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ON-FARM WATER MANAGEMENT PROJECT

THE SECOND

JOINT US-PAKISTAN EVALUATION

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

ISLAMABAD, PAKISTAN

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TABLE OF CONTENTS

Page

Summary....i
Recommendations....iv
1. Introduction....1
2. Project Evaluation: Background and Purpose....2
3. Project Beneficiaries....7
4. Institutional Arrangements....7
5. Project Progress....14
6. Selection Criteria....18
7. Project Financial Issues....21
8. Personnel Recruitment....37
9. Training....41
10. Supporting Research....46
11. Technical Aspects....50
12. Extension....53
13. Water User Associations....57
14. Technical Assistance (SCS)....60
15. GOP Project Support....65
16. Conclusions....66

TABLES

1. Evaluation Team Members....3
2. OFWM Evaluation Scope of Work....4
3. Staffing Proposals Contained in the Original PC-I's....10
4. Number of Watercourses to be Improved: Targets and Achievements....15
5. PLL: Targets and Achievements....16
6. OFWM Project: Financial Targets and Allocations....22
7. Broad Indication of Direct Project Costs on Physical Works as Proportion of Total Allocations: FY 79....23
8. Material Costs: Selected Improved Watercourses....26
9. Current Fixed Amount Reimbursement Rates....29
10. Summary of Advances and Liquidations OFWM Loan 391-T-172....30
11. COP Requests for Reimbursement....31
12. OFWM Loan 391-T-172 COP Requests Pending for Reimbursement..32
13. Phase-Out of SCS Team Serving OFWM Program in Pakistan....61
14. SCS Staff Assigned to Work With PLL and OFWM Dec. 73 - Oct. 79....63

APPENDIXES

Appendix A - Project Paper Facesheet
Appendix B - On-Farm Water Management Project - A Joint US-Pakistan Evaluation, May 1978

TABLE OF CONTENTS

Appendix C - Evaluation Team Itinerary
Appendix D - The Rural Poor as Beneficiaries
Appendix E - Survey of Improved Watercourses - Punjab Province - On-Farm Water Management Project by Dr. Malik Ashraf and Dr. Raymond Hooker, USAID/Pakistan
Appendix F - Constraints on Small Farmers in the Precision Land Leveling Program in the Pakistani Punjab by Raymond A. Renfro, Colorado State University

SUMMARY

The purposes of this evaluation of the Pakistan On-Farm Water Management Project were:

1. To stimulate a more beneficial and rapid disbursement of the USAID loan during the remaining 15 months of the project.

2. To gather and analyze information and make recommendations relevant to the development of possible subsequent National On-Farm Water Management Program to be partially supported by other international donor agencies.

3. To satisfy the requirements of the Project Paper.

With these goals in mind, an evaluation team composed of GOP, World Bank, and USAID personnel interviewed various concerned Federal and Provincial Officials and inspected project field activities. The interviews revealed a general viable functioning organization, particularly in Punjab and Sind, strongly supported by the GOP, with potential institutional capabilities for managing a subsequent expanded national program.

Several program areas require modification and change. Perhaps most obvious was project financing and costs. Inevitably, during the initial stages of a pilot project overheads will be relatively high. Nevertheless, even in Punjab, the program is costly in relation to the completion of physical works, especially if other costs incurred in support of the program are taken into account. Any major expansion in the program will therefore clearly require a considerable increase in field team productivity; a substantial reduction in the share of overheads; ways of reducing the costs of project works; and, given Pakistan's resource constraints, means of generating the resources to finance the program.

A summary of project productivity through June 1979 is as follows:

TARGETS AND ACHIEVEMENT THRU 6/79

	PC Targets		Achievements	
	WCI*	PLL**(000) (Acres)	WCI*	PLL**(000) (Acres)
Punjab	195	54.00	202	13.90
Sind	137	38.80	16	9.20
NWFP	15	4.20	9	1.70
Baluchistan	2	0.05	-	0.06
TOTAL	349	97.05	227	24.86

* watercourse improvements
** precision land leveling

All provinces fell behind their assigned targets except Punjab in WCI. While some increase in project productivity and loan disbursement can be expected with experience, the evaluation team recommended a number of modifications, listed below, designed to improve the quality of the program as well as increase the rate of implementation and disbursement.

a. Removal of the farm size restrictions for water course improvement. This should enable field teams to concentrate their efforts, especially in Sind.

b. Reduce emphasis on PLL. Remove farm size limitation on PLL, and restrict PLL work to areas on or contiguous to improved watercourses. This will allow field teams to supervise PLL work while undertaking the primary task of watercourse improvement.

c. Give to the provincial OFWM Projects and the Water User Associations the legal authorities required to assure timely organized cleaning and maintenance of improved watercourses in order that water saving and water control benefits can be maintained.

d. Continued research and testing of low-cost watercourse linings and other improvement technologies. Flexibility must be built into the project in order that the most suitable procedures and technologies may evolve.

e. Increase the number of USAID inspectors so that FAR payments and loan disbursements are not delayed.

The project beneficaries should be redefined as the rural poor which includes "small to medium" farmers, the present project target group. The program goals of increasing crop production and thus the income of the target groups are partially dependent on the program extension components. It is through these components that water savings are transformed into increased production. To date, the overall project achievement in demonstrating and training farmers in improved water management and agronomic practices has been inadequate. A recommendation for FAR coverage for these components should stimulate and increase their implementation. Additionally, there is a need to evaluate various extension models in order to improve project techniques for motivating farmers to use these improved practices.

Little information has been gathered on the impact of the project and progress towards its goals. The pilot nature of the

project implies the need for evaluation, experimentation and change. A supporting USAID rupee grant to support a five-year detailed monitoring and evaluation of the OFWM Project was rejected by the GOP. Because such a monitoring and evaluation can contribute greatly to the success of a subsequent national program, the evaluation team feels strongly that the GOP should reconsider their position on the rupee grant project.

A complete listing of the evaluation team recommendations are found in the following section.

RECOMMENDATIONS

Project Beneficiaries

The Project beneficiaries should be conceptually defined as the "Rural Poor" which in addition to small and medium farmers includes seasonal labors, village artisan haulers, etc., and other rural poor who are economically dependent on agriculture.

Institutional

The present provincial OFWM organizations should be established as permanent directorates with legal ties to water user associations and with legal authority and responsibility to assure cleaning and maintenance of improved watercourses. The field staff should therefore be expanded to include a Maintenance and Inspection Unit in each OFWM Project area.

Selection Criteria

Remove all land ownership requirements for participation in subsidized watercourse improvement but restrict improvement of watercourses to judiciously selected contiguous areas (i.e., along a minor or distributary) where the majority are known to be small farm operators.

PLL should be de-emphasized as a major project component and all targets removed. It is however recommended that cost-shared reimbursed PLL be retained as a project service to all farmers along an improved watercourse or in the near vicinity regardless of the size of their holdings. Cost shared PLL should be limited to a maximum of 5 acres per operator.

