past, and thus it would be better maintained than before.

On the other hand, there is some evidence that farmers were better able to maintain their watercourses in the past. In the SCARP II area, for example, farmers say that the increase in water available after the installation of SCARP tubewells led to a decline in maintenance efforts (Merrey, 1979). Farmers often claim that sanctions for not doing one's share of cleaning were enforced more in the past than in the present. Also, up until fairly recently, the warabandi¹² on most watercourses was kacha, that is, not fixed by the government. On most watercourses with a kacha warabandi, there was one man, a wandara, who had some responsibility for managing the timings of turns, and for calling out the farmers for cleaning. With the adoption of a pakka warabandi on

¹²/Warabandi - the schedule specifying the time when each farmer may take his irrigation water.

most watercourses, this position has disappeared, and the quality of maintenance has also declined. All the watercourses in our sample have a pakka warabandi.

Whether watercourse maintenance was better or not in the past, at present it is totally inadequate on most watercourses. It is this poor maintenance that causes the high water losses and has necessitated a watercourse reconstruction program; but reconstructing watercourses without at the same time improving maintenance seems foolhardy. In this chapter we discuss the quality of maintenance of the sample watercourses, and the social arrangements for carrying out maintenance. We show that inadequate local farmer organization is the cause of the poor maintenance; and we test some of our hypotheses concerning the preconditions for successful watercourse projects.

The Organization of Watercourse Maintenance

We asked key informants on the sample watercourses about the frequency and organization of watercourse reconstruction and maintenance, before and after improvement. Table 4.1 presents the data on frequency of maintenance, division of labor among shareholders, and enforcement of participation. For frequency of maintenance, we asked informants to name the months during the last year before improvement, and since improvement, when cleaning was done. The table shows that six watercourses were apparently cleaned once a month before improvement; after improvement this frequency was continued on four. On four watercourses, the frequency of cleaning declined after improvement while on one watercourse there seems to have been an increase in frequency.

On eight watercourses, the division of labor for cleaning both before and after improvement is based on the size of landholdings. On two

Table 4.1. Organization of watercourse improvement and maintenance before, during and after improvement.*

Water-course	Frequency of maintenance		Division of work shares			Enforcement of participation		
	Before	After	Before	During improvement	After	Before	During improvement	After
01	1 month	1 month	Size land holding	Jointly	Size land holding	Shame	Rs.10/day	Shame
02	1 month	1 month	Together to own nakka	Jointly	Together to own nakka	Shame	Rs.10/day	Shame
03	2 months	3-4 months	Size land holding	Size land holding	Size land holding	Shame	Shame	Rs.10/day
04	4-5 months	4 months	Size land holding	Size land holding	Size land holding	Shame	Rs.15/day	Shame
05	Twice/mo. (main w/c silt)	3 months (twice/mo. silt tank)	Size land holding	Size land holding	Size land holding	Shame	Shame	Shame
06	1 month	1 month	Size land holding	Size land holding	Size land holding	Shame	Shame	Shame
07	1 month	1 month	Size land** holding	Size land holding	Size land holding	Shame	Shame	Shame
08	1 month	1-5 month (variable)	Together to own nakka	Jointly	Together to own nakka	Shame	Shame	Shame
09	1 month	2 months	Size land holding	Size land holding	Size land holding	Rs.10/day	Rs.10/day	Rs.10/day
10	6 months	4 months	Size land holding	Size land holding	Size land holding	Rs.20/day	Rs.20/day	Rs.20/day

*Based on key informants' statements.

**On Watercourse 07, each farmer has a section of the watercourse for which he is responsible; this varies with the size of landholding. This section may even be beyond his own nakka.

watercourses all farmers work together from the mogha up to one's own nakka; this means the Tail farmers do a proportionally large share of the cleaning. While the division of work shares before and after improvement for cleaning does not change, the division was changed on three watercourses for the improvement work: on these watercourses the reconstruction work was done jointly by all the shareholders.

The weakness of sanctions to enforce participation in watercourse work is indicated in the third section of Table 4.1. On eight of the ten watercourses "social shame" is the only mechanism before improvement; on one of these a ten rupee fine was instituted after improvement. "Social shame" is effective only against relatively powerless people: it does not work against the large owners and those possessing substantial power/influence. Similarly, fines are difficult to collect from big farmers. Nevertheless, a fine system was used on two of these eight watercourses (and a total of four watercourses) to enforce participation in the improvement work, and our informants indicated some fines were collected, and used to pay laborers to do that farmers' share.¹³ On two watercourses, farmers claimed a fine system was used before, during and after improvement.

We also asked our informants who generally applies whatever sanctions are used; their answers are given in Table 4.2. On four watercourses, informants said "no one" applies sanctions, on two, one influential individual was mentioned, and on three, the sanctions are applied by an "informal committee"; in one of these cases it is the same persons who constitute the watercourse committee. On one watercourse the farmers said all the shareholders together apply social pressure. It is notable

¹³/The fines are about equal to the daily wages of a laborer and are what a farmer would have to pay someone to do it; they are not "punitive" in any sense.

Table 4.2. Who applies sanctions?*

Watercourse	01	02	03	04	05	06	07	08	09	10	Total
Sanctions											
No one	-	-	-	-	Yes	Yes	Yes	Yes			4
One individual	Yes	-	-	-	-	-	-	-	Yes	-	2
Informal committee	-	Yes	Yes	-	-	-	-	-	-	Yes	3
All W/C members together	-	-	-	Yes	-	-	-	-	-	-	1

*Based on informants' statements.

that with one possible exception, farmers did not mention the "Watercourse Committee" set up by OFWM as a vehicle for enforcing sanctions. In fact, although the effectiveness and role of the Watercourse Committee vary among watercourses during the improvement process, on all watercourses the committee ceases to exist as an entity after improvement is completed. The same people may continue to operate informally (which seems to be the case with the possible exception mentioned above) but they are not operating as a committee; rather, they are continuing to operate in terms of their position in the local informal social network. As an effort in institution building, the "Watercourse Committees" are an unqualified failure.

Table 4.3 presents the estimated man/days devoted to watercourse maintenance per cleaning before and after watercourse improvement. In seven cases the effort devoted did not change; on two watercourses the time devoted to cleaning declined, and in one case it apparently

Table 4.3. Estimated man hours per cleaning.*

	Before	Meters/man	After	Meters/man
01	16	268	16	268
02	30	74	30	74
03	34	154	34	154
04	50	108	50	108
05	50	145	50	145
06	20-28	123-88	20-28	123-88
07	15	206	11	291
08	25	134	12-16	255-191
09	20-25	187-150	20-25	187-150
10	30	176	approx. 50	106

*Based on informants' statements; number of men X number of days devoted for 6-8 hours days; 4-hour days are counted as half-days.

increased.¹⁴ An improved watercourse should require less time for cleaning since it is more accessible, has no trees, and has higher banks. However, since newly reconstructed watercourses need substantial maintenance to keep their efficiencies high, the fact that neither the frequency of cleaning and maintenance, nor the efforts to enforce better participation, have increased since improvement is not an encouraging sign.

Table 4.4 shows that the division of labor for cleaning and improvement - that is, who does the work - varies considerably among the watercourses. On only five of the watercourses do a majority of the owners do the cleaning or reconstruction work themselves; on the others,

¹⁴/But in this case, watercourse 10, only a few months had elapsed since reconstruction; the time period is therefore too short to be sure of this figure.

Table 4.4. Division of labor for watercourse improvement and maintenance.*

Water-course	Period **	Kamis ***		Servants		Special labor		Servants &/ or special labor		Tenants		Owners		Total	
01	Before	-	-	-	-	1	3.2	-	-	5	16.1	25	80.6	31	100
	During	-	-	-	-	-	-	-	-	5	16.7	26	83.3	31	100
	After	-	-	-	-	-	-	-	-	6	19.4	25	80.6	31	100
02	B	-	-	12	57.1	-	-	-	-	4	19.0	5	23.8	21	100
	D	-	-	-	-	-	-	12	57.1	4	19.0	5	23.8	21	100
	A	-	-	12	57.1	-	-	-	-	4	19.0	5	23.8	21	100
03	B	-	-	-	-	-	-	-	-	-	-	18	100.0	18	100
	D	-	-	-	-	-	-	-	-	-	-	18	100.0	18	100
	A	-	-	-	-	-	-	-	-	-	-	18	100.0	18	100
04	B	-	-	-	-	-	-	5	10.9	10	21.7	31	67.4	46	100
	D	-	-	-	-	-	-	15	32.6	10	21.7	21	45.7	46	100
	A	-	-	-	-	-	-	5	10.9	10	21.7	31	67.4	46	100
05	B	-	-	9	9.1	-	-	-	-	10	10.1	80	80.8	99	100
	D	-	-	9	9.1	-	-	-	-	10	10.1	80	80.8	99	100
	A	-	-	9	9.1	-	-	-	-	10	10.1	80	80.8	99	100
06	B	-	-	12	57.1	-	-	-	-	-	-	9	42.9	21	100
	D	-	-	12	57.1	-	-	-	-	-	-	9	42.9	21	100
	A	-	-	12	57.1	-	-	-	-	-	-	9	42.9	21	100
07	B	-	-	16	72.8	-	-	-	-	-	-	6	27.3	22	100
	D	15	68.2	-	-	-	-	-	-	3	13.6	4	18.2	22	100
	A	15	68.2	-	-	-	-	-	-	4	18.2	3	13.6	22	100
08	B	10	31.3	3	9.4	-	-	-	-	7	21.9	12	37.5	32	100
	D	0	-	23	71.9	-	-	-	-	4	12.5	5	15.6	32	100
	A	0	-	23	71.9	-	-	-	-	5	15.6	4	12.5	32	100
09	B	3	14.3	9	42.9	-	-	-	-	6	28.6	3	14.3	21	100
	D	4	19.0	4	19.0	3	14.3	-	-	4	19.0	6	28.6	21	100
	A	0	-	6	28.6	3	14.3	-	-	4	19.0	8	38.1	21	100
10	B	-	-	0	-	2	3.6	-	-	-	-	54	96.4	56	100
	D	-	-	0	-	2	3.6	-	-	-	-	54	96.4	56	100
	A	-	-	3	5.4	0	-	-	-	-	-	53	94.6	56	100
Total	B	13	3.5	61	16.6	3	0.82	5	1.4	42	11.4	243	66.2	367	100
	D	19	5.2	48	13.1	5	1.4	27	7.4	40	10.9	228	62.0	367	100
	A	15	4.1	65	17.7	3	0.82	5	1.4	43	11.7	236	64.3	367	100

*Based on key informants' statements.

**Before, during and after watercourse reconstruction.

***Kamis are the craft specialists and landless laborers who traditionally have long-standing ties to particular farmer families and are paid in grain at harvest time for their services.

most of the work is done by tenants, servants, or kamis. Although on a few watercourses there is some variation in the division of labor before, during, and after improvement, overall, there is very little change. The basic conclusion must be that watercourse improvement has not resulted in any significant institutional changes.

The Quality of Maintenance Since Watercourse Improvement

As more watercourses have been improved by the OFWM Project, there has been increasing concern about the quality of the maintenance of these watercourses. Since we were unable to measure watercourse losses, we developed a method to evaluate the quality of maintenance of the watercourses by observation. Our research officers walked the length of each improved watercourse and noted the condition of the pakka structures and earthen sections of the watercourse. We developed a scoring system to translate these observations into numbers, and then ranked the watercourses based on their scores. The ranking of the sample watercourses is presented in Table 4.5.

Table 4.5. Ranking of sample watercourses based on an evaluation of the quality of maintenance since improvement.

Watercourse	01	02	03	04	05	06	07	08	09	10
Rank*	3	4	5	7	8	2	1	9	6	10

*Ranking is from best maintained (1) to worst maintained (10). Our research officers walked the full length of each improved watercourse and noted the condition of the lined section, pakka nakkas, and check structures, number of unauthorized cuts in the banks, number of trees, (old and new), vegetation growth, condition of the banks, and rat holes; later a scoring system was developed and the watercourses have been ranked based on these scores. The scoring system is given in Appendix II.

The maintenance scores ranged from eight to twenty-five; the lower score, the better the maintenance. We further divided the sample watercourses into three categories: "good", "fair", and "poor" maintenance. These are relative categories; in fact none of the watercourse maintenance is really "good" in any absolute sense.

Table 4.6. Quality of maintenance of sample watercourses.

Score	<u>8-13</u> Good	<u>14-19</u> Fair	<u>20-25</u> Poor
Watercourses	06, 07	01, 02, 03, 09	04, 05, 08, 10

The Determinants of Watercourse Maintenance: Rank Correlations

Since maintenance is so essential on improved watercourses the quality of maintenance is the litmus test of the success of the project. If the farmers maintain their watercourse well after improvement, they can benefit substantially from improvement; if they cannot maintain it their benefits will be minimal. In Chapter one we stated that our major working hypothesis is that social organizational factors do significantly affect farmers' ability to cooperate to improve and maintain their watercourse, and there will therefore be significant and systematic relationships between patterns of organization and conflict, and the quality of maintenance. This section provides overwhelming confirmation of this general hypothesis.