USAID must increase and locate their inspectors so leveled land and improved watercourses can be inspected within one month after completion of work.

USAID should reduce the minimum submission required from FAR processing from $50,000 to $25,000.

Establish personal ledger bank accounts for all area and team leaders so that project contingency needs can be immediately met and implementation not delayed.

Recruitment

University graduates with degrees in crops or soils should be recruited for all team Agricultural Officers positions.

For appointment to regularized OFWM Project positions, graduation from OFWM training schools must be mandatory.

To reduce personnel turnover OFWM positions should not normally be filled with transferees from other Agricultural Department positions.

For team engineering positions (WCI and PLL) recruit 2 year technical diploma holders and capable matriculates. Accordingly, present team members who are university graduates should serve as a pool from which future area and team leaders are selected.

Curricula

A watercourse improvement training manual must be prepared for use by all provinces.

Training

Project recruits must not be trained until they receive a project appointment.

Team Agricultural Officers should be university graduates with majors in crops or soils. To avoid the placement of unsatisfactory graduates from other project training courses, all Agricultural Officers should be recruited from outside the project; their first project training must be the 4½ month course given at the University of Agriculture at UAF.

Project personnel requirements in NWFP and Baluchistan are not sufficient to warrant individual training schools. All their recruits should be trained in Punjab or Sind; the NWFP training school should be closed and excess trainers assigned to area or field teams.

Supporting Research

GOP should approve immediately USAID rupee grant funding for a 5 year monitoring and evaluation of the OFWM project.

Watercourse improvement research at Mona Reclamation Experimental Project must be continued with testing of new lining or methodologies throughout the entire length of a watercourse.

Formal linkage between the OFWM Project and Mona Reclamation Experimental Project must be developed and strengthened in Water Management research and watercourse improvement.

Linkage between UAF and OFWM in both training and water management research must be maintained.

The Chung Demonstration and Research Farm must be maintained to develop improved extension techniques and provide farmers with recommendations on efficient utilization of water saved.

The pilot nature of the program should be emphasized and provision made within the program to develop alternative implementation approaches and allow testing of alternate technologies.

Water User Associations

The duties of WUA should be restricted to improving, cleaning and maintaining watercourses. Presently, they should not assume the organization burden and responsibilities of cooperatives.

They should be given a legal status which binds them to the OFWM Project with a legal responsibility to clean and maintain.

Farmer cooperation in cleaning and maintenance should be acquired through persuasion and social pressures. Non-cooperation must, as a legal requirement, be reported to the OFWM Project.

OFWM, upon complaint by WUA, must clean and maintain sections assigned to non-cooperating farmers. Farmer will be billed for this work.

If farmer cleaning and maintenance payment are not paid promptly, the Irrigation Dept. upon request of the OFWM must be legally required to take sanctions against noncooperating farmers.

The WUA organization should not be highly structured. A flexible organization will permit each WUA to work out its own arrangements.

Federation of WUA should be organized.

Research should continue on WUA and expanded into other provinces.

Technical Assistance

Punjab engineering advisor should spend 60 percent of his time assisting other province particularly Baluchistan.

An advisory team chief (SCS) should delay departure until (and if) the subsequent advisors are appointed to the program. Overlapping of advisors should assist in the smooth integration of the present program with a succeeding program.

OFWM staff should maintain close coordination and cooperation with other extension programs that are active in irrigated agriculture.

Extension

Demonstrations, farmer training, etc. should be covered by assigned targets, funds for inputs (seed, fertilizer, etc.), and FAR payments. Emphasis should be given to the extension of improved agronomic and water management techniques on the improved watercourses.

Evaluate the various extension models working in the country and determine the best model for the different activity needs.

Maintain the extension function in the OFWM Project during its pilot project stage in order to demonstrate the effectiveness of a well managed extension service, adequately staffed and funded with definite goals and objectives. One of the goals should be organization and development of WUA.

Assist in developing the Agricultural Extension Service (AES) capability in irrigated agriculture via field days and formal training. The AES should provide the OFWM extension function when the project moves from the pilot to implementation stage.

1. INTRODUCTION

Historically, a shortage of water has constrained Pakistan's agricultural development. More than a century ago steps were taken to remove this constraint by initiating construction of a sophisticated irrigation system consisting of dams, barrages, canals, link canals, distributaries, etc. From that beginning until relatively recently, emphasis was on development of new water sources (dams, tubewells, etc.) and means of water conveyances with little concern given to water use. Irrigation Departments past and present, concentrated on water delivery to the moghas (canal outlets) and, although legally authorized, showed little interest in the water problems within farmer-operated watercourse command areas.

The resulting irrigation system delivers water to over 80,000 watercourses and in excess of 30 million acres. Indeed, the engineering achievements are miraculous. Even today there remains a concept that large engineering constructions are the solution to water shortages. Despite the engineering achievements, water shortages still persist: ask any tail-end farmer. Pakistan's crop yeilds, despite this irrigation system, remain among the world's lowest!

Various engineering feasibility studies concerned with water delivery assumed that conveyance losses within the country's watercourses were 10-15 percent. The origin of this value is uncertain, but possibly results from local definition that restricts loss only to unavoidable losses such as seepage.

In 1970, Colorado State University (CSU), working under a centrally funded AID contract, initiated a Water Management Research Program in Pakistan. In identifying various water management constraints, the Water and Power Development Authority (WAPDA), in cooperation with CSU, measured huge conveyance losses along the nation's watercourses. Repeated "inflow-outflow" loss measurements established that conveyance losses were not an assumed 10-15 percent, but averaged near 50 percent (here a less restrictive loss definition was used which included all losses within the watercourse command area, except theft, that prevented the individual farmer from receiving his allocated share). Building on these findings, WAPDA and CSU developed simplified watercourse earthen improvement techniques that, in conjunction with inexpensive concrete and brick water control structures, reduced conveyance losses 50-60 percent. Based on the technology's use of contributed farmer labor and anticipated timely organized cleaning and maintenance, the benefit/cost ratios were indeed favorable.

In 1973 the Punjab and Sind Agricultural Departments initiated a Precision Land Leveling Project to demonstrate the potential of precise land leveling (PLL) for increasing both water application efficiencies and crop yields. The Soil Conservation Service of the United States Department of Agriculture, working under a USAID/PASA contract, provided technical advisory assistance to the projects. Additionally, they were charged with assisting in the development of a Government institutional capability for providing PLL services.

The potential of both technologies (watercourse improvement and PLL) for saving water and increasing crop yields was obvious to key GOP and USAID officials. The annual water savings, if implemented throughout Pakistan, could equal the storage capacity of several Tarbela Dams. To alleviate Pakistan's water shortage and thereby increase crop production, these two technologies were integrated in 1976 by funding the On-Farm Water Management Project; the subject of this evaluation. The face sheet, summary, recommendations, project background and project description from the Project Paper are found in Appendix A.