The sociological characteristics of watercourses that we identified in our hypotheses as likely to be significant have been described in

Chapter two. Many of these variables lend themselves to ranking, and thus can be related to maintenance quality by using the rank correlation method (Siegel 1956).¹⁵ Those hypotheses tested with this method are discussed first.

A. Effect of Size of Landholdings:

We hypothesized that the greater the percentage of small but economically viable holdings, defined as holdings of 6.5 to 25.0 acres, the better will be the quality of maintenance. Table 4.7 presents the ranking of the sample watercourses on this parameter, compared to the maintenance quality; the correlation of these two variables is the highest of all those we examined. The Spearman coefficient is 0.86 which is significant at the 0.01 level.

Table 4.7. Rank correlation between percentage of small viable land holdings and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Small viable holdings*	1	2	4.5	6	9	4.5	3	8	7	10

$$r_s = 0.86 \quad P < 0.01$$

*Percent of holdings between 6.5 and 25.0 acres.

This hypothesis is thus strongly supported by our data.¹⁶

¹⁵/A Spearman coefficient of 0.564 or more is significant at the 0.05 level; a coefficient of 0.746 or more is significant at the 0.01 level. See Siegel (1956).

¹⁶/Interestingly enough, if watercourses are ranked according to percent of all holdings over 6.5 acres, the correlation declines considerably to 0.60, still significant, but at the 0.05 level; this suggests that Lowdermilk, Freeman, and Early (1978, vol. IV) are correct in their assessment that large farmers often do not play a constructive role in watercourse maintenance.

B. Effect of Equality:

We hypothesized that watercourses characterized by relative equality of land holdings would be better maintained; Table 4.8 shows that the rank correlation between equality of land holding and watercourse maintenance is positive, but not highly significant.¹⁷ We had also hypothesized that equality of power/influence would be conducive to better watercourse maintenance. As Table 4.9 shows, this hypothesis is confirmed for power/influence among biraderi members; the correlation is significant at the 0.05 level. However, the correlation of maintenance quality and influence with Government officials, though positive, is not significant at this level. These data suggest that size of land holding alone is too clumsy a measure of the ability of farmers to sanction each other, or deal with each other as equals; our power/influence measure appears to be a better predictor of this characteristic.

C. Effect of Centrality of Power/Influence:

We hypothesized that watercourses characterized by a large percentage of farmers perceived as influential by fellow farmers (that is, possessing "centrality") will be better organized and maintained than those having few farmers perceived as influential. Table 4.10 shows the rank correlation of centrality on our two parameters, with the community and with Government officials, and maintenance quality. Both hover around the significant mark (0.564); at 0.53 and 0.54, but Spearman coefficients for maintenance and power/influence on both parameters are slightly short of significance at the 0.05 level.

¹⁷ These correlations (0.48, 0.49) are in fact significant at the 0.10 level.

Table 4.8. Rank correlation between equality of landholding and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Equality landholding	2	3	1	7	8	9	4	6	5	10

$$r_s = 0.48 \quad P > 0.05$$

Table 4.9. Rank correlation between equality of power/influence and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Equality power/ influence- biraderi*	4	6	1	9	10	3	2	7	8	5
Equality power/ influence- officials**	9	4	2	6	10	1	3	5	8	7

*Power/influence biraderi: $r_s = 0.61$ $P < .05$

**Power/influence officials: $r_s = 0.49$ $P > .05$ ($P < 0.10$)

Table 4.10. Rank correlation between centrality* of power/influence and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
**Centrality score- biraderi	7	1	2	9.5	8	3	5	9.5	4	6
***Centrality score- officials	8	2	1	7	9	4.5	3	10	4.5	6

* Those scoring 70% or more of potential power/influence score.

** Centrality biraderi: $r_s = 0.53$, $P > 0.05$ ($P < 0.10$)

***Centrality officials: $r_s = 0.54$, $P > 0.05$ ($P < 0.10$)

In these calculations we used 70% or more of the potential power/influence score as an indication of "centrality". If we reduce the limit to 50% for the biraderi and village parameter, and calculate the rank correlation with maintenance, Table 4.11 shows the relationship is significant at the 0.05 level. This suggests the 70 percent limit is unrealistically high for Punjabi villages; using the lower standard, the hypothesis is supported. The 70 percent limit is probably a measure of highly influential leadership; the lower 50 percent limit is a measure of the percentage of persons who have some value and respect among their fellows, without necessarily being highly influential.

D. Effect of Number of Shareholders:

We suggested in Chapter one that the larger the number of shareholders on a watercourse, the more difficult it will be to organize them to maintain the watercourse. If we rank the watercourses from

the smallest number to the largest number of shareholders, Table 4.12 shows that the rank correlation with maintenance quality is significant at the 0.05 level. This hypothesis, perhaps an obvious one, is also confirmed.

Table 4.11. Rank correlation between percent having some* power/influence and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Power/ influence	6.5	2	1	10	9	4	3	8	5	6.5

$$r_s = 0.61 \quad P < 0.05$$

*Those scoring 50% or more at birader/village level.

Table 4.12. Rank correlation between number of shareholders and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Number of shareholders	6	3	1	8	10	3	5	7	3	9

$$r_s = 0.63 \quad P < 0.05$$

In Chapter two we described our method of measuring "progressiveness"; we hypothesized that in more "progressive" communities, as measured by availability of institutional services, percent of educated farmers, and exposure to mass media, the farmers are more likely to cooperate successfully for watercourse maintenance. Table 4.13 shows that the ranking of "progressiveness" and watercourse maintenance quality are significantly correlated at the 0.05 level. Again, our hypothesis is supported.

Table 4.13. Rank correlation between "progressiveness" and quality of maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Progressiveness	2	6	7	9	3	5	1	8	4	10

$$r_s = 0.69 \quad P < 0.05$$

E. Effect of Perceived Water Shortage:

We had hypothesized that where farmers perceive a shortage of water, they are more likely to maintain their watercourse well. We have two measures of water shortage: one is the percentage of farmers perceiving water supply as a "big problem"; the other is a measure of water shortage based on incomplete data on the amount of water available at the mogha (including Government and Cooperative, but not private, tubewells) per unit of land. Table 4.14 shows that there is no relationship between either of these measures and quality of maintenance. Therefore, our data do not confirm the hypothesis that water shortages or perceived water shortages per se lead to better watercourse maintenance.

Table 4.14. Rank correlations between water as a "big problem", and water availability, and quality of watercourse maintenance.

Watercourse	01	02	03	04	05	06	07	08	09	10
Maintenance	3	4	5	7	8	2	1	9	6	10
Water as a "Big Problem"*	7	9	2	5	8	1	10	3	4	6
Water avail- ability**	4	7	6	10	8	9	1	2	3	5

$$*r_s = -0.21$$

$$**r_s = 0.08$$

We had also hypothesized that maintenance would be poorer in SCARP than in non-SCARP areas, based on the above reasoning. We cannot adequately test this proposition since our sample includes only two SCARP watercourses. It is notable, however, that the quality of maintenance of these two watercourses (09 and 08) rank sixth and ninth respectively out of ten watercourses. Nevertheless, no conclusion is possible on this point based on our data.

The Determinants of Watercourse Maintenance Quality: Other Correlations

The data used to test our other hypotheses do not lend themselves to ranking but can be categorized. Our watercourse sample is too small, however, to apply a statistical test such as Chi-Square to these data. However, in many cases the associations seem by inspection sufficiently strong to regard as support for our hypotheses.

Table 4.15 shows the relationships between "good", "fair", and "poor" maintenance, on the one hand, and various sociological variables hypothesized to be significant. The following discussion is based on this table.

Table 4.15. Association of selected sociological variables and the quality of watercourse maintenance.

Variable		Maintenance quality score		
		8-13 Good	14-19 Fair	20-25 Poor
A. Biraderi structure	Single	06, 07	03	05
	Multiple	-	01,02,09	04,08,
B. Previous cooperation	Yes	06, 07	01,09	-
	A little	-	03	04
	No	-	02	05,08,
C. Previous conflict	No	-	01	05
	A little	06, 07	03,09	-
	Yes	-	02	04,08,
D. Location of influentials	Head	-	-	10
	Head-Middle	07*	02	04,08
	Middle	06	01	-
	Tail Middle	-	09,03	-
	Equal (H,M,T)	-	-	05
*07 power is greater at the Middle than at the Head				
E. Settlement status	Settlers	07	01,02,09	04,08
	Refugees	-	-	05
	Locals	06	03	10
F. Branches	Single	07	01	08
	Multiple	06	02,03,09	04,05,
G. Conflict during improvement process	None	-	01	-
	Some	06,07	03,09,02	10
	High	-	-	05,04,

A. Effect of Biraderi Structure:

We hypothesized that single-biraderi watercourses would be the best maintained, double biraderi watercourses the worst, and multiple-biraderi watercourses would be problematical but generally less well maintained than single-biraderi watercourses. Our sample includes no double-biraderi watercourses so we could not test this part of the hypothesis. The data in Table 4.15(A) show, however, that two of the four single-biraderi watercourses are well maintained; only one is poorly maintained. On the other hand, three of the six multi-biraderi watercourses are poorly maintained and the other three have only fair maintenance. The data therefore tend to support this hypothesis.

B. Effect of Previous History of Cooperation:

Successful cooperation on previous community projects suggests both that the community has the prerequisites for successful cooperation on a watercourse project, and also provides the community with an encouraging previous positive experience. The opposite is probably also true. Table 4.15(B) provides considerable support for this hypothesis. Both of the well maintained watercourses have a previous history of cooperation on community projects; three of the four poorly maintained watercourses have no such experience while the other has only a little experience in collective projects. One of the four "fair" watercourses has no history of cooperation; two do have such experience while the other has a little cooperative experience.

C. Effect of Level of Previous Conflict:

Watercourses that had been characterized by a high level of previous conflict, we hypothesized, would not be as well maintained as those having no or little previous conflict. Again, this hypothesis

is supported by our data. Table 4.15(C) shows that the two best maintained watercourses are both characterized by "a little" previous conflict; on the other hand, three of the four poorly maintained watercourses have had a lot of previous conflict. The fourth, watercourse 06 is poorly maintained but has no previous conflict; this is in fact an indication of the lack of local politics, and lack of influential people; perhaps "no conflict" can be as unhealthy as too much conflict.

D. Effect of Location of Influential Farmers on Watercourse:

We assume that since Tail and Middle farmers tend to benefit more than Head farmers from watercourse improvement and maintenance, they will have more incentive to maintain the watercourse well. Our hypothesis is that relative concentration of power/influence (at the community level) at the Tail and Middle of the watercourse, or equal distribution of power/influence along the watercourse will be more conducive to good maintenance than concentration of power/influence at the Head of the watercourse. Table 4.15(D) suggests there is such a relationship between location of influence and quality of maintenance. Three of the four poorly maintained watercourses are characterized by a concentration of power/influence at the Head and Head-Middle; on the other hand, none of the four with power/influence concentrated at the Tail or Middle are poorly maintained. Watercourse 05, classified as poorly maintained, has an equal distribution of power/influence, but the level of influence ("centrality") is very low.

E. Effect of Settlement Status:

Based on perceptions of many educated Pakistanis, including some OFWM personnel we have talked to, we expected to find that "settlers" and "refugees" would have better maintained watercourses than "locals". Locals have a reputation for quarrelsomeness and inability to cooperate

However, this perception receives absolutely no support from our data. Table 4.15(E) shows that the three "local" communities in our sample are evenly distributed among the "good", "fair", and "poor" maintenance categories; the settlers and refugees are clustered mainly under the "fair" and "poor" categories. The perception of locals as less cooperative than settlers and refugees appears to be a product of ethnocentricity on the part of many educated people, and not based on reality.

F. Effect of Number of Watercourse Branches:

We expected that single-branch watercourses would be better maintained than multiple-branch watercourses. However, as Table 4.15(F) shows, our data provides weak support for this hypothesis. The three single-branch watercourses are equally distributed among the three categories of maintenance quality; on the other hand, six of the seven multiple-branch watercourses are either fairly or poorly maintained, while one is well maintained.

G. Conflict during Improvement and Maintenance:

Table 4.15(G) shows that none of those watercourses whose improvement process was characterized by a high degree of conflict are well or even fairly maintained. All three are poorly maintained. On the other hand, the one watercourse where there was no conflict during improvement is fairly well maintained (in fact it ranks third in maintenance), and five of the six watercourses where there was "some conflict are either well maintained or fairly well maintained.

Conclusion: Prediction of Likelihood of Success and Maintenance

In Chapter two, we predicted certain watercourses would have a high likelihood of success, on certain ones success was possible but risky, and on others the likelihood of a successful project seemed remote.

Table 4.16. Prediction of likelihood of success and quality of maintenance.

Likelihood of success	Maintenance Quality Score		
	8-13 Good	14-19 Fair	20-25 Poor
High	06,07	01,03,09	-
Possible	-	02	05
Low	-	-	08,04,10

Table 4.16 shows the relationship between these "predictions", based on judgments from all our social data, and the quality of maintenance. Both of the well maintained watercourses were categorized as highly likely to be successful. The maintenance of the other three predicted to be successful is fair.

All three of the watercourses predicted as very unlikely to be successful have poor maintenance. Of the two "possible but high risk" watercourses, one has fair maintenance, and the other is poorly maintained. It would seem then that this study has succeeded in identifying some of the major determinants and prerequisites of successful watercourse improvement projects.

Chapter Five

FORMING WATER USERS ASSOCIATIONS: SAMPLE FARMERS' OPINIONS

Unlike the industrialized societies, which are dominated by a multitude of single- or limited-purpose formal organizations, most rural Pakistanis have never been members of even one such formal organization. Aside from Cooperative Societies, there are hardly any such organizations that a rural Pakistani could join even if he wished to do so. The other formal organizations with which he comes into contact, such as banks and the Government, are remote and somewhat mysterious entities quite apart from, or grafted onto his social milieu. A rural Pakistani spends his life as part of a complex informal social organization, characterized by multi-stranded ties to many different people. The man whose warabandi time precedes his may be related by several different kinship ties, plus marital ties, and may be the leader of the biraderi, the man from whom he takes loans and the man who will help him in time of need in Government offices. He cannot separate these various relationships into different compartments and deal with each without regard to the other. This type of multi-stranded social tie, multiplied by all the persons with whom he has such relationships, and all the other people with whom people in his network also have such ties, thus also bringing them into his own potential network, is part of the context into which any kind of formal Water Users Associations would be introduced. As a result forming such formal organizations in rural Pakistan is quite a different thing from starting another association in an industrialized society.

We included in our survey of sample farmers several questions about whether they would favor establishing formal water users associations. Before asking the question, it was necessary to explain the concept, since such an association is not an alternative that most rural people understand or have experienced. Table 5.1 summarizes the responses, by watercourse, to the question of whether the respondent would favor establishing such an organization on his watercourse.

Table 5.1. Sample farmers' opinions on forming water users' associations.

Watercourse	Favor Forming Association		Do not Favor Forming Association	
	n	%	n	%
01	16	100.0	0	0
02	12	75.0	4	25.0
03	2	11.1	16	88.9
04	13	81.3	3	18.7
05	3	11.5	23	88.5
06	1	6.7	14	93.3
07	8	47.1	9	52.9
08	12	75.0	4	25.0
09	11	73.3	4	26.7
10	12	54.5	10	45.5
Total	90	50.8	87	49.2

N = 177

The sample farmers were almost evenly split, ninety favoring and eighty-seven not favoring such associations. One very striking result, however, is that on eight of the watercourses, the responses went in one way or another by very heavy margins, ranging from 73 percent to 100 percent. On only two watercourses was there a relatively even split. Of the eight voting overwhelmingly in one way or another, five of the watercourses voted in favor of establishing such associations, while three opposed. The other two were split at one favoring and the other opposing.

It is difficult to explain why most farmers on some watercourses overwhelmingly favor establishing associations, and equally large majorities on others oppose such an association. We had hypothesized that farmers who are dissatisfied with watercourse maintenance are more likely to favor establishing water user organizations. Table 5.2 relates the maintenance quality of watercourses with the majority opinion on establishing water users associations. Interestingly enough, the majority of farmers on the two best maintained watercourses oppose forming an association; presumably they are satisfied with their present arrangements. Farmers on three of the four most poorly maintained watercourses on the other hand favor setting up Water Users Associations, suggesting they are most dissatisfied with the present mode of insuring cooperation on the watercourse. Three of the four watercourses with "fair" maintenance also favor setting up Water Users Associations. These data suggest the possibility that on watercourses where farmers are actively dissatisfied with their water supply, establishing Water Users Associations may meet the most positive response. Another interpretation, supplementing this one, is that well-maintained

Table 5.2. Quality of maintenance and opinion on establishing water users associations.

Large majority favor	Maintenance quality		
	Good	Fair	Poor
Yes		01,02,09	04,08
No	06	03	05
Close vote	07*	--	10**

* Slight majority oppose.

**Slight majority favor.

watercourses are also better organized; farmers may be expressing satisfaction/dissatisfaction with their organization as well as their watercourse maintenance.

We had also hypothesized that farmers with small land holdings, greater education, and with land located at the Tail of the watercourse, would be more likely to favor establishing Water Users Associations. However, we have found no significant association between any of these variables and attitude toward establishing associations. The finding that educated farmers' support for the idea is no greater than uneducated farmers' is somewhat of a surprise.

The only variable in our study that is significantly associated with opinion on establishing water users associations is power/influence. Table 5.3 shows that although the values of C are low, the relationship between power/influence on both parameters and opinion on forming associations is highly significant. Specifically, the tendency is for those with low power/influence on both parameters to favor associations, while a majority of those with significant influence oppose the idea.

Table 5.3. Power/influence scores and opinion on establishing water users' associations.

Favor WUA	Power/influence score biraderi/village			Total
	Low 0-33	Medium 34-66	High 67-100	
No	35	29	23	87
Yes	56	21	13	90
Total	91	50	36	177

df=2 $\chi^2 = 8.85563$ C=0.218 P<.02

Favor WUA	Power/influence score Govt. official			Total
	Low 0-33	Medium 34-66	High 67-100	
No	54	19	14	87
Yes	71	11	8	90
Total	125	30	22	177

df=2 $\chi^2 = 6.03258$ C=0.181 P<.05

Those with medium influence also tend to oppose the idea. This suggests the weaker farmers see such associations as protection from more powerful people; stronger farmers, instead of seeing an opportunity to expand their political arena, perhaps see such an innovation as a threat to their position.

We asked the ninety farmers favoring establishing Water Users Associations whether they would favor legal recognition of such associations; all but one responded favorably. Seventy-two of the ninety (80 percent) also favor having an executive committee running the affairs

of the Association. Out of seventy farmers responding to the question of whether the executive committee should include a Government official among its members, sixty-four (91 percent) responded favorably. It appears the respondents view such a person as a possible referee, who is separate from the local social network, and thus more able to be objective. It is also possible this response is an indication of farmers' expectations that such committees will play an authoritarian role, especially in enforcing rules concerning maintenance and water distribution.

Conclusion

Sample farmers are about evenly divided in their responses to the idea of establishing water users associations, though particular watercourses tend to be characterized by a uniformity of opinion. It appears that farmers on poorly maintained watercourses are more likely to favor such associations, as are people with relatively little power/influence. Ironically, this means that farmers on those watercourses where attempts at organizing farmers are least likely to succeed are the ones most favorably disposed toward the idea. Otherwise there are no significant trends. The idea of setting up such associations is a new one to the farmer; and his previous experience with formal institutions, such as Cooperatives, banks, and the Government, have often not been positive. This means that any program to establish such associations should proceed slowly in setting them up, choose the initial sites carefully to maximize the chances of success, and monitor them carefully to learn how best to organize such associations. If such associations are demonstrably successful, the idea will gain support on other watercourses.

Chapter Six

CONCLUSIONS AND RECOMMENDATIONS

Present Forms of Farmer Organization are Inadequate

Legally, all the farmers on a watercourse are jointly responsible for the maintenance of their watercourse. No rational farmer does his share of the work unless he can be sure that all others will also do their share; and some farmers will not do their part unless pressured to do so.

At present there is no effective mechanism to insure that all watercourse shareholders contribute their fair share to watercourse maintenance. What little organization exists is purely informal, based on kinship, biraderi, community social pressure, or relative power and influence. The Watercourse Committees established by the On-Farm Water Management Project to facilitate the improvement of watercourses are also informal, and cease to exist after the completion of reconstruction. Despite the substantial investment of both the Government and the farmer in improved watercourses, there have been no adequate attempts at institution-building to insure their maintenance and proper management. Without adequate maintenance it is unlikely that the program will have any long term benefits. On the other hand, if watercourse improvements were accompanied by a strong institution-building effort, the potential benefits to the farmer and the nation are very great indeed.

The solution pursued so far by OFWM involves assigning Agriculture Officers to "motivate" and "educate" the farmers to maintain their watercourse and improve their water management practices. A strong extension

program is certainly necessary to help the farmers learn better irrigation practices. However, not even the strongest extension effort can succeed in insuring that groups of farmers will maintain their joint watercourses in the absence of an organization with the power to sanction "free riders" and insure that all contribute their fair share. Watercourse maintenance is not really an extension problem: it is our experience that farmers recognize very clearly the benefit of watercourse cleaning and maintenance. However, farmers have no effective means to enforce collective participation in watercourse maintenance. If OFWM relies purely on an extension effort to get farmers to maintain their improved watercourses the project is unlikely to succeed; what is needed is a combination of extension work and institution-building.

Factors Conducive to Successful Watercourse Rehabilitation Projects Under Present Conditions

We judged the "success" of watercourse improvement projects by two criteria: the quality of the improvement process; and the quality of watercourse maintenance since improvement. The improvement process was evaluated in terms of the degree of disruptive conflict during the improvement project, and the completeness of the project. There was considerable variation among sample watercourses in the degree of conflict during improvement and completeness: five of the ten watercourses are incomplete in some way; three have substantial lengths of sanctioned watercourse that were not improved. The nature of the improvement process is very closely related to the quality of subsequent maintenance that is watercourses which were improved with difficulty are also poorly maintained. Furthermore, given its importance, and its dependence on the farmers' ability to cooperate in the absence of formal sanctions, the quality of maintenance is really the litmus test of the project.

Therefore, the major criterion we have used for judging the "success" of watercourse projects is the quality of maintenance.

Our data show that certain sociological variables are consistently related to the quality of maintenance of watercourses; these variables themselves tend to occur together, making it possible to draw a "profile" of a watercourse where an improvement project is most likely to succeed. Well-maintained watercourses tend to have the following characteristics:

1. A large percentage of landholdings in the 6.5 and 25 acre range.

Comment. We defined holdings in this range as "small but economically viable" in irrigated Punjab, though of course the economic viability of such holdings depends on one's standards and varies from area to area. Nevertheless, this characteristic has the highest correlation with quality of maintenance among all the variables we used. This finding suggests that watercourses having predominantly small holdings (below 6.5 acres) may be especially difficult watercourses on which to work. Possible reasons for this include: very small farms increase the number of shareholders, making cooperation more problematic; and farmers whose holdings are insufficient for subsistence often have other sources of income, reducing their incentive to devote so much labor to their land. On the other hand, this finding also suggests that contrary to the assumption in some circles, watercourses dominated by "large" farmers (over 25 acres holdings) are also not necessarily the best candidates for an improvement program. Large farmers tend to use servants for watercourse cleaning, reducing the quality of the work, and they are the ones who can violate sanctions with impunity.

2. Relatively equal distribution of power and influence among farmers on the watercourse.

3. A large percentage of farmers being perceived by fellow shareholders as having some power/influence.
4. Concentration of power/influence at the Tail or Tail and Middle of the watercourse.

Comment. We measured power/influence by asking sample farmers to rate the power/influence of all the other shareholders on the watercourse, and summed the scores. This measure proved to be more sensitive than size of landholding. Equality of landholding is not significantly correlated with maintenance quality but equality of power/influence is. Size of landholding is a significant but in itself insufficient basis for having power/influence. These three findings together suggest that a good candidate for an improvement project is a watercourse where influence is both equally and widely distributed, that is, where most farmers command some respect from others even if they are not really "leaders"¹⁸; and where at least some of the leaders or at least most highly respected men have their land toward the Tail of the watercourse.

5. "Progressiveness" of the community.

Comment. We measured "progressiveness" by the number of institutional services available in the community, the percentage of farmers with a better than primary (fifth class) education, and the percentage of farmers who listen to the radio. "Progressiveness" here has nothing to do with size of landholding, but is an indirect measure of attitudes toward innovation and modernization.

¹⁸/Lowdermilk, Freeman, and Early (1978, vol. IV 228-36) define a watercourse having high centrality and equality scores as "pluralist", and contrast this with "elitist" watercourses (low percentage of farmers with centrality and great inequality of power/influence). In their terms, "pluralist" watercourses are the best candidates for an improvement program.

6. Previous history of cooperation and lack of serious recent conflict.

Comment. If the watercourse is characterized by tensions resulting from some previous conflict, these tensions will be acted out during the watercourse improvement project. On the other hand, if the community has a previous history of cooperation on collective projects, this is an indication of its ability to cooperate, and means it has acquired valuable experience in cooperating.

7. Single-biraderi watercourse social structure.

Comment. Patterns of cooperation and conflict in Punjabi villages are generally based on biraderi membership. We had no double-biraderi watercourses in our sample, but the single-biraderi watercourses tended to be more successful at watercourse maintenance than multi-biraderi watercourses. However, this is not a hard and fast rule, but only a tendency; and it is certainly not surprising.

8. A small number of shareholders on the watercourse.

Comment. Organizing farmers on a large watercourse to cooperate in improvement and maintenance is more difficult than on small watercourses, again reflecting the inadequacy of present forms of informal organization.

Two of our major hypotheses have been rejected as they were not supported by our data. Neither water shortages per se, nor perceptions of water supply as a big problem, seem to be related to maintenance of the watercourse. Further, contrary to a belief many OFWM personnel and others have informally expressed, there is no relationship between "settlement status" and ability to cooperate for watercourse improvement and maintenance. Our data do not support the proposition that "locals" are less able to cooperate than "settlers" or "refugees"; indeed, there is if anything a slight tendency in the other direction in our data.

The emerging "profile" of a watercourse where an improvement and maintenance program is most likely to be successful, then, is one where most of the farmers have small but adequate holdings, and are relatively equal in status and power, where most farmers have the respect of their fellows, and most are "progressive" in the sense of being positively oriented toward change and improvement; and where farmers are not divided by previous conflicts and have had a positive experience in cooperating on other community projects.