2. PROJECT EVALUATION: BACKGROUND AND PURPOSE

The OFWM Project has completed its third year of operation. The Project Paper established a need for annual evaluations on the basis that "many project aspects are experimental and may require modification since experience indicates that logical framework assumptions and other understandings are not always supported by events." These annual evaluations are jointly conducted by external and internal staffs. The evaluation responsibilities are shared by both the GOP and AID.

Due to a slow project start-up the first evaluation was delayed until May 1978. (The summary and recommendations from that evaluation are found in Appendix B.) One year later the Mission was issued phase-out orders; the second evaluation was delayed until the Mission's future status was clarified. Finally, this evaluation commenced September 16 and terminated October 13, 1979. The evaluation team members and the Scope of Work are shown in Tables 1 and 2. The team itinerary, and persons interviewed are listed in Appendix C.

This second evaluation was necessary because of the following reasons:

1. USAID and Project Paper requirements.

TABLE 1

EVALUATION TEAM MEMBERS

1. Mr. Jeremy Berkoff, Economist
   World Bank
   Washington, D.C.

2. Dr. Sidney A. Bowers (Team Leader), Soil Scientist
   USAID/Islamabad

3. Mr. Keith Byergo, Extension Agronomist
   USAID
   Washington, D.C.

4. Dr. Gilbert Corey, Water Management Specialist
   USAID
   Washington, D.C.

5. Dr. Gerald Hickey, Anthropologist
   USAID
   Washington, D.C.

6. Dr. Raymond W. Hooker, Economist
   USAID/Islamabad

7. Mr. A.M.H. Kango, Agricultural Engineer
   Government of Pakistan
   Islamabad

TABLE 2

OFWM EVALUATION SCOPE OF WORK

Specific OFWM Project components assigned for evaluation are as follows:

1. Institutional:

   a) Organizational structure and staffing
   b) Administrative procedures

2. Personnel Recruitment:

   a) Technical qualifications
   b) Recruitment procedures
   c) Constraints to project expansion

3. Training:

   a) Curricula
   b) Training staff
   c) Physical facilities
   d) Teaching methodology

4. Supporting Research:

   a) Colorado State University
   b) Mona Reclamation Experimental Project
   c) OFWM research

5. Selection Criteria for Project Assistance:

   a) Watercourse improvement
   b) Precision land leveling (PLL)

6. Project Accomplishments:

   a) Training
   b) Watercourse improvement
   c) Precision Land Leveling
   d) Demonstration and farmers training

7. Water User Associations:

a) Organization and responsibilities
b) Watercourse improvement
c) Maintenance and cleaning

8. Technology:

a) Watercourse improvement including structures
b) Precision land leveling
c) Extension - demonstration of improved water management and agronomic practices

9. Financial:

a) FAR and loan disbursement
b) Project disbursement
c) PLL cost sharing
d) Credit availability

10. Inspection:

a) Procedures
b) Constraints to disbursement

11. Assess GOP support for project

12. Assess project institutional capability for managing subsequent OFWM national project

2. The OFWM Project will terminate December 31, 1980. All uncommitted funds on that date will be de-obligated. It, therefore, is important that the maximum project implementation and beneficial use of loan funds be achieved prior to the termination date. Recommendations by the Evaluation Team, if acted upon, should stimulate project implementation and loan disbursements.

3. It is anticipated that the GOP will continue with a subsequent, national, On-Farm Water Management Project with possible financial assistance from other international donor agencies. It, therefore, is important that achievements and failings of the program be documented in order to develop an information base upon which the succeeding program can be built.

In relation to point 2 above, project implementation and loan disbursement were slower than anticipated. However, based on the record of FAR submissions, the evaluation team believes that the total loan disbursements can reach $7.5 million by December 31, 1980, particularly if the recommendations to remove certain operational constraints are implemented. For submission request to total $7.5 million on that date, the quarterly submissions must be as follows:

Quarter	$ Submission Required* (Approx.)
October - December 1979	823,000
January - March 1980	953,000
April - June 1980	1,082,000
July - September 1980	1,211,000
October - December 1980	1,341,000

These projections imply that total utilization of the loan fund by the termination date requires successive increases in the quarterly submission rates from 19 up to 93 percent of that submitted for the July - September 1979 quarter. Hopefully, the evaluation recommendations will allow these projections to be realized.

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* Quarterly submissions were derived from the following quadratic imperical projection of cummulative FAR submissions.
Cum. $ Submissions = $2.08350 - 0.25021\ t + 0.00719\ t^2$ where $ = million dollars; t = time in months; $R^2 = 0.99167$
This equation was based on the amount and dates of which FAR submissions were received in the USAID office and a final submission on December 31, 1980. The equation assumes zero FAR submissions up through the 21st month of the project.

3. PROJECT BENEFICIARIES

The Project Paper and the various Provincial Project Proposals (PC-1's) focus on assisting the small and medium farmers and restrict, to a great extent, assistance to larger farmers. The criterion used to identify these groups is size of land holding. In Sind Province small farmers are defined as owning less than or equal to 16 acres and medium farmers more than 16 acres, but less than or equal to 32 acres. Elsewhere in Pakistan, the corresponding acreage limits are 12.5 and 25 acres.

It appears by implication these acreage criteria were meant to distinguish between poorer and wealthier farmers. This criterion assumes equality, on an acre basis, in crop producing potential, in value of the crop, in land value, etc. Unfortunately, this is not true. The crop value of 12.5 acres of fruit trees in North West Frontier Provinces (NWFP) or Baluchistan in no way compares with 12.5 acres of wheat. The average production per acre of "tail-end" farmers on a Punjab watercourse does not equal that of head farmers. These and numerous other examples show that a "size of land ownership criteria" is inequitable. Therefore, the Evaluation Team recommends that the Project's population targets should be conceptually redefined as the "Rural Poor." This broadened definition is consistent with the Congressional mandate and does not exclude assistance and help to the project specified target groups--the "small and medium farmers." In addition to the poor small and medium farmers, it recognizes the need to help the other agriculturally dependent poor such as the seasonal farm laborer, village artesans, etc. The intent of this broadened definition is to relieve the project of restrictions that impede its implementation and in truth, due to circumvention, do not assure that the intended poorer farmers are the primary recipients of the project assistance. Indeed it is felt that the increased implementation rate resulting from adoption of this less restrictive target definition will benefit greater numbers of rural poor and poorer farmers in the time remaining to this project than would be possible under the present target definition and criteria. This redefinition implicitly recognizes that "rural poor" also benefit from increased productivity of the larger farmer through the creation of greater opportunity for employment and greater demands for services. (See Appendix D.)

4. INSTITUTIONAL ARRANGEMENTS

A. Project Organization and Staffing:

The OFWM Project is implemented by the Provincial Depart-

ments of Agriculture, with overall coordination and program responsibility provided by the Director, Water Management Cell, in the Federal Ministry of Agriculture, Food and Cooperatives. In NWFP and Sind, the Project Director reports directly to the Secretary, Agriculture. In Punjab, he reports through the Director General, Agriculture (Field), while in Baluchistan he operates within the Directorate of Agricultural Extension.