Support for Establishing Water Users Associations

A slight majority of ninety out of a sample of one hundred seventy-seven farmers expressed support for the idea of establishing Water Users Associations. However, on five of the sample watercourses, there was overwhelming support for such associations, while on three large majorities opposed them. The other two were more evenly divided, one in favor and the other opposed. Farmers on poorly maintained watercourses, and farmers having low power/influence scores tended to support the idea.

The finding that there is no great demand for establishing water users associations is not surprising, given the lack of positive experience with formal associations. This reluctance by farmers may also be related to their negative rating of the "helpfulness" of present Government services, as reported in Chapter two. The fact that farmers on poorly maintained watercourses, and farmers with low power/influence tended to support the idea is an indication of their dissatisfaction with present arrangements. These findings also suggest that farmers on watercourses that by our criteria are poor candidates for organizational efforts are the very ones who are most favorably inclined toward the idea. It is

important to note, however, that even on watercourses where farmers did not see the need for such an association, we found no strong opposition to the idea. If farmers are approached with a good, practical plan for organization, it appears to us that they would be willing to give it a try.

Recommendations to Improve the Present Program

Overall, we are impressed with the performance of the On-Farm Water Management Project in Punjab. Although we did hear criticisms by some farmers, many other farmers praised it, and most sample farmers perceive that they benefited substantially from the Project. The vast majority of farmers on our sample watercourses - 87.4 percent - have holdings of less than 25 acres; this means the program is reaching the targeted small farmers. Therefore, the suggestions contained in this section are not to be taken as criticism, but rather as suggestions for further improving the effectiveness of the project.

The OFWM Project is a "pilot" project. We take this to mean that it is intended to be a project which experiments with various procedures, in order to discover the best techniques and demonstrate their usefulness, for later adoption on a larger scale. We suggest, therefore, that the Project avoid, as far as is possible, becoming overcommitted to any one procedure or policy; rather it should try to retain sufficient flexibility to be able to experiment continuously with new ideas. This also means OFWM should try to avoid becoming overly concerned with achieving purely statistical targets, such as meters of watercourse improved, at this early stage.

Selection of Watercourses for Improvement

In our preliminary report we strongly recommended that OFWM carefully choose watercourses for improvement where there would be a high

likelihood of success. OFWM says that in most areas at least, the demand for improvement is greater than it can satisfy. The mean time required for improvement of the sample watercourses was nearly four months each, and even then several of them are unfinished. We are certain that a few days' investment in a preliminary survey of watercourses seeking an improvement project, and then careful selection of watercourses based on these surveys, as well as the use of the survey data to plan a strategy for dealing with particular watercourses, could save OFWM many man months of time later, and lead to an increase in the number of watercourses improved per year.

Our study shows that there are a few sociological characteristics that seem to be prerequisites (or determinants) of a successful watercourse rehabilitation and maintenance program, under present conditions. These characteristics can be easily identified using simple and short survey forms. A further advantage of such a pre-improvement survey is that potential leaders and obstructionists, and special problems and perceptions of farmers, can be identified; and this information can then be used for planning an overall strategy for dealing with the watercourse. Appendix III contains suggested forms for such a survey.

Participation of Farmers in Watercourse Improvement Projects

A basic principle of the present OFWM Project is that there must be the maximum possible participation by the farmers in the Project. The greater their level of participation, the greater will be their commitment to the subsequent maintenance of the improved watercourse. However, this participation should go beyond contributing money and labor to the project. Farmers should also be involved in the decision-making process.

Our data show that the "Watercourse Committees" vary in effectiveness during the improvement process, but invariably the committee ceases

to function after improvement is completed. Sometimes the Committee exists mainly on paper; sometimes one or two farmers are so dominant they make the decisions the Committee should make, and work with the OFWM personnel.

We would suggest, as an interim effort until more formal associations can be set up, that OFWM try to improve the participation of all the farmers, and communication with them, by calling a series of general meetings to discuss the plans for the project, get farmers' ideas, and obtain a consensus on the design before work begins. We would also suggest that OFWM should make a greater effort to see that the Committee includes representation of all the various groups and interests on the watercourse: the various biraderis, various locations on the watercourse, and the various branches on multi-branch watercourses. Although we are not suggesting that formal procedures such as voting are necessary, we do suggest that the selection process should be as open as possible, and farmers should be satisfied with their representatives.

OFWM should also encourage the farmers to give the Committee authority to act on their behalf to set up a more formal post-improvement maintenance schedule. This could even be made a prerequisite to qualify for improvement. Rather than wait until the watercourse has deteriorated before calling the farmers for maintenance, there should be a fixed monthly time period during which all cleaning and maintenance must be done. Each household should be assigned a particular section of the watercourse for whose maintenance it will be responsible. The size of this section should be proportional to the size of the landholding. Formal sanctions should be agreed upon for insuring that each household does its share during the appointed period; the sanctions should include a system of fines sufficient to act as a deterrent to noncooperation.

The fines should go into an account and the money used for future expenditures on watercourse maintenance such as replacement of nakka lids or cement to keep pakka sections in good repair.

Finally, we would suggest that OFWM personnel try even harder to improve their relations with the farmers. They should avoid getting entangled in local disputes and jealousies (the pre-improvement survey can help in identifying some of these). They should also avoid making promises such as for extra buffalo baths or nakkas that they cannot keep and they should be very particular to explain the proposed watercourse design, including nakka location, to the farmers before the work begins.

Many OFWM personnel have expressed the personal view that they should be given legal authority to force recalcitrant farmers to cooperate on the watercourse project. It is true that their lack of legal authority limits their ability to deal with obstructionists. However, we feel that giving the OFWM personnel legal enforcing authority would create many new problems. The authority to insure proper participation by all should be in the hands of the farmers, not OFWM. We discuss this proposition below.

Other Suggestions Beyond the Data

As part of the "Pilot" Project, we suggest it would be very appropriate for OFWM to try out some new ideas in water management, ideas that have been discussed in many circles but not yet tried in Pakistan.

It is a fact that Tail farmers suffer more than Head farmers from poorly maintained watercourse; and even though their benefits from improvement and maintenance are proportionally greater than Head farmers' still do not get as much water per acre as do Head farmers. Yet, farmers' abiana (water rate) is not less than Head farmers'. Head

farmers often object to participating equally with Tail farmers in maintenance because they feel the benefits are less - even though they are getting more water for less investment (of labor) than the Tail farmers.

It will be many years before a volumetric water rate will be feasible in Pakistan. Therefore, we suggest that Tail farmers should be compensated for getting less water by paying proportionally less abiana than Head farmers. This should be calculated in such a way as to compensate them for getting less water, and also compensate them for their greater effort than Head farmers in cleaning and maintenance. Economists would need to calculate what the rates should be to achieve these goals. Carrying this out on an experimental basis would require the cooperation of the Irrigation Department.

There has been some discussion of the so-called "reverse warabandi", but so far to our knowledge no one has tried it. It should be tried on some improved watercourses, to find out if Tail farmers can benefit. A reverse warabandi simply means that the watercourse is filled, then the rotation begins with the Tail farmers; the farmer nearest the mogha gets his turn last, then the watercourse is filled again. On some watercourses it may be feasible to keep the whole watercourse full constantly, with water taken turn by turn. This would eliminate the time required to fill it, and reduce "wetting" losses; but it does also increase the opportunities for water theft.¹⁹

Finally, many experts have noted the inadequacy and weakness of the existing water law. The Canal Act is more than one hundred years old.

¹⁹/However it also equalizes the opportunity for theft, reducing the advantage - and power - of the Head farmers by making it theoretically possible for the Tail farmer to steal water from the Head farmer during the Head farmer's turn; this equalization may in itself act as a deterrent.

We add our voice to those who have urged a thorough re-examination and revision of Pakistan's water law.

Recommendations for Further Research (Phase II)

The Project Agreement under which this research was funded calls for a second phase of research in which about a dozen experimental Water User Associations are to be established and monitored. Based on the experience of the Phase I research, these are to be assisted in evolving appropriate rules, procedures, and functions. It was envisioned that at least some of these associations would be formally organized under the Cooperative Societies Act and the Companies Act.

The research to date has demonstrated the need for a legal mechanism to promote local responsibility and participation in improving the management and maintenance of watercourses. Watercourses are the collective responsibility of the farmers. However, as the need for increasing the productivity of agriculture has increased, and the deficiencies in the management of irrigation water have become increasingly apparent, it has also become obvious that neither traditional informal mechanisms, nor even "new" informal mechanisms such as "Watercourse Committees" are adequate for improving water management. As this report is being written the status of Phase II of the Project is unclear. However, in this section we outline the proposed research design for Phase II.

Hypotheses

1. Our major working hypothesis is that water users associations established on a legal basis, that is, organized under some legal framework, will be more effective in managing and maintaining the watercourse than will informally organized associations or committees. We expect

this to be true despite the glaring weaknesses in existing laws for organizing such associations (see discussion below).

2. Organizations characterized by a large amount of participation by members in the decision-making process will be relatively more successful than those dominated by a few farmers.

3. Organizations will be relatively more successful on watercourses characterized by the factors that seem conducive to success, as identified in Phase I of the research. These factors include: a predominance of small but viable landholdings (about 6.5 to 25 acres); relative equality of power/influence among farmers on the watercourse; a large percentage of the farmers having some influence with their fellow farmers, location of relatively influential persons toward the Tail or Tail and Middle of the watercourse; a previous history of cooperation on community projects and a minimum of previous conflict; a high degree of "progressiveness" as measured by institutional services in the village, educational level, and use of mass media; a small number of shareholders on the watercourse; single-biraderi social structure on the watercourse; and single-branch watercourse.

In the long run, if water users associations are to be established throughout the country, associations will have to be established on watercourses not possessing some of the above characteristics. However, we suggest that at the initial experimental stage, given the difficulties and complexities of trying such a new approach, the problems should be minimized as much as possible. As workable organizational forms are developed and tested, and people come to see the benefits of such organizations, we can then deal with the problem of establishing organizations on less than ideal watercourses.

Criteria for Comparing Associations

The criteria for comparing watercourses with formal and informal organizations, and judging the "success" of an organization will include

1. degree of cooperation and conflict during and after watercourse reconstruction;
2. completeness of the reconstruction;
3. quality of maintenance of the watercourse over a period of time after reconstruction;
4. changes in cropping patterns and/or agronomic inputs and production;
5. perceptions by farmers of the benefits of the improvement program and the organization;
6. extent of participation of farmers in management of the association (attendance at meetings, participation in discussions);
7. extent of cooperation by members on other aspects of water management besides maintenance (such as tubewell construction, extending the lined section, contacting Government officials for help in improving their water management or supply, etc.).

These criteria will be quantified to the extent possible.

Research Design

This study must be done on a small scale in the beginning. Funds and qualified field workers are limited. More important the Principal Investigator will have to be closely involved in the organizational as well as monitoring effort. It would be useful to experiment with organizing farmers in several different areas, as there are considerable agronomic and sociological variations from area to area. Therefore, we

propose to work in four tehsils, two in each of the two major OFWM areas. Table 6.1 sets out the basic research design.

We plan to set up six formally organized Water Users Associations, three each under the Cooperative Societies Act and Societies Registration Act. As a control we also plan to set up six informal associations. In order to further control for "demonstration effect", that is, the impact of the extra attention itself on organization efforts, we propose to subdivide the informal organizations into two halves. Three will be watercourses on which OFWM organizes Watercourse Committees as they have been doing; three others will have some of the extra attention of both OFWM and our personnel that the formally organized watercourses will have, but without the formal legal cover.

The original agreement for this research project called for organizing associations under the Companies Act (1913) as well as the Cooperative Societies Act (1925). However, the USAID lawyer, Mr. Moizuddin Sayyed, in a memorandum to Mr. Ken Lyvers dated December 3, 1978, has

Table 6.1. Proposed research design of Phase II.

Type organization area	Formal organization		Informal organization		Total
	Coop. Act	Societies Act	special inputs	no special inputs	
Faisalabad Area					
Tehsil one	1	1	1	-	3
Tehsil two	1	-	1	1	3
Bahiwal Area					
Tehsil three	-	1	1	1	3
Tehsil four	1	1	-	1	3
Total	3	3	3	3	12

indicated that the Companies Act has several drawbacks for organizing farmers. The major problem is that the law is quite complex, and there are severe legal penalties for noncompliance with its requirements. We feel that there is too great a risk of legal problems for relatively uneducated farmers to use this Act, risks that would also raise ethical problems for the researchers.

In place of the Companies Act we sought legal advice on using the Societies Registration Act (1860) as a legal cover for Water Users Associations. The opinion of Ch. Rafique Hussain, an Advocate in Faisalabad is included as Appendix IV. There are some problems with this Act, too, but it appears we can use it for our purposes. The major reason for wishing to organize farmers under some other Act as well as the Cooperatives is to control the negative attitudes many farmers have toward this Act. In fact, as discussed below under "Anticipated Problems", none of the existing laws are really appropriate for our purpose.