In all provinces, the OFWM organization is temporary; established only for the lifetime of the project. In Sind, the original PC-1 covered the period 1976/77 - 80/81, in Punjab the period 1977/78 - 81/82. Subsequently, the project was rescheduled to coincide with the Fifth Five Year Plan period (1978/79 - 82/83) and the targets were revised. Accordingly, the provinces were asked to submit revised PC-1's to take this and other changes into account.

Differences in the internal structures of the Provincial organizations reflect both the stage reached by the various programs and their relative size. Basic implementation in all Provinces is undertaken by field teams, but the hierarchy of command and the extent to which supporting services are provided differs:

(1) The Punjab program is both the largest and the most advanced. The project area comprises seven contiguous districts in the lower Rechra and Lower Bari doabs. Field operations are organized under two area team leaders (Faisalabad and Sahiwal) and two additional area teams are proposed (Khanewal and Chiniot). By end FY-1979, 15 field teams had been established; the total is expected to rise to 40 by the end of the project period. In addition to the field operations, a Deputy Director is responsible for a Training and Research Institute in Lahore, for a Training-cum-Demonstration and Research Farm near Lahore, and for technical advice and support to the Field Staff. Appropriate staff are provided the offices of the Director, the Deputy Director (training and research) and the Area Team Leaders.

(2) In Sind, the project area comprises the Rohri Canal command. Field operations are organized similarly to those in Punjab. Two area team leaders (Water Management Specialists) with appropriate staffs are located at Hyderabad and Nawabshah. Thirteen field teams were established by end FY-79; two additional teams are being

assembled; a total of 25 are planned. Training and technical support are located in or near the Project Director's office with six deputy directors responsible directly to him. Additionally, an administrative staff reports directly to the project director.

(3) The NWFP program is substantially smaller than those in Punjab and Sind. The field team leaders report to a single Deputy Director located at Project headquarters in Peshawar. Two field teams have been established (in D. I. Khan and Peshawar). Two additional teams are being recruited with a total of seven proposed. Training and technical support are provided by headquarters staff who report directly to the Project Director.

(4) The Baluchistan program is the least advanced. Field team leaders report to the Project Director who comes under the Extension Department. Three partial teams have been established (Quetta, Sibi, and Kachhi) and two additional teams are planned. Due to recruitment and other problems the Baluchistan teams consist of only 4 to 5 persons as compared to 9 or 10 in other Provinces. Due to limited staff, training is not provided in Quetta; new recruits are trained in Hyderabad or Peshawar. Headquarters staff, with assistance from the SCS technical advisors, provide technical assistance to the teams.

Table 3 summarizes the staffing proposals in the original provincial PC-1's. Revision has not yet been made to comply with the Fifth Five Year Plan. With exception of the Sind field teams, the original staffing targets have been maintained. Sind through FY-79 established 13 of the proposed 15 teams.

In addition to the OFWM project staffs, USAID provides a team Soil Conservation Service advisor. The team leader is housed at Islamabad in the Director's office, Water Management Cell; Ministry of Food, Agriculture, and Cooperatives. Additional team members reside in Lahore, Hyderabad, and Peshawar; those in Peshawar also serve Baluchistan.

B. Relationship with Other Government Agencies

The project organizations outlined above are supplemented by other government agencies which contribute to particular aspects of project implementation. The most significant of these are WAPDA and the Agricultural University at Faisalabad. Their contributions are primarily in the fields of research,

TABLE 3

STAFFING PROPOSALS CONTAINED IN THE ORIGINAL PC-I's

	PC-I Proposals				Actual
	Thru FY-79	FY-80	FY-81	FY-82	Thru FY-79
No. of Field Teams					
Punjab	15	25	35	40	15
Sind	15[1]	20	25	na	13
NWFP	2	4	6	7	2
Baluchistan	3	5	5	5	3
Punjab Staff					
Planning & Policy Cell:					
Officers[1]	13	13	13	13	
Other	26	26	26	26	
Project HQ:					
Officers	7	7	7	7	
Other	30	30	30	30	
Training & Research:					
Officers	20	20	20	20	
Other	64	64	64	64	
Area Teams:					
Officers	5	7	9	9	
Other	34	51	68	68	
Field Teams:					
Officers	135	225	315	360	
Other	180	300	430	480	
Sind Staff					
Project HQ:	17	17	17	na	
Officers	17	17	17	na	
Other[2]	32	32	32	na	
Area Teams:					
Officers	8	8	8	na	
Other[2]	ns	ns	ns	na	

Field Teams:				
Officers	135	180	225	na
Other	111	149	166	na
NWFP: Staff				
Project HQ:				
Officers	7	7	7	7
Other	45	45	45	45
Field Teams:				
Officers	10	20	30	35

Source: Project PC-I's and OFWM Directorates.

1. Officers: Grade 16 and above.
2. Included in HQ staff.

training, and (potentially) monitoring and evaluation. Briefly, WAPDA, in cooperation with Colorado State University at its Mona Research Station,* played the crucial role in developing the watercourse earthen improvement technologies now being implemented by the OFWM projects. This research is continuing and may be extended to a new WAPDA research station proposed for Sind. In addition, it is proposed that WAPDA Master Planning Division (which also supervises the Mona Station) be contracted by the Ministry of Agriculture to monitor and evaluate the impact of the OFWM project. Such a program by an independent agency is crucial to the design of any subsequent major expansion of OFWM. It has the further advantage of establishing a formal link between WAPDA and the OFWM project which should help facilitate the two-way flow of information, research needs, and research results between the organizations.

The University of Agriculture at Faisalabad (UAF) provides specialized training for the Agricultural Officers who are members of the OFWM field teams and, additionally, undertakes supportive research. Colorado State University assisted in the organization of this training program and participated in UAF's supportive research. With the completion of CSU's program by end-October 1979, this source of technical support will cease.

In addition to the direct contributions of WAPDA (Master Planning Division) and UAF to the project, coordination is required with a number of other provincial and federal agencies, some of which are involved in activities similar to those of the OFWM project. In Sind, NWFP, and Baluchistan, general coordination is provided by a policy committee chaired by the Secretary of Agriculture and with representatives from departments such as Planning and Development, Finance, Irrigation, Agricultural Extension, Agricultural Engineering, USAID, etc. The Planning and Development Department plays an important role in project planning and control. In Punjab, a special planning and policy cell, established within the office of the Secretary of Agriculture, provides overall coordination and guidance. In addition the project is

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* Mona Reclamation Experimental Project, WAPDA, located near Bhalwal, Punjab.

regularly reviewed by the Planning and Development Department which has appointed a project officer to monitor its implementation.

Coordination and cooperation are of particular importance among Government agencies involved in work similar to that assigned the OFWM Project. These can be discussed as follows:

(1) The Agricultural Extension Directorates in the Provincial Departments of Agriculture, as part of their general responsibilities, advise farmers on water management. To ensure an understanding of the objectives of the OFWM project, field assistants from the Extension Service have been trained at the OFWM Training Institutes and hopefully, this will provide a more effective service in the future. In FY-79, the Punjab Extension Directorate, together with other departments, initiated a crash program designed to persuade farmers to clean and repair watercourses. Such a heavy cleaning and maintenance program on a rational basis has been recommended by CSU.[1] CSU estimates that, at low cost, such a program could save up to 9 MAF if implemented and maintained nation-wide.

(2) The Provincial Agricultural Engineering Directorates implemented the earlier USAID supported PLL program. They also provide bulldozers to farmers on a heavily subsidized basis for land reclamation and rough leveling activities. The Provincial Agricultural Engineering Directorates also service OFWM tractors and similar equipment at their engineering workshops.

(3) The Irrigation Departments have power under the Irrigation and Drainage Act to intervene and settle the water related problems on watercourses; to define the "public" portion of a watercourse (the Sakari Khal) and its associated right-of-way; to authorize nukkas (field outlets) and changes in the location of the canal outlet (Mogha); to schedule the distribution of water (warabundi) where farmers are unable to agree among themselves; to undertake cleaning and maintenance of watercourses if

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1. CSU: "Water Management Programs to Improve Agricultural Productivity in Pakistan", May 1979.

farmers fail to do so and charge the costs to the farmers; and to close the watercourse if farmers fail to cooperate. In theory, the Irrigation Departments have wide power to ensure watercourse improvement. They have in the past implemented minor watercourse lining and improvement programs. In general, due to other priorities and funding and personnel constraints, they have severely limited their involvement below the Mogha. Given their legal responsibilities, the OFWM Directorate must obtain their agreement before improving a watercourse; this includes consulting them on the location of the Sakari Khal and authorized nukkas. The OFWM has occasionally requested permission, through the farmers, to relocate the Mogha.

(4) WAPDA has, in a number of SCARP projects included plans to enlarge, improve, or construct additional watercourses. In the past, such plans usually were eliminated due to budgetary and staffing constraints. However, in recently approved SCARP projects (SCARP VI, SCARP Mardan) such proposals were given considerable importance and are expected to be implemented. WAPDA also directly contributed to evolving the technologies being implemented by the OFWM project, and could continue to play an important role in research, monitoring and evaluation.

5. PROJECT PROGRESS

Tables 4 and 5 summarize the original PC-I targets, the revised Fifth Five Year Plan targets and actual achievements for improved watercourses and PLL. In the initial years since both components (WCI and PLL) fell below the PC-I targets, the Fifth Five Year Plan targets were revised downwards. However, the Punjab watercourse improvement program greatly accelerated in FY-79 and the FY-80 Annual Development Plan (ADP) reinstated the original PC-I target; this target will probably be exceeded. Each established team is expected to improve an average of nine watercourses and each new team, five. However, in FY-79, one particular team improved as many as twenty-three watercourses and another improved sixteen. If the watercourse selection restrictions are removed, and if team efforts are concentrated on watercourse improvement, then a considerable increase in team productivity can be achieved.

In Sind, the watercourse improvement program lagged in FY-79 and therefore the FY-80 ADP established a fairly modest target--equivalent to only three watercourses per team. Nevertheless, the rate of progress is greatly accelerating. In Nawabshah, with only five established teams, no less than 25 watercourses were under

TABLE 4

NUMBER OF WATERCOURSES TO BE IMPROVED: TARGETS AND ACHIEVEMENTS

	FY-77	FY-78	FY-79	FY-80	FY-81	FY-82	FY-83	TOTAL
Punjab								
PC-I Target	5	70	120	185	250	270	-	900
Fifth Five Year Plan	-	-	76	129	164	210	275	854
Actual Achievement	5	46	151	(185)[1]	-	-	-	
Sind								
PC-I Target	12	43	82	142	231	-	-	510
Fifth Five Year Plan	-	-	44	75	96	124	161	500
Actual Achievement	-	1	15	(40)[1]				
NWFP								
PC-I Target	-	5	10	20	30	35	-	100
Fifth Five Year Plan	-	-	8	13	17	22	28	88
Actual Achievement	-	1	8	(20)[1]				
Baluchistan								
PC-I Target	-	-	-	2	4	6	8	20
Fifth Five Year Plan	-	-	2	3	3	4	6	18
Actual Achievement	-	-	-	(4)[1]				
Pakistan								
PC-I Target	17	118	212	349	515	311	8	1530
Fifth Five Year Plan	-	-	130	220	280	360	470	1460
Actual Achievement	5	48	175	(249)[1]				

1. ADP Target

Source: OFWM Directorate, Ministry of Agriculture, Food, and Cooperatives.

TABLE 5

PLL: TARGETS AND ACHIEVEMENTS (ACRES)

	76/77	77/78	78/79	79/80	80/81	81/82	82/83	TOTAL
Punjab								
PC-I Target	1,000	18,000	35,000	55,000	65,000	76,000		250,000
Fifth Five Year Plan	-	-	21,508	36,507	46,412	59,430	77,825	241,682
Actual Achievement	555	6,461	6,885	(55,000)[1]				
Sind								
PC-I Target	3,396	12,169	23,206	40,186	65,375	-	-	144,330
Fifth Five Year Plan	-	-	12,452	21,225	27,168	35,092	45,563	141,500
Actual Achievement	-	2,379	6,829	(10,000)[1]				
NWFP								
PC-I Target	375	1,325	2,525	4,925	7,325	8,525	-	25,000
Fifth Five Year Plan	-	-	2,264	3,679	4,011	6,226	7,924	24,904
Actual Achievement	-	428	1,305	(3,679)[1]				
Baluchistan								
PC-I Target	-	-	50	750	2,450	4,625	4,625	12,500
Fifth Five Year Plan	-	-	566	849	849	1,132	1,698	5,094
Actual Achievement	-	-	60	(600)[1]				
Pakistan								
PC-I Target	4,771	31,494	60,871	100,861	140,150	89,150	4,625	431,830
Fifth Five Year Plan	-	-	36,790	62,260	79,240	101,880	133,010	413,180
Actual Achievement	555	9,268	15,079	(69,279)[1]				

1. ADP Target

Source: OFWM Directorate, Ministry of Agriculture, Food, and Cooperatives.

survey, design, or improvement in October 1979, and an additional twenty applications had been reviewed. Watercourses tend to be longer in Sind than in Punjab, and the design discharge greater. Sind's average field team productivity in terms of watercourses improved per year can, therefore, be expected to remain lower. Nevertheless, a considerable increase is expected particularly if the land holding restrictions are removed; these are a severe constraint in Sind and force individual teams to work over a wide area.

In NWFP, modest watercourse improvement targets were established. The FY-79 target was achieved, but the earthen improved sections appear to be little more than cleaning with the installation of concrete nukkas. As in Sind, a considerable increase in field team productivity appears both desirable and possible.