Ordinarily, we would expect to establish one Water Users Association on one watercourse. However, in some areas it may be more appropriate to establish an association at the village level, with perhaps subcommittee responsible for particular watercourses; it is also possible that on a large, multi-branch, multi-biraderi watercourse separate associations for each branch, perhaps with a coordinating committee, would be most appropriate.

Data Gathering Procedure

We have already developed and partially pretested a benchmark survey instrument. This survey would be carried out on each watercourse before organizational work and watercourse reconstruction begins. Data would be gathered both from key informants and from a stratified random sample

of farmers on the watercourse. Sociological, economic, and agronomic data would be gathered, as well as measurements of water losses. These data will be analyzed as it is gathered and used both for identifying potential problems and leaders, and for making predictions about the likelihood of success of the project. A watercourse where the likelihood of success is very low will be rejected from our sample.

Organizing of Water Users Associations will precede watercourse reconstruction. During the process of organizing farmers, watercourse reconstruction, and for as long a period as is feasible after improvement, the management and maintenance of the watercourse and the activities of the organization will be continuously monitored. Each of the four field team members will be assigned to a particular Area Team and remain in continuous contact with the watercourse members and OFWM personnel, and will keep detailed diaries on the processes observed.

At the end of the project period, another formal survey and measurement of water losses will be undertaken to measure the changes in social, economic, and agronomic variables since the benchmark survey.

Procedures for Organizing Water Users Associations

The success of this research effort will depend to a large extent on the degree of cooperation among our staff, the OFWM personnel, and the Cooperatives Department. To the extent that OFWM personnel perceive participation in this project as inhibiting their ability to meet their quotas, they will naturally be reluctant to devote much time to the project. This is an administrative problem that requires solution.

We propose that both our research staff and OFWM personnel (and where appropriate Cooperatives Department staff) work closely on motivating and organizing farmers. We cannot impose an organization on unwilling

farmers. It will be necessary to give farmers a choice between being helped to organize formally and informally; given the voluntary nature of existing law, essentially one hundred percent of the farmers would have to agree to participate in an organization.

At this initial stage it would be an error to develop detailed sets of rules and regulations to be imposed on farmer organizations; farmers should be encouraged to develop their own procedures based on their own needs, perceptions, and cultural patterns (Merrey, 1979; and Lowdermilk, Freeman, and Radosevich n.d.). There has been no reported experience in organizing farmer organizations in Pakistan to use as guidance, but the following seem to be important considerations based on our research to date, surveys of Cooperative Societies in Punjab, and experience in the Comilla Project (Bangladesh):

1. Farmers should be given the maximum possible responsibility both in decision-making and in arranging inputs, doing the work, etc. The responsibility should be shared by all the farmers, and not given to a small clique which might take advantage of their position for their own benefit.
2. Education of farmers in the responsibilities and management of their association, as well as management of their water, is very important.
3. There should be frequent meetings of all the members of the Association to discuss plans, problems, and solutions.
4. If there is a powerful person in the organization whose cooperation is necessary for its success but who may not have an active interest in the everyday management of the Association, two chairmen might be selected; one the local magnate, giving

him an overall ceremonial role (greeting officials, etc.) and another, a younger, energetic "worker".

5. All of the farmers together should be helped to draft a charter for the organization, and a set of rules and regulations, including a clear statement of the obligations, rights, and liabilities of association members. However, it is not necessary - and may not be advisable - to insist on formal voting rules and decision-making processes, at this early stage. The reasons for this are given in Merrey (1979).
6. For legally organized societies, it is important that the members understand the law under which the Society is registered, and that all legal procedures be followed.
7. Although farmers express support for the idea of Government officials having a substantial role in the management of any association that might be established, we suggest that giving officials too large a role in such an association would defeat the purpose of the exercise, which is to decentralize responsibility and develop managerial abilities among the farmers.

Possible Activities and Functions of Water Users Associations

Given the limited managerial and cooperative experience of farmers, it would be a mistake to push the Associations too rapidly into activities beyond their capacities. On the other hand, the farmers should be encouraged to take the maximum responsibility for the activities in which they do get involved.

The association, first and foremost, will work with OFWM for managing the watercourse reconstruction process. It may negotiate for extra lining or nakkas, to be paid for by the members; and the association

should be given responsibility for procuring materials as well as organizing labor.

The association will also be the vehicle for the longer-term maintenance and further development of the watercourse: it will be responsible for organizing its regular maintenance, replacing damaged nakkas, extension of the lined or improved sections, installation of tubewells where appropriate, and even adjusting the warabandi system.

A legally registered association should be able to obtain bank credit on behalf of its members for improving the watercourse beyond what is covered under the present scheme. It could use such money for extra pakka lining, or installation of a tubewell, for example. OFWM should be prepared to offer encouragement and technical advice for such projects.

Anticipated Problems

It is difficult to anticipate all the possible problems that might occur during this research. However, the following problems are very likely to arise:

1. Weakness of existing law. None of the existing laws are designed to deal with the problems of collective management of irrigation water. The major drawback in both the Cooperatives Act and the Societies Registration Act is their voluntary nature: members can withdraw at any time they wish, and there is no provision sanctioning farmers who do not cooperate, for example in watercourse maintenance. Yet this is probably the most crucial problem faced under the present arrangements, and is the major problem that organizing water users associations ought to solve. This inability to sanction the "free riders" and the farmer who violates the rules governing the use of the watercourse is a serious handicap in

carrying out this research project. Recognizing this, as part of the Seminars on "Water Users Associations" held in June, 1978, a draft "Irrigation Association Act" was prepared by Radosevich, Qureshi, and Merrey (1978). Promulgation of this or a similar Act even on a temporary or limited basis would considerably enhance the likelihood of success of this research project.

2. Social and Cultural Factors. There are many social and cultural factors, not only in Pakistani society, but in most peasant societies, that make it difficult to organize effective farmer organizations. One is the complete lack of experience with formal organizations. More important, as discussed in detail in Merrey (1979), there are social and cultural characteristics that operate not only to discourage cooperation among farmers, but to encourage rivalry, competition, and mistrust. These characteristics include cultural values that emphasize rivalry and one-upmanship in the pursuit of maintaining or improving one's honor and reputation (izzat); and the social relationships that underly these cultural values, including the nature of the kinship groups (biraderis); an hierarchical and exploitative social structure; and following from all this, the lack of a cultural tradition of equal participation, democratic procedures, and the idea of a "loyal opposition".

All of this means that the researchers will have to be flexible, in order to deal with problems as they arise. Experimenting in a social context is not at all like carrying out controlled experiments in a laboratory setting. It will undoubtedly be necessary to make changes in the procedures and design after the project is underway; and because of the likelihood of delays such as have plagued the Phase I research, the time period should also contain some flexibility. Nevertheless, despite these anticipated problems, the fact that people in some communities do

cooperate on collective projects gives us some ground for optimism that an appropriate form of watercourse organization can be evolved.

Anticipated Outcome of Phase II Research

The period of time allowed for this research should be at least eighteen months, though by the end of a year an interim report could be prepared. By the end of the project it should be possible to offer recommendations concerning the feasibility of establishing Water Users Associations; the types of legal changes that will be needed to facilitate the establishment of such associations; and the types of procedures, structures, and functions that would be most appropriate for the operations of effective Water Users Associations. These results then can be used for planning a successor to the On-Farm Water Management Pilot Project.

Conclusion

Both the pilot watercourse improvement project, and the larger development policies of Pakistan have reached a critical juncture. A major choice that faces both is whether to follow a policy of further centralization of decision-making and implementation, or whether to decentralize the system and encourage the development of local institutions through which local people can work together to solve their problems. Reuss, Skogerboe and Merrey (1979) discuss the advantages and disadvantages of each of these alternatives for improving water management, and strongly advocate a decentralized approach. Indeed, this is the strategy that has been advocated from the beginning of the present program for watercourse improvement (Radosevich, 1975; Water Management Research Project Staff, 1976).

This study has identified some of the problems involved in the present approach to involving local water users in rehabilitating their watercourses. We have presented some recommendations for improving the present program; and we have set out a research design to experiment with establishing effective Water Users Associations. If this research is properly carried out, the results may be very useful in designing a more modern and efficient water management system for Pakistan.

APPENDIX I
Questionnaires

SCHEDULE 1

Key Informant Information:

Note to Interviewer: Keep in mind the following criteria in selection of the village key informants:

- a. Informants must have had long residence in the village and must be knowledgeable about the village and watercourse behavior.
- b. Informants must be farmers in the village and should have at least some land on the watercourse which has mobilized for watercourse improvement.
- c. Informants should be selected so as to represent each caste/biraderi group and/or major faction.
- d. The group of informants should include, but not be limited to Lumberdars and leading land owners.

Fill in the following for each informant whose information you used:

Name _____ Biraderi and Zat _____ Age _____

No., if in sample _____

Land holdings: sample W/C _____ Village _____

Location on W/C _____

Positions held _____

Why and how chosen: _____

Estimation of reliability and reasons for your faith

If he gave only certain specific kinds of information, specify
(e.g. Schedule No. _____ only, disputes; W/C cleaning only, etc.)

SCHEDULE 2

Observations of Watercourse Improvement and Maintenance.

Village _____ Name _____
 Tehsil & District _____ Date _____

Note:

Soon after arrival on site you should inspect the whole watercourse, from head to tail, yourself. Make a rough sketch map to supplement the design map, indicating improved sections, & after census is done, general location of farmers' fields by census no.

1. Mogha _____ running freely _____
 Submerged _____ obstructions (specify) _____
2. Silt tank: Yes _____ No _____
 If yes, specify condition:
 full of silt _____ some silt but not obstructing flow _____
 silt obstructing flow _____
3. Pakka (lined) section: Yes _____ No _____
 If yes, length _____
 Condition (broken, cracks, silted, etc.).

4. Pakka nakkas:
 No. provided by Govt. _____
 No. provided by farmers _____
 No. wooden or other (specify) _____
 No. of damaged nakkas:
 Broken chipped covers _____
 Broken chipped rims _____
 Cracks in masonry _____
5. Check structures
 No. concrete _____
 No. other _____
 No. damaged/chipped covers _____

No. damaged rims _____

Other _____

No. & location of buffalo baths

i. _____ ii. _____ iii. _____

6. No. of kacha nakka cuts on improved section:

Head _____

Middle _____

Tail _____

Reasons farmers give for these:

Theft _____

Insufficient pakka nakkas _____

Others (specify) _____

7. General condition of kacha sections:

No. trees not cut and location:

Head _____

Middle _____

Tail _____

No. new trees planted after improvement on W/C & location:

Head _____

Middle _____

Tail _____

Vegetation (little or none; excessive):

Head _____

Middle _____

Tail _____

Weak, broken banks

Head _____

Middle _____

Tail _____

Rat holes (few, many):

Head _____

Middle _____

Tail _____

SCHEDULE 3

Village Level Data

Village (name and No.) _____ Interviewer Name _____
 Tehsil & District _____ Date _____

No. of watercourses in village

	Mogha No.	Improved Yes/No	Area Commanded (acres)
Sample W/C 1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

Total commanded area in village _____

Total uncommanded area in village _____

Total commanded by T/W only _____

Total area in village _____

Major Crops (rank first 3 in order of importance)

1. Wheat _____	5. Rice _____
2. Cotton _____	6. Gram _____
3. Fodder _____	7. Vegetables _____
4. Sugarcane _____	8. Fruit _____

Institutional serviceIn VillageMiles from Village

1. Paved road	_____	_____
2. Railroad station	_____	_____
3. Bus stop	_____	_____
4. Nearest mandi	_____	_____
5. Post Office	_____	_____
6. Fertilizer Agency	_____	_____
7. Field assistant	_____	_____
8. Boys' primary school	_____	_____
9. Girls' primary school	_____	_____
10. Boys' middle school	_____	_____
11. Girls' middle school	_____	_____
12. Boys' high school	_____	_____
13. Girls' high school	_____	_____
14. Govt. Medical Dispensary	_____	_____

15. Veterinary dispensary _____
16. Bank branch _____
17. Electricity _____

Mosques	Juma	How maintained	specify
Name	Yes/No	(committee, individual, maulvi)	

Other Organizations	In Village yes/no	Registered yes/no
1. Islahi Committee	_____	_____
2. Panchayat	_____	_____
3. Cooperative Society	_____	_____
4. Water user association	_____	_____
5. Union Council office	_____	_____
6. Other	_____	_____

3. Village Social Conflict Patterns:

- a. Construct a list of central social conflicts in the village during the last 10-15 years. Obtain definition of the issue conflict list from 3-5 key informants. Each informant is to be asked to identify the central issues over which at least some village farmers are divided. Do not list those conflicts having nothing to do with group involvements. For each dispute provide details in your diary. Rate extent of tension as follows: -

1. Verbal
2. Violence (fights, etc., non-lethal)
3. Court Cases
4. Murder

Use maximum appropriate number

- b. Informant listing of issues:

Issue 1: _____

Issue 2: _____

Issue 3: _____

Issue 4: _____

Issue 5: _____

Issue 6: _____

Having prepared the list of conflict issues, take each issue separately and ask:

Name or Number of Issue _____

Which group or groups allied (Number Households)	Versus group or groups allied (Number Households)	Extent of tension or hostility 3 2 1
--	---	--

Name or Number of Issue _____

Which group or groups allied (Number Households)	Versus group or groups allied (Number Households)	Extent of tension or hostility 3 2 1
--	---	--

Name or Number of Issue _____

Which group or groups allied (Number Households)	Versus group or groups allied (Number Households)	Extent of tension or hostility 3 2 1
_____	_____	_____

SCHEDULE 4

Watercourse Level Data

Village (Name and Number) _____ Interviewer Name _____
 Tehsil & District _____ Date _____
 Canal _____ Distributary _____

Note:

Before working on this questionnaire the 100% census of households on the watercourse must be completed. Each household is assigned a number ranging from 1 to n.