Similarly, in Baluchistan only minimal progress has been achieved, and very modest targets have been set. Although Baluchistan has unique problems and requirements the concentration of efforts in particular areas should increase the number of watercourses improved. Baluchistan needs to develop their team expertise in watercourse improvements. Presently, they depend on the SCS advisors for required watercourse designs. With the departure of the NWFP SCS engineer in November 1979, design assistance will not be readily available.

There is encouraging evidence from Punjab and more recently from Sind, that the watercourse improvement program is well received by farmers and that progress will continue to accelerate. The farmer benefits are discussed below and appear to be considerable. However, these benefits are crucially dependent on the continued maintenance of the improved watercourses. Observations and reports indicate that the earthen sections are not always maintained and can deteriorate rapidly. This suggests vital need for developing appropriate mechanism for encouraging adequate maintenance and it also has implications for the technologies being employed in the improvement program. The progress achieved in implementing the program must be viewed against the uncertainties related to continuing maintenance. One cannot over-emphasize the importance of launching a monitoring and evaluation exercise, such as that proposed by WAPDA Master Planning Division, which will provide detailed feedback as to: what the true benefits are, how long they continue, and desirable modifications to future programs.

In contrast to the watercourse improvement program, PLL achievements have fallen consistently below even the revised targets established in the Fifth Five Year Plan. Farmer response has been lower than expected; interest is mainly confined to larger

farmers whose access to the subsidized element in the program is restricted. Shortages of tractors for PLL work especially in Sind and low output per tractor driver/OFWM worker may be contributing factors. Undoubtedly, productivity could be increased; this would be facilitated by the removal of farm size restrictions. Nevertheless, the evidence from both Punjab and Sind suggests that demand for PLL will remain much less pronounced than for watercourse improvement.

6. SELECTION CRITERIA

Implementation of watercourse improvement and precision land leveling is regulated by provisions and selection criteria found in the Project Agreement, Implementation Letters, and Provincial PC-1's. These provisions, in many instances, have impeded project implementation because they are too restrictive. Reconsideration of the selection criteria is warranted.

A. Watercourse Improvement

For watercourse improvement, the troublesome provision requires that 75% of the landowners along a watercourse have holdings of 32 acres or less in the Sind and 25 acres or less in the Punjab and elsewhere. This requirement eliminates 70% of the Sind watercourses and thus rejects a large percentage of those people who need assistance, since in the Sind alone 50-60 percent of the farmers are tenants.

Admittedly the remaining 30 percent of Sind watercourses can supply the present Sind project needs. Presently, there are nearly 100 applications for watercourse improvements. Unfortunately, these are not contiguous watercourses and, therefore, team efforts cannot be concentrated. Time spent traveling to and working on distantly separated watercourses reduces the team efficiency and productivity.

Punjab also experiences some implementation difficulties in watercourse improvement. Although a far greater proportion of Punjab watercourses meet the selection criteria, the difficulty in finding contiguous watercourses for improvement again reduces team efficiency since one engineer can simultaneously supervise improvement of two adjacent watercourses. It was reported to the Evaluation Team that 80 percent of a field team's effort in watercourse improvement is devoted to contacting farmers, processing applications, verifying land holdings, etc., while 20 percent of their time is devoted to

actual technological implementation.

From reports, interviews, personal observations, and experience, it is obvious that farmers appreciate and desire improvement of their watercourses. For the middle and tail-end farmers, it means more water; for all farmers it gives water control and eliminates from their fields the soil-borrow pits used for bunding. These benefits are immediately discernible and wanted, and the potential for financial gain is very favorable.

The immediate problem is one of increasing the team efficiency and thereby the implementation rate and the rate of loan disbursement. Therefore, the Evaluation Team recommends that all land ownership requirements for participation in watercourse improvement be removed (i.e., the restriction that 75 percent of the watercourse farmer's land holdings be less than or equal to 25 acres in the Punjab and 32 acres in the Sind), but that implementation be restricted to judiciously selected contiguous areas where the majority are known to be smaller farm operators.

Note that the term "farm operator" is specified to allow tenants to be included in this small farmer majority. This recommendation relieves the team from the responsibility of verifying land holdings and allows them to spend more time on improvement. Restricting the team to continguous areas should promote their efficiency. Preferably team and project works should be concentrated along individual distributaries and minor canals.

The Evaluation Team did not specify the area selection procedures, but from conversation held with officials and OFWM personnel they feel finding areas with majority of smaller operators presents no constraints to implementation. Another significant reason for this recommendation is to allow improvement of large contiguous areas so possible follow-on projects can benefit from their experience and its achievements.

B. Precision Land Leveling

Under the OFWM Project cost-shared precision land leveling is limited to 5 acres or less for owners whose holdings were equal to or less than 32 acres in the Sind and 25 acres elsewhere. Despite the cost-shared 50 percent subsidy, the

program has not successfully been implemented for various reasons as enumerated by Renfro (See Appendix F). The original PLL targets (110,370 acres in Project Paper and 97,046 acres in PC-1's) assigned for the first 3 project years were not realized. In fact, based on the PC-1's, only 26 percent of the targets were achieved. (In comparison, 66 percent of the targeted watercourses were improved.)

The Project Papers' projected FAR disbursements were too optimistic. To date, 3 years after Project initiation, PLL accounts for only 19.8 percent of the FAR disbursements in contrast, to a projected 69.7 percent. Similarly, team compositions reveal excessive optimism; experience indicates that the assignment of 5 Land Development officers for PLL as compared to 2 Watercourse Development officers (Punjab and Sind) is unwarranted.

All team members recognized the value of PLL in saving water (increased application efficiencies), increasing crop stands, efficient utilization of nutrients, increasing crop yield, etc., but more to the point, farmers obviously don't perceive the additional benefits as compared to their historical methods of leveling. Within the time remaining to this project, the Evaluation Team sees no possible way to significantly enhance farmer acceptance of this technology. The team, therefore, recommends that PLL be de-emphasized as a major component of the OFWM Project. Further, the team recommends PLL be retained as a project service for those farmers requesting it but that its implementation be restricted to the command area and the near vicinity of watercourses under improvement.

The report of Renfro (Appendix F) and team observations clearly indicate that the intent of acreage restriction on PLL is being legally circumvented. Larger farmers, who distribute land titles to children, relatives, etc., qualify for the PLL cost-shared subsidy. It makes little sense to maintain regulations that cannot enforce the intent of the program. Indeed, some Team members argued that such farmers should not be excluded; that being influential leaders in their areas, their examples help spread the practices. Accordingly, the Team recommends that all acreage ownership restrictions on cost-shared PLL be removed and each farm operator within the confines of the improved watercourse command area or its near vicinity be allowed to participate in cost-shared PLL up to a maximum of 5 acres. Further, the Team recommends that subsidies per unit of earth moved be

retained at their present level. It was the Team's belief that present reimbursement levels and the given technological advice were sufficient subsidy for this program component.