1. Type of warabandi: Katcha _____
 Pakka _____ Rosewari _____
 If pakka, when was change from kacha made? _____
 Why? (Probe for details _____ incidents, etc.) _____

2. Private tubewells on watercourse

Capacity (cusecs)	Joint/ Private	Owner Farmer No.	Watercourse location (Head, Middle, Tail)	Source of power: Electric, Diesel, etc.
1. _____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
3. Has any official of the Irrigation Department inspected the water-course?
 Yes _____ No _____ If yes, date _____
 which official _____
4. What are the approximate market values of land on this W/C?
 (Specify special reasons, and probe for specific recent examples of sales).
 H _____ M _____ T _____

5. Watercourse Maintenance.

a. Cleaning behavior one year prior to improvement.

S. No.	Date	Portion of W/C cleaned	Estimated Men	Estimated Days	Estimated Hours
1.					
2.					
3.					
4.					
5.					
6.					

b. Cleaning behavior since improvement.

S.	Date	Portion of W/C cleaned	Estimated Men	Estimated Days	Estimated Hours
1.					
2.					
3.					
4.					
5.					
6.					

c. General formula for dividing manual labor:

Specify if by size of land-holding; biraderi-wise; or all together	Cleaning before improvement	During improvement work	Cleaning since improvement

d. How many households:

	Before improvement	During improvement work	Since improvement
Had sepies do the work			
Had servants do the work			
Hired special labor			
Had tenants do the work			
Did the work themselves			
Other			

- e. Who calls members for cleaning/maintenance (Name and No. of farmer).

Before Improvement

After Improvement

- f. What types of penalties/sanctions are imposed on those who do not do their share of W/C cleaning/improvement?

Before
Improvement

During
Improvement
Work

Since
Improvement

Lose turns (No.)

Pay fine (Rs.)

Pay fine in kind

Social shame

Other

What is done with the fine
(water, money, goods)?

When was the last instance of fining? (Specify)

How are penalties enforced, and by whom?

If there has been no cleaning/maintenance since improvement on all or part of the W/C, find out why; probe in depth.

Watercourse Improvement

Who signed the application for improvement?

Farmer No:

Organization of watercourse

- a. When was first general meeting of watercourse members called?

- b. Where was such a meeting called?

- c. Who initiated and conducted such a meeting?

Farmer No.

d. Was any Committee formed? Yes _____ No _____

If yes, who were the members?

Farmer No. _____

Chairman _____

e. On what basis the Committee members were chosen or nominated?

Landholdings _____

Caste & Biraderi _____

Location on W/C _____

Appointed by Officers _____

Elected (formal election) _____

Other _____

Does the W/C Committee still function as a Committee?

Yes _____ No _____

5. Opposition and support with regard to the decisions taken by the Committee: (Give farmer Nos. in each case).

a. Decision with regard to uprooting the trees on watercourse.

Support

Opposition

With what results? _____

b. Decision with regard to the point from where digging had to be started.

Support

Opposition

With what results? _____

c. Decision with regard to re-routing of watercourse on account of improvement.

Support

Opposition

With what results? _____

- d. Decision with regard to position or location of pukka nakkas.

Support

Opposition

With what results? _____

- e. Decision with regard to division of work during improvement.

Support

Opposition

With what results? _____

- f. Decision with regard to sections of watercourse to be lined.

Support

Opposition

With what results? _____

- g. Decision with regard to change in location and number of nakkas.

Support

Opposition

With what results? _____

- h. Other key issues/decisions.

Support

Opposition

With what results? _____

6. What voting rule has generally been followed in Committee's decision?

a. Simple majority _____

b. Three-fourths majority _____

c. Nearly complete consensus _____

d. Complete consensus _____

e. Will of a few _____

(Give farmer Nos. in case of e)

7. How many general meetings were held to review the progress of work during the course of improvement? _____

Were there any problems in conducting these meetings?

1. _____
2. _____
3. _____
4. _____

8. What kind of pressures, if any, were exerted over farmers to speed up work or resolve disputes?

External pressures
(Specify) _____

Internal (social)
pressures (Specify) _____

9. If Khal chowkidar has been hired, what are the terms of his service?

SCHEDULE 5

Data Obtained from Improvement Officers

Village (Name and Number) _____ Interviewer Name _____
 Tehsil _____ Date _____
 District _____ Mogha No. _____

Note:

If possible, the person(s) who worked on this watercourse improvement project should be interviewed for this information. A copy of the map must also be obtained.

Area commanded (acres) _____

Watercourse length; Branch (1) _____

(2) _____ (3) _____ (4) _____

Total _____

Mogha Discharge: Official _____ cusecs

Measured _____ cusecs

Public Tubewell: No. _____

Discharge _____ cusecs

Location: Head _____ Middle _____ Tail _____

Why/how was this watercourse chosen?

What problems were faced? (Describe)

Also ask about disputes, problems mentioned by the farmers:

Enter the following dates:

Date

- a. Applied for watercourse renovation _____
- b. Uprooting of trees started _____
- c. First digging of watercourse started _____
- d. Katcha improvement completed _____
- e. Lined section started _____
- f. Lined section completed _____
- g. Pukka nakkas fixed _____

SCHEDULE 6

To be administered to a random sample of
farmers stratified by position on watercourse

Village Name _____ Interviewer Name _____

Village No. _____ Date _____

Tehsil _____ Watercourse/Mogha _____

1. Farmers respondent information:

a. Randomly chosen Yes 1 No 0 (circle)

b. If no, is this farmer located primarily at extreme:

Head 1 Tail 0 (circle)

c. Farmer's Name (full) _____

d. Son of _____

e. Farmer's number (Use same number assigned in 100% census)

f. Residence: 1. Village _____

(circle) 2. Farm Dera _____

3. Other (specify) _____

g. Age (at last birthday) _____

h. Education _____ Years completed formal schooling _____

i. Religion _____ Sunni 1 Shia 2 Other (specify) 3

j. Time spent in farming (circle):

a. Part-time 1

b. Full-time 2

c. Joint 3

If part-time, type of non-farm business/occupation

_____ Years involved _____

2. Acres cultivated

a. Total _____ Rented in _____ Rented out _____

b. Total in this village _____

c. Total this watercourse: Acres _____ No. of Parcels _____

i. Watercourse Mogha No. _____

3. Overall, what are the most important farming problems you face?
Would you say:

A.	<u>Big Problem</u>	<u>Small Problem</u>	<u>No Problem</u>
a. Credit	2	1	0
b. Land	2	1	0
c. Water	2	1	0
d. Seeds	2	1	0
e. Fertilizer	2	1	0
f. Pesticides	2	1	0
g. Machinery	2	1	0
h. Marketing of product	2	1	0
i. Labor	2	1	0
j. Personal safety	2	1	0

- B. On the above list, rank the three biggest problems in order of importance.

4. Machinery/Implement Ownership

Do you own the following?

Machinery/ Implement	By self only	Jointly	Owned				
			If jointly, with the partner	If do not own, from where do you rent?	Farmer No.	Prvt. shop	Govt. Agency
i. Tubewell							
ii. Tractor							
iii. Wheat Thresher							
iv. Land scraper							
v. Rabi Drill							
vi. Any other (specify)							

5. Adoption of Innovations

A.	Wheat sown Last Rabi (1977-78)	Type and amount of fertilizer/acre
a.	Maxi-Pak	_____
b.	Yakora	_____
c.	Chenab 70	_____
d.	SA. 42	_____
e.	Other	_____

B. Cotton sown last kharif (1978)

Variety	No. acres	Amt. & Type fertilizer/ acre	Pesticide Yes/No
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

6. Media Use (frequently = 5/week; sometimes = 1-4; never = 0)

A. Times listened to radio at least $\frac{1}{2}$ hour last week _____B. Timelisted to farm radio programs last week _____

C. Identify: Yes No

Station 1 0

Program Time 1 0

Program Name 1 0

7. Rank radio program preference:

(Rank, giving 1 to first preference, and 2 to second preference, etc.)

	<u>Preference</u>
a) Musical	_____
b) Farm	_____
c) World News	_____
d) Local News	_____
e) Religious	_____
f) Other (specify)	_____

8. A. Knowledge and Evaluation of Institutional Services:

Personnel	Knows location		Knows Name		Contacts in past three months (Often 1/week; occasional; never)	Evaluation of helpfulness: Highly Some No help somewhat unhelpful highly unhelpful
	Yes 1	No 0	Yes 1	No 0		
Ag. Officer	1	0	1	0		
Field Asst.	1	0	1	0		
Bank/Credit	1	0	1	0		
People	1	0	1	0		
Coop. Dept.	1	0	1	0		
Canal Patwari	1	0	1	0		
Revenue Patwari	1	0	1	0		
Zilledar	1	0	1	0		
SDO Canal	1	0	1	0		
Overseer	1	0	1	0		
Watercourse						
Committee	1	0	1	0		
Watercourse						
Area Team	1	0	1	0		

9. Farmer Water Management knowledge

- A. Of all the water which enters the mogha, how much would you estimate is lost by the time it reaches the nakka of your largest parcel?

Amount lost	Prior to Improvement	After Improvement
None		
Fourth to half		
Up to Three-fourths		
More than three-fourths		

- B. Has any Agricultural Officer from OFWM ever contacted you about:

1. Improving your irrigation and cultivation techniques?

Yes _____ No _____

2. Leveling your land?

Yes _____ No _____

- C. What are the major sources of your water losses on this W/C?
(Rank in order of importance; Most important = 1, etc.)

	<u>Prior to Improvement</u>	<u>After Improvement</u>
a. Spills over side	_____	_____
b. Seepage	_____	_____
c. Water standing in ditches	_____	_____
d. Silting	_____	_____
e. Katcha nakkas	_____	_____
f. Illegal cuts (theft)	_____	_____
g. Rat holes	_____	_____
h. Livestock crossing	_____	_____
i. Vegetation in and around channel	_____	_____

- D. How satisfied are you with the levelness of your fields?
(circle)

1. Highly satisfied
2. Somewhat satisfied
3. Somewhat dissatisfied
4. Highly dissatisfied

E. How much warabandi time do you have? _____

Area irrigated per water turn

	Prior to W/C Improvement	Soon after improvement	Presently
Interviewer: convert to	_____	_____	_____
minutes	_____	_____	_____
per kanal	_____	_____	_____

10. Estimate power/influence each farmer has with regard to:
(Note: list all farmers' names/numbers before administering. Ask about each farmer.) 4=much; 2=Biraderi only; 1=little; 0=none.

Farmer's Name & Number	Biraderi/Village	Govt. Officials
_____	_____	_____
_____	_____	_____

etc.

11. Sample Farmers' participation in Watercourse Improvement decision-making:

A. Are you a member of a watercourse committee? Yes _____ No _____

B. If yes, how many general meetings did you attend in connection with watercourse improvement?

i. During the course of watercourse improvement? _____

ii. After watercourse improvement? _____

C. What was the issue under discussion in each meeting that you attended?

1. _____

2. _____

D. How many meetings you knew of the time and date but you did not attend? Give reasons.

1. _____

2. _____

12. How do you feel about the general meetings?

A. Never held: Yes _____ No _____

B. Held and you usually attended Yes _____ No _____

C. Held but you rarely or never attended Yes _____ No _____

D. You had an opportunity to express your point of view at these meetings:

Frequently _____

Occasionally _____

Never _____

E. You never considered the problem important enough to participate in discussion. Yes _____ No _____

13. Were you satisfied with the working of the Watercourse Committee?

Yes _____ No _____

Give merits and demerits in either case _____

14. What difficulties were encountered during the process of watercourse renovation? (from uprooting of trees to the construction of the last nakka.)

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

- 15.A. Who were the people who created some obstacles during khal improvement or could not do their share of work?