7. PROJECT FINANCIAL ISSUES

A. Overall Financial Position

Table 6 summarizes the project's financial targets and allocations. Inevitably, during the initial period of pilot projects, overhead costs represent a large share of total costs. Nevertheless, even in Punjab overheads remain high in relation to physical completion of works. Unfortunately, a breakdown of project allocations according to overheads, special capital expenditures (e.g., the training institutes), and direct project costs was not available to the Evaluation Team. Table 7 provides a broad and rough indication of direct costs as a proportion of total financial allocations. The sources and assumptions on which these calculations are based are given in the table and are somewhat arbitrary. However, Table 7 does provide an indication of the share of direct physical works in total project costs.

In addition to the expenditures incurred by the various provincial OFWM directorates, there are a number of other costs which wholly or in part should be attributed to the project. These include the costs incurred in research and development, e.g., at Mona; the costs of training and research at Faisalabad University; the costs of SCS advisors; the costs incurred by USAID, notably in relation to FAR inspection procedures, supervision and evaluation; and the labor and other costs incurred by the farmers in implementing OFWM developments.

No attempt has been made here to estimate and allocate these costs in a systematic fashion and it would, in any case, be unfair to judge this pilot project on the basis of the inevitably heavy costs incurred during the initial years. Nevertheless, these other costs have been substantial. For instance, according to the SCS team leader, the cost of the SCS advisors averaged about $52,000 in FY-79, equivalent to Rs. 3.6 million for a seven-man team or almost 10 percent of total Provincial expenditures on the project. In the case of farmer costs, these will continue at comparable rate as the project is implemented. According to estimates for seven watercourses in Sind, farmer labor costs averaged about 23,700 rupees, equivalent to about 35 percent of the construction material costs. The estimates for Punjab suggest

TABLE 6

OFWM PROJECT: FINANCIAL TARGETS AND ALLOCATIONS (MILLION RUPEES)

	76/77	77/78	78/79	79/80	80/81	81/82	82/83	TOTAL
Punjab								
PC-I Targets	3.68	39.79	24.17	35.25	41.87	45.30	-	190.06
Fifth Five Year Plan	-	-	22.00	37.40	47.50	60.90	79.70	247.50
ADP Allocations	5.00	10.00	30.00	40.00				
Actual Expenditures	3.34	9.96	28.93					
Sind								
PC-I Targets	4.72	10.59	16.22	24.46	36.08			92.07
Fifth Five Year Plan	-	-	12.80	21.80	27.80	36.00	46.60	145.00
ADP Allocations	1.00	7.20	6.80	11.50				
Actual Expenditures	0.38	3.45	6.56					
NWFP								
PC-I Targets	0.08	4.98	3.32	4.29	4.37	4.16	-	21.21
Fifth Five Year Plan	-	-	2.30	3.80	4.90	6.40	8.10	25.50
ADP Allocations	-	1.00	2.30	3.80				
Actual Expenditures	-	0.65	2.08					
Baluchistan								
PC-I Targets	-	2.16	1.15	2.05	2.18	2.31	-	9.85
Fifth Five Year Plan	-	-	0.60	0.80	0.80	1.20	1.60	5.00
ADP Allocations	-	5.63	2.16	2.84				
Actual Expenditures	-	1.17	0.75					
Pakistan								
PC-I Targets	8.48	57.52	44.86	65.96	84.51	51.77	-	313.19
Fifth Five Year Plan	-	-	37.70	63.80	81.00	104.50	136.20	423.20
ADP Allocations	6.00	23.83	41.26	58.14				
Actual Expenditures	3.72	15.23	38.32					

Source: OFWM Directorate, Ministry of Agriculture, Food and Cooperatives.

TABLE 7

BROAD INDICATION OF DIRECT PROJECT COSTS
ON PHYSICAL WORKS AS PROPORTION OF TOTAL ALLOCATIONS: FY-79

PUNJAB

6455 structures at average cost of Rs. 250 each	Rs 1.61 Mil.
6243 metres of lined section at Rs. 103/metre	Rs 6.43 Mil.
Engineering at Rs. 4.76/metre: 718,168 metres improved	Rs 3.42 Mil.
Total direct costs for improving 151 watercourses	Rs 11.46 Mil.
Average cost per watercourse Incl. Engineering	Rs 75,900
Average cost per watercourse Excl. Engineering	Rs 53,200
6885 acres of PLL: assuming 50% on a cost share basis at Rs. 1.5/cu metre and 200 cu metres/acre	Rs 1.03 Mil.
Total Direct costs for PLL and watercourses	Rs 12.79 Mil.
Total Direct costs excluding engineering	Rs 9.07 Mil.
Direct costs as % of budgetary expenditures	43.0%
Direct costs excl. engineering as % of budgetary exp.	31.4%

SOURCES AND ASSUMPTIONS

Achievements in FY-79: OFWM Project, Annual Progress Report 1978/79: Directorate of OFWM Project, Lahore.
Average Unit Costs: USAID Cost Survey. Attached to letter to Economic Affairs Division, November 27, 1978.
Proportion of PLL on a cost-share basis: Arbitrary assumption of 50% in absence of better data.

SIND

820 structures at average cost of Rs. 300 each	Rs 0.25 Mil.
6250 metres of lined section at Rs. 124/metre	Rs 0.78 Mil.
Engineering at Rs. 4.76/metre: 44,500 metres improved	Rs 0.21 Mil.
Total Direct costs for improving 15 watercourses	Rs 1.24 Mil.
Average cost per watercourse incl. Engineering	Rs 82,700
Average cost per watercourse excl. Engineering	Rs 68,700

6829 acres of PLL: assuming 50% on a cost share basis at Rs. 1.5/metre and 200 cu metres/acre	Rs 1.02 Mil.
Total direct costs for PLL and watercourses	Rs 2.26 Mil.
Total direct costs excluding engineering	Rs 2.05 Mil.
Direct costs as % of budgetary expenditures	31.2%
Direct costs excl. engineering as % of budgetary exp.	28.0%

SOURCES AND ASSUMPTIONS

Achievements in FY-79: Average of seven watercourses pro-rated for 15. The seven watercourses were subject to data provided to the Evaluation Team by the OFWM Project, Sind
Average unit costs as for Punjab @ 20%.
Proportion of PLL on a unit cost basis: Arbitrary assumption of 50% in absence of better data.

NWFP

491 structures at average cost of Rs. 325 each	Rs 0.16 Mil.
1446 metres of lined section at Rs. 134/metre	Rs 0.19 Mil.
Engineering at Rs. 4.76/metre: 19,980 metres	Rs 0.10 Mil.
Total direct costs for improving 8 watercourses	Rs 0.45 Mil.
Average cost per watercourse incl. Engineering	Rs 56,250
Average cost per watercourse excl. Engineering	Rs 44,000
1305 acres PLL: 50% on cost share at Rs. 1.5 per cubic metre and 300 cu metres/acre	Rs 0.29 Mil.
Total direct costs for PLL and watercourses	Rs 0.74 Mil.
Total direct costs excl. engineering	Rs 0.64 Mil.
Direct costs as % of total financial allocations	35.6%
Direct costs excl. engineering as % of total financial allocations	30.8%

SOURCES AND ASSUMPTIONS

Achievements in FY-79: Report of Project Director, OFWM Project, NWFP: September 10, 1979.
Average unit costs: as for Punjab plus 30%.
Proportion of PLL on a cost share basis: arbitrary assumption of 50% in absence of better data.

construction costs of 87 rupees/acre, which is equivalent to 26,100 rupees for a 300 acre watercourse command area or about 50 percent of material costs. In Punjab, farmers pay for the masons engaged in constructing the lined sections and structure whereas in Sind the masons are paid by the Project. This partially explains the higher farmer costs in Punjab despite the fact that Sind watercourses are longer.

Inevitably, in the initial years staff overhead costs are high; costs of training (both capital and recurrent) are relatively large; mobilization problems and implementation delays are encountered; and field team productivity starts from a low base. Furthermore, it should be remembered that this is a pilot project. As suggested elsewhere in this report, there must be room in this project for experimentation, and this again tends to increase the project's costs. Nonetheless, it is important that in any major expansion project overhead costs must be substantially reduced and field team productivity increased. In addition to increasing the number of field teams and their productivity, direct reductions in project overheads might be possible by centralizing project training at one institute, and reducing headquarters staffs. The Evaluation Team was unable to investigate these possibilities in detail and cannot, therefore, make specific recommendations.

Project Physical Costs

The previous section emphasized the importance of reducing overheads as a proportion of total costs. This should not preclude simultaneous efforts to reduce the costs of the physical works, both in absolute terms and in relation to the costs borneby the Government.

Table 8 illustrates the material costs involved in watercourse improvement works. Under the present OFWM project, these, together with engineering and other overheads, are provided free of charge to the farmer. While the examples given in Table 8 may not be fully representative, they nevertheless illustrate a number of general conclusions which appear to be valid.

(1) Punjab: The improved watercourses are fairly uniform, with design discharges usually in the range of 2 to 3 cusecs, and commanded areas of 300-400 acres. The discharges are higher where tubewells were installed. The lined section in theory is limited to 10% of the

TABLE 8

MATERIAL COSTS: SELECTED IMPROVED WATERCOURSES

	PUNJAB: Faisalabad District			SIND									NWFP
	37048/L	32126/R	30019/R	62RD NASIR	4-L TANDO SOUND	61RD NASIR	2-L THEMAL	3-R GUPCHANI	3AR QAISER	3AR NAGNA	6AL RAHUN	1--BR	BALU Mar79
Design discharge:cusecs	2.5	3.0	2.8	5.0	5.5	6	3.5	3.5	3.0	2.0			1.4
Commanded area:acres	350	300	400	481	1013	723	854	660	229	1044			154
Watercourse length:	3182	3350	4064	4140	5460	3480	1916	2905	1455	1400			1390
Lined Section Length:	360	503	183	500	600	562	300	580	182	180			258
No. of structures:	40	40	50	46	67	65	50	88	23	41			63
No. of culverts	10	8	6	4	4	2	3	3	3	3			1
No. of Buffalo Wallows	-	1	-	-	-	-	-	-	-	-			-
Material Prices													
Sand: Rs/cuft	(.5/cuM)	(35.3/cuM)	12cuft	2.8							2	3.85	2.28
Gravel: Rs/cuft	-	-	-	5.0							4	-	2.28
Bricks: Rs/1000	290	220	230	310							300	350	450
Cement: Rs/Bag	45	35	40	35							35	50	35
Nukkas:RS each	65	60	70	85							85	90	72
Material Costs:Rs													
Sand	1963	2014	2348	7181							2679	5583	3648
Gravel				25150							6056	-	2508
Bricks	26167	26141	26534	30070							2370	15435	16700
Cement	20301	20794	23073	24745							17710	16400	14685
Nukkas	2600	2280	3500	3910							2005	2380	4536
Other	1680		1800	12272							1110	960	90
Total Costs	52711	52062	57254	103328	79890	80535	71170	73975	28561	29678	31930	41258	42166
Cost per metre of WC	16.6	15.5	14.1	25.0	14.6	23.1	37.1	25.5	19.6	21.2			30.3
Cost per acre commanded	150.6	.173.5	143.1	214.8	78.9	11.4	83.3	112.1	124.7	284.3			273.8
% of Sakai Khal lined	11.3	15.0	4.5	12.1	11.0	16.1	15.7	20.0	12.5	23.9			18.6

SOURCE: OFWM PROJECT

total sakari khal (averaged 8.7% in FY-79), but when justified lining is permitted, up to 15%. Similarly, the material costs of improvement are in theory limited to Rs. 50,000 per watercourse, but in practice this has been exceeded. Total material costs per meter of sakari khal are probably about 14-18 rupees per meter, with the costs varying from 140 to 180 rupees per commanded acre.

(2) Sind: The improved watercourses are much more variable with design discharges varying from 2 cusecs to 6 cusecs. Similarly, commanded areas range from less than 200 to more than 1000 acres. Material costs tend to be higher than in Punjab, reflecting not only higher prices, but also the use of concrete lining and the higher lined proportion of the sakari khal. The total costs per watercourse ranged from a low of Rupees 28,000 to more than Rupees 100,000. Material costs per meter of sakari khal tend to be higher than in Punjab (20-25 rupees per meter), but costs per commanded acre are on the whole lower reflecting the larger average chak size and the shorter sakari khal per commanded acre.

(3) In NWFP, with some exceptions, the watercourses improved tend to be shorter than in Punjab, with design discharges in the region of 1.5 to 2.5 cusecs, and a commanded area of 150-300 acres. Two larger watercourses have been improved. The length lined averaged 6.8%. Nevertheless, material costs per meter (averaging 17.5 rupees per meter) and the costs per commanded acre (Rs. 250/acre) were substantially higher than in Punjab; in part this is due to higher prices. Because of the small chak size, total costs averaged only 41,000 rupees per watercourse.

Both at Mona and the Punjab OFWM farm, research is on-going into alternative methods of lining, etc. It is of the highest importance and strongly recommended that investigations continue into ways and techniques for containing, and if possible, reducing average lining costs. This becomes particularly important if to reduce the maintenance problem, the allowable lining percentage is increased.

C. FAR Payments and Loan Disbursements

The Project Paper specified that a system of Fixed Amount Reimbursements (FAR) based on the completion of physical units

of works be used for disbursement of the loan. Here, the amount of reimbursement is not established on the actual costs but on a work unit amount, fixed in advance, which is based on reasonable cost estimates reviewed and approved by AID. Table 9 shows the current FAR rates. FAR emphasized reimbursement based on satisfactorily completed outputs rather than inputs. The total amount