None _____

Farmer No. _____

Farmer No. _____

- B. What kinds of obstacles? 1. None _____

2. _____

3. _____

16. Are you satisfied with the W/C improvement? Yes _____ No _____

Give reasons: _____

17. Can you suggest any ways to improve the efficiency and involvement of people working for watercourse renovation?

Explain the idea of a Water User Association, then ask the following questions:

18. Do you favor forming an association of all the farmers getting water from the watercourse? Yes _____ No _____

Reasons _____

19. If yes, should this association have a legal recognition?

Yes _____ No _____

Reasons _____

20. Should the water user association have an Executive Committee?

Yes _____ No _____

A. If no, give reasons _____

B. If yes, should representation on Executive Committee be based on:

- i. Caste & Biraderi _____
- ii. Land ownership _____
- iii. Location of land on watercourse, i.e.:
Head, Middle, Tail _____
- iv. General Election _____
- v. Any other (specify) _____

C. Should there be representation of any Govt. Official on the watercourse committee?

Yes _____ No _____

If yes; of which department? _____ Status _____

Why or why not? _____

D. Should this committee have legal powers with regard to:

- | | | |
|-------------------------------------|-----------|----------|
| i. Watercourse cleaning/maintenance | Yes _____ | No _____ |
| ii. Warabandi | Yes _____ | No _____ |
| iii. Assessment of water revenue | Yes _____ | No _____ |
| iv. Settle disputes | Yes _____ | No _____ |
| v. Any other matter | Yes _____ | No _____ |

E. What kinds of sanctions should it have?

- i. Fine _____
- ii. Cut off water _____
- iii. Appeal to appropriate department _____
- iv. Other _____
- v. None _____

F. Who on your W/C should be a member of the Executive Committee?

Farmer No. and/or name: _____ Reason _____

1. _____ 2. _____ 3. _____ 4. _____

G. What personal attributes should the member of the Watercourse Executive Committee have?

1. _____ 2. _____ 3. _____ 4. _____
5. _____ 6. _____

21. Would you like to have a Panchayat separate from the Executive Committee for settling water disputes?

Yes _____ No _____

100% Census of all Watercourse Members

Village Name and Number _____ Interviewer _____

Watercourse Mogha Number _____ Date _____

Farmer Number	Farmer Name	Son of	Biraderi Caste Sub-caste	No. of adult males	(If scattered, indicate) watercourse position (Head, Middle Tail)	If on an un- improved branch, indicate	Total		Position ³ held	Inter- viewed in sample (fill in later)
							Owner ² Tenant Mixed	Cultivated land Village W/C ¹		

[illegible]

Note: (1) Total W/C holdings should equal approximately commanded area. If it does not, recheck; explain if there is a reason why these are not equal.

(2) For tenant, indicate No. of owner of land cultivated.

(3) Lumberdar, Watercourse Committee, Users Association, Ag. Bank, Cooperative Credit Society, Patwari, Biraderi Head.

Watercourse Structural Attributes

Sr. No.	Major castes/ Zats	Any recognized subcastes/ biraderis/ Pattis	Total Number House- holds	Religion	Settlement	Tenancy status: Owners: Tenants: Mixed
				Sunni: Shia: Other (Specify) Number Households	status: Locals: Settlers: Refugee: Number Households	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

Watercourse Structural Attributes

Sr. No.	Major castes/ Zats	Any recognized subcastes/ biraderis/ Pattis	Total Number House- holds	Religion	Settlement	Tenancy status: Owners: Tenants: Mixed
				Sunni: Shia: Other (Specify) Number Households	status: Locals: Settlers: Refugee: Number Households	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

APPENDIX II
Scoring of Watercourse Maintenance

Scoring of Watercourse Maintenance

Aspect of Watercourse	Scores to Observation	Scores if re-categorized
Lined section, if silted	No = 0 Yes = 1	
Pucca structures, including lined section	Actual count of crack = 1 broken = 2	Counts recategorized 1-5 = 1 6-10 = 2 11-15 = 3 16-20 = 4 21-25 = 5
Illegal cuts	Actual counts	1-10 = 1 11-20 = 2 21-30 = 3 31-40 = 4 41-50 = 5 51-60 = 6
Weak, Broken Banks	Few = 1 Many = 2	Observed for three positions, Head, Middle, and Tail, then added.
Rat Holes	Few = 1 Many = 2	Observed for Head, Middle, and Tail separately, then added.
Vegetation	A little = 1 Excessive = 2	Observed for Head, Middle, and Tail separately, then added.
Trees, Old and New	Actual Counts	Re-categorized separately for Head, Middle, and Tail and then added. 1-20 = 1 21-40 = 2 41-60 = 3 61-80 = 4 81-100 = 5 and above

The final score of maintenance on each watercourse was determined by adding all observations after re-categorization and by position of Head, Middle, and Tail as indicated above. The lower the score, the better the maintenance and was ranked accordingly from one to ten.

APPENDIX III
Pre-Improvement Watercourse Survey
Instructions

The purpose of a pre-improvement watercourse survey is to facilitate gathering basic social data that can be used by On-Farm Water Management personnel both to select watercourses that have the greatest potential for a successful improvement program, and to facilitate the improvement process by giving the OFWM workers basic information on the people with whom they will be working. The survey forms are simple to use, and short. More space may be required for some answers than is provided on these sample forms.

There are four basic forms: form A is for doing a 100% census of the watercourse members, and finding out about the basic social structure of the candidate watercourse. It is self-explanatory.

Form B, is to be completed by interviewing key informants, that is, knowledgeable village residents who are willing to give accurate information. The information should be confirmed from several informants, preferably located at various social positions (different biraderis, different points on the watercourse), and reasons for differences, if any, ascertained. A community in which no one is willing to give the basic data sought would probably not be a good candidate for improvement.

Form C, on the distribution of power/influence in the village, is very important and should be done carefully. Sometimes farmers are reluctant to answer these questions; the interviewer will have to explain carefully that he is just trying to get an idea about how many people on the watercourse are influential, etc.

Form D is a tabulation sheet for summarizing the results of the survey.

After pre-improvement surveys have been completed for several watercourses, and the results tabulated, the watercourse(s) judged most likely to be successfully improved and maintained should be selected. Listed below, in order of importance, are the attributes that seem most conducive to a successful improvement and maintenance program. It is not necessary for a watercourse to have all of these characteristics, but the more of them it has, the greater the likelihood of success. The first six attributes listed are probably the most important.

Factors Conducive to Success

1. A large majority of landholdings within the 6.5 to 25 acre range.
2. Equal distribution of power and influence.
3. A large percentage of farmers perceived as having some influence.
4. Relative concentration of power/influence toward the tail or middle of the watercourse.
5. Cooperation on previous collective projects, and no serious recent conflict.
6. A small number of shareholders on the watercourse.
7. Domination of the watercourse by a single biraderi.
8. "Progressiveness" of the community, as measured by the percentage of farmers with a better than primary education, and the number of institutional services available in the community.
9. Single-branch watercourse.

A final important factor is of course the level of interest in the project; the more widespread and enthusiastic it is, the better.

The Tabulation Sheet (form D) provided is meant to summarize the data in terms of the above listed factors and to facilitate the decision on whether to improve particular watercourses. However, the final decision is a matter of judgment; no strict and invariable formula can be applied. It is hoped that the procedure outlined here will facilitate making more informed and objective judgments.

PRE-IMPROVEMENT WATERCOURSE SURVEY

form A

100% Census of the Watercourse Members

This form should be completed with the help of key informants,
and should be in the same order as the warabandi (head to tail).

serial no.	name	father's name	caste	biraderi	landholding village/w-c	location H,M,T	education beyond fifth class(yes/no)
---------------	------	---------------	-------	----------	----------------------------	-------------------	--

1.

2.

3.

4.

5.

etc.

PRE-IMPROVEMENT WATERCOURSE SURVEY

form B

Village and Watercourse Level Data

This form should be completed with the help of knowledgeable and helpful key informants; the information should be checked with several informants.

1. Village _____ 2. Tehsil and District _____

3. Number of watercourses in village: total _____ improved _____

4. Institutional services present in village

<u>service</u>	<u>present? (check)</u>
a. paved road	_____
b. railway station or bus stop	_____
c. post office	_____
d. fertilizer agency	_____
e. field assistant	_____
f. boys' school--primary	_____
middle	_____
high	_____
g. girls' school--primary	_____
middle	_____
high	_____
h. govt. medical dispensary	_____
i. bank branch	_____
j. veterinary dispensary	_____
k. electricity	_____

TOTAL NUMBER _____

5. Active organizations in village (yes/no)

mosque committee	_____
islahi committee	_____
cooperative society	_____
Union Council	_____
other (specify)	_____

PRE-IMPROVEMENT WATERCOURSE SURVEY

(form B continued)

6. Collective projects undertaken in the village in recent years:
 (Give details: who initiated it, what was the project, who benefited,
 how was money or labor collected/contributed, number of years ago,
 degree of success of the project.)

Project 1. _____

 2. _____

 3. _____

7. Caste and Biraderi Structure (farmers)

	village level				watercourse level			
	caste	no. hshlds	biraderi	no. hshlds	caste	no. hshlds	biraderi	no. hshlds
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								

8. Organization of cleaning and maintenance of watercourse at present.

- a. distribution of shares among farmers: _____
 b. frequency of cleaning: _____
 c. sanctions for non-compliance: _____
 d. effectiveness of cleaning program: _____

PRE-IMPROVEMENT WATERCOURSE SURVEY

(form B continued)

9. Presently prevailing conflicts/tensions in village and on the sample watercourse. This section will require much tact, and should not be asked until after some rapport is established with informants; one can learn a lot about conflicts from comments dropped while other matters are being discussed. For each conflict, try to find out which groups and key individuals are involved, the severity (insults, fights, murder, court cases), reasons for the conflict, and what effect it would have on the improvement program's success.

PRE-IMPROVEMENT WATERCOURSE SURVEY

form C

Measurement of Power/Influence

List all the farmers' names and serial numbers (from 100% Census, form A) before interviewing. Randomly choose about 50% of the farmers, stratified by Head, Middle and Tail, and ask each of these farmers to rate all the other farmers on the watercourse with respect to their power/influence in decisions pertaining to biraderi, village and watercourse affairs.

<u>Farmers' no. and name</u>		<u>power/influence score*</u>								<u>Total score</u>
		<u>informant:</u>	<u>1.</u>	<u>2.</u>	<u>3.</u>	<u>4.</u>	<u>5.</u>	<u>6.</u>	<u>... 20</u>	
Head:	1.									
	2.									
	3.									
	4.									
	5.									
Middle										
Tail										

*Code for power/influence: 4 = much; 2 = some; 1 = little; 0 = none. The overall measure of power/influence of each farmer (total score) will be: $\frac{\text{sum of all his scores (Total score)}}{\text{no. of sample farmers}} \times 100.$

PRE-IMPROVEMENT WATERCOURSE SURVEY

form D

Tabulation Sheet

This form is to be completed based on forms A, B, and C.

1. Percentage of holdings (village level) of watercourse members in the 6.5 to 25 acre range (form A). _____
2. Distribution of power/influence among watercourse members (form C). _____
Method: Rank all the farmers' total scores from highest to lowest and find the sum; then calculate the number of farmers' scores, from the top, required to equal half the total score. Convert this to a percentage of total farmers; the higher it is, the more equal is the distribution.
3. Percent of farmers perceived as having some influence (form C). _____
Method: Calculate the number of farmers who achieved 50% or more of their potential total score; convert to a percentage of total farmers.
4. Distribution of power/influence according to location on the watercourse (form C). H _____
Method: For Head, Middle and Tail separately, the M _____
average score per farmer; alternate method: T _____
calculate the percent of farmers at each location scoring 50% or more of potential total score.
Higher scores at the Tail and/or Middle than the Head suggests the watercourse may be a good candidate.
5. a. Cooperation on previous collective projects (form B). yes/no _____
b. Serious conflict/tension in the community (form B). yes/no _____
6. Number of shareholders on the watercourse (form A). _____
7. Single-biraderi (form A & B). yes/no _____
Note: if 90% of the shareholders belong to a single biraderi whose members hold approximately the same percentage of the land on the watercourse, count as a single-biraderi.
8. "Progressiveness": a. education--percentage of farmers with 6th class or better education (form A). _____
b. Number of institutional services (form B). _____
9. Single-branch watercourse (map). yes/no _____

APPENDIX IV
Societies Registration Act (1860)

This Appendix contains an opinion by Advocate Ch. Rafiq Hussain written at our request on the possibility of using the Societies Registration Act of 1860, and his responses to further questions posed by the authors concerning his opinion.

SOCIETIES REGISTRATION ACT (1860)

1. Registration Procedure

A society organized for the promotion of advancement of agriculture can be registered under the Societies Registration Act, 1860.

Any seven or more persons associated for the above said purpose may, by subscribing their names to a memorandum of association and filing the same with the Registrar of Joint Stock Companies, form themselves into a Society under the Societies Registration Act, 1860. However, before the Registration of the Society an assent to it being so registered must be given by three-fifths of the members present personally, or by proxy, at some general meeting convened for that purpose by the governing body. It shall be competent for the members thereof upon due notice, to create for itself a governing body to act for the Society thenceforth.

The memorandum of Association must contain the name of the Society, its object, and names and addresses of the members of the governing body or the Executive Committee of the Society.

The form of memorandum of Association is as follows:

Fee Rs. 50.00

Name of the Society.

Registered under Act XXI of 1860.

Memorandum of Association

1. The name of the Society is _____
2. The Registered Office of the Society is situated at _____
3. The objects for which the Society is established are:
 - (a) _____
 - (b) _____
 - (c) _____
4. The names, addresses, and description of the present members of the governing body are:
 1. _____
 2. _____
 3. _____

5. The undersigned are desirous of forming a Society.

	Signature	Address & Description	Name, address, and description of witness
1.			
2.			
3.			
etc.			

A copy of the Rules and Regulations of the Society, certified to be a correct copy by not less than three of the members of the governing body shall also be filed with the Memorandum of Association. When the said Memorandum and the certified copy mentioned above are filed, the Registrar will then certify that the Society has been registered under the Societies Registration Act, 1860.

Bylaws:

Bylaws are framed by the Societies in order to carry out the purposes of the Societies. Bylaws are made by the Society by virtue of which the society and its Officers and Servants not only bind themselves but also the members of the public who come within the sphere of their operation. The Rules and Regulations of the Society should provide for making the bylaws of the Society.

Membership:

The membership of the Society is acquired by having admitted therein according to rules and regulations and by paying a subscription and by signing the list of members. The termination of membership is regulated by the bylaws of the Society.

The body to whom by the rules and regulations of the Society the management of its affairs is entrusted is called the governing body.

Special provisions in the rules should be made about the quorum of a meeting.

The chairman of the meeting should take care that the proceedings are conducted in a proper manner and no business other than the Agenda notice of which has been given to the members, be transacted at a meeting.

Powers of the Society

(Contracting loans; buy, sell, i.e. produce; tractors on rent to the members.)

The society is registered under the Societies Registration Act to give the Society a legal status. Therefore, a Society registered under the said Act becomes a legal person in the eye of law and can get loans, buy and sell produce, and can also give tractors on rent to its members. However, the property whether movable or immovable belonging to the society will be deemed to be vested for the time being in the governing body of the society.

Disciplining of members i.e. fines, etc.

The Society can impose penalty on its members for the breach of any rule or bylaw. The pecuniary penalty so imposed can be recovered through court of law. Any member of the Society can be sued in the following amongst other cases:

- i. If his subscription is in arrear.
- ii. for detaining the property of the society against the rules.
- iii. for causing damage to the property of the society.

Apart from the abovesaid Civil Action a member of the Society can be prosecuted if he intentionally destroys or causes any damage to the property of the Society just as a non-member can be prosecuted.

Limits on activities of society

The opinion and acts of the majority members would be binding on the whole society especially when the rules of the society so provide. However, the action taken by the majority has got some limits. A majority cannot bind a dissenting minority to do that which is not authorized by the Constitution of the Society. The powers conferred on the majority must however be exercised in good faith.

Legal requirements (auditing, reports, inspections and record keeping)

The Society must keep its record. Books of a society are sufficient evidence of the existence of bylaws entered in them. The Registrar containing the details of the funds of the society must be properly maintained. The bylaws should provide for its auditing. Any member can inspect the record of the society. Where a society sues a non-member upon the basis of a bylaw, it cannot refuse to allow him inspection of the bylaw.

Dissolution

Three-fifth members of the Society (or any larger number) may determine that a Society shall be dissolved. In the event of dissolution all the requisite steps must be taken for the settlement and disposal of the property of the Society. Its claims and liabilities must also be determined.

Dated: 24.2 1979

Sd/-

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Faisalabad.

Questions About Societies Registration Act

Q.1. Can an Organization whose primary purpose is the benefit of its members be registered under the Act?

The position of a Society registered under the Societies Registration Act, is that of a Club or a joint stock company. Societies formed for the foundation or maintenance of libraries or reading rooms among its members are usually registered under the said Act. So long as the object remains the advancement of Agriculture the Society whose primary purpose is the benefit of its members can be registered under the said Act.

Q.2.(a) Distinction between the rules and regulations and bylaws.

Rules and regulations of the Society are filed with the memorandum of Association at the time of the Registration of the Society with the Registrar of joint stock company. The bylaws are made by the society in accordance with its rules and regulations after its registration. These bylaws can be made by the society at any time and from time-to-time after its registration to regulate the society, its members and Officers, and to carry out the aims and objects of the society.

(b) Are there any specific limits in regard to scope of the bylaws?

When the society is registered under the Societies Registration Act, then the bylaws cannot override the provisions of the Act. Any bylaw which is inconsistent with the provisions of the Act will become inoperative. Where the constitution of a society provides for making the bylaws in a particular manner and form, the provisions of the Constitution must be followed. The intention of the creating authority as expressed in the Constitution can be made basis for testing the validity of the bylaws.

(c) How can bylaws bind not only the Society and its Officers, but also the members of the public?

Bylaws are framed by the Society under its inherent powers to carry out the aims and objects for which it is formed. Books of a Society are sufficient evidence of the existence of bylaws entered in them even against the strangers. After registration the society becomes

a legal person in the eye of law, therefore the society can also take action against a non-member for causing wrongful loss to the property of the Society.

Q.3.(a) Limits on the termination of the membership of the Society?

Termination of membership is regulated by the bylaws of the Society concerned. However, when the society is registered under the Societies Registration Act, the provisions of the Act will apply and then bylaws of the Society cannot provide a procedure for the termination of the membership different from that of the Act. Under the provisions of the Act a member whose subscription had been in arrear for over three months should not be counted as a member.

(b) Are there any specific provisions concerning the Governing body in regard to its powers, etc.?

There is no specific provision in the Act concerning the "Governing Body" in regard to its powers or limits on its powers. However, the Act provides that once in every year, on or before the 14th day succeeding the day on which, according to the rules of the Society, the annual general meeting of the society is held, or, if the rules do not so provide, in the month of January, a list of the names and addresses and occupations of the Directors of other governing body, then entrusted with the management of the affairs of the Society, must be filed with the Registrar of joint stock Companies. The powers or the limits on the powers of the "Governing Body" are provided in the Rules and Regulations which are filed with the Memorandum of Association at the time of the Registration of the Society.

(c) Is transaction of business not mentioned in the Agenda notice a strict requirement? Is written notice a must?

Usually a business not mentioned in the Agenda notice cannot be transacted at meeting. However, if all the members are present and consent to the inclusion of any other business in the Agenda, then the said condition can be waived. The opportunity of attending the annual general meeting must be given to every member entitled to attend. As the oral intimation of an Agenda to the

member can give rise to many malpractices, the law requires the intimation in the form of a written notice. However, a meeting held without notice will be valid if all members of the Society are present and consent to the meeting being held.

4. Is the provision that all Society property is deemed to be vested in the governing body qualified or limited in any way? Can it be vested in the General Assembly?

When the society has been registered under the above said Act, it can sue or be sued in the name of its President, Chairman, or Principal Secretary, or in the name of any other person who has been appointed by the Governing body for the occasion. Therefore, it is provided in the Act, that in all legal proceedings, the moneys, Securities, goods, chattels, and effects belonging to a society and not vested in the trustees, may be described as belonging to the governing body. Therefore, the term that the property of the Society will be deemed to be vested in the governing body is used in a limited sense for the disposal of all proceedings Civil and Criminal.

5. Disciplining of members

- (a) Recovering penalties through the courts is a long and expensive process?

In view of the recent amendments made in the relevant law, court fee on plaints in the civil suits has been exempted where the valuation of the suit for purpose of Court fee is up to Rs. 25000/-. Therefore, where the value of the property of the society detained by the member is up to Rs. 25000/-, no court fee will have to be paid on suits for the recovery of such property.

- (b) If a member's subscription is in arrear, can he just quit if the Society tries to recover?

Sufficient safeguard has been provided in the Societies Registration Act against a member who has been sued for the recovery of such arrears. A suit by or against a society will not abate or become defective even by reason of the death of one of its members. The suit will continue against the successor of such person/member.

6. Limits of activities of society.

(a) Is there no specific statutory auditing provision or standard?

There is no specific provision in the Societies Registration Act about the auditing of the accounts of the Society. However, the by-laws should provide for the auditing of the funds of the Society.

(b) Tax status of the Society

As the Society is to be registered for the advancement of Agriculture, it should not be liable to tax. However, if any income is derived in contravention of the provisions of the Act, the income will be liable to tax.

(c) How can a non-member be sued on the basis of bylaws?

The Societies Registration Act specifically provides that any member of the society who steals or embezzles any money or other property willfully and maliciously destroys or injures the property of the Society can be prosecuted in the same manner just as a non-member can be prosecuted. Therefore, a non-member can be sued on the basis of a bylaw provided it is made in consensus with the provisions of the Act.

7. The need of a lawyer in the event of Dissolution of the Society if there is any property?

The Society can retain the services of a legal advisor to give opinion on matters including the procedure to be adopted in case the society is dissolved and any property is left after satisfying all the debts and liabilities of the society.

8. Precedents of Societies formed under the Act analogous to the Water Users Association?

As the project of water users association is a new and unique experiment, precedent of exactly the same nature could not be found. However, in Radha Swami Satsung Sabha Versus Tarachand a case reported in A.I.R. 1939. Allahabad 557, it was held that the Sabha was a Society Registerable under the Societies Registration Act, and its registration in the said Act was proper. The Sabha was a well-organized society with a minimum of 40 members, having a secretary and an executive committee. It had an educational Institute with a

managing committee and it also had a dairy and an agricultural farm the ostensible objects of which were: Firstly, of providing to the above institute an opportunity of obtaining first-hand knowledge of the various practices employed in modern farming, and secondly, of securing a pure and abundant supply of fresh vegetables and pure butter and milk to the residents of Dayal Bagh. The society was held to be a Charitable institution.

.....

Dated: 20.3. 1979

Sd/-

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BIBLIOGRAPHY

- Clyma, Wayne, Arshad Ali and Mohammad Ashraf. 1975. Watercourse Losses. Annual Progress Report, Fort Collins: Water Management Research Project, Colorado State University.
- Corey, Gilbert L. and Wayne Clyma. 1975. Improving Farm Water Management in Pakistan, Water Management Technical Report No. 37 (Pakistan Field Report No. 1). Fort Collins: Water Management Research Project, Colorado State University.
- Coward, E. Walter, Jr. 1979. Principles of Social Organization in an Indigenous Irrigation System. *Human Organization* 38 (1):28-36.
- Freeman, David K. and Max K. Lowdermilk. 1976. Community and Irrigation in the Pakistan Punjab - Physical and Sociological Dimensions of the Water Management Program. Annual Technical Report, Appendix 40. Fort Collins: Water Management Research Project, Colorado State University.
- Freeman, David K. and Max K. Lowdermilk. 1978. Sociological Analysis for Irrigation Water Management - A Perspective and Some Analytical Approaches to Assist Decision Making. Improving Water Management on Farms, Appendix 34; Annual Technical Report. Fort Collins: Water Management Research Project, Colorado State University.
- Hunt, Robert C. and Eva Hunt. 1976. Canal Irrigation and Social Organization. *Current Anthropology* 17(3):389-411.
- Lowdermilk, Max K., Wayne Clyma and Alan C. Early. 1975. Physical and Socio-Economic Dynamics of a Watercourse in Pakistan's Punjab: System Constraints and Farmers' Responses. Water Management Technical Report No. 42. Fort Collins: Colorado State University.
- Lowdermilk, Max K., David M. Freeman and Alan C. Early. 1978. Farm Irrigation Constraints and Farmers' Responses: Comprehensive Field Survey in Pakistan. Six volumes. Water Management Technical Report 48. Fort Collins: Water Management Research Project, Colorado State University.
- Lowdermilk, Max K., David M. Freeman and George E. Radosevich. n.d. Guidelines and Alternatives for Organization of Water Users Associations in Pakistan. (Draft)
- Mirza, Ashfaq Hussain. 1975. A Study of Organizational Factors Affecting Water Management Decision Making in Pakistan. Water Management Technical Report No. 34. Fort Collins: Colorado State University.



- Mirza, Ashfaq Hussain and Douglas J. Merrey. 1978. The Water User Association Research Project: An Interim Report. Faisalabad: Agriculture University (Cyclostyled). Also published in: Annual Report, Water Management Research Project, Colorado State University, Fort Collins, Colorado. June 1979. pp 540-586.
- Merrey, Douglas J. 1979. Irrigation and Honor: Cultural Impediments to the Improvement of Local Level Water Management in Punjab, Pakistan. Field Report No. 9. Lahore: Colorado State University, Water Management Research Project in Pakistan.
- Niazi, Iqbal, Muhammad Yasin, Douglas Merrey and Helmer Holje. 1979. Tree Removal and Watercourse Improvement: A Preliminary Survey. Annual Technical Report. Fort Collins: Water Management Research Project, Colorado State University.
- Radosevich, George E. 1975. Water User Organizations for Improving Irrigated Agriculture: Applicability to Pakistan. Water Management Technical Report No. 44. Fort Collins: Colorado State University.
- Reuss, John O., Gaylord V. Skogerboe and Douglas J. Merrey. 1979. Water Management Programs to Improve Agricultural Productivity in Pakistan: An Appraisal. Pakistan Report No. 42. Lahore: Water Management Research Project in Pakistan, Colorado State University.
- Radosevich, George E., Iftikhar Ali Qureshi and Douglas J. Merrey. 1978. Proposed Legislation to Authorize the Formation of Irrigation Associations in Pakistan. In Proceedings of Seminar on "Water Users Associations for Improving Irrigated Agriculture". Islamabad: Ministry of Food and Agriculture, Government of Pakistan, and United States Agency for International Development.
- Schumacher, E.R. 1973. Small is Beautiful: Economics as if People Mattered. New York: Harper and Row.
- Siegel, Sidney. 1956. Nonparametric Statistics. New York: McGraw-Hill.
- Water Management Research Project Staff. 1976. Institutional Framework for Improved On-Farm Water Management in Pakistan. Special Technical Report. Fort Collins: Water Management Research Project, Colorado State University.
- White House - Department of the Interior. 1964. Report on the Land and Water Development in the Indus Plain. The White House - Department of Interior Panel on Waterlogging and Salinity in West Pakistan. Washington, D.C.: The White House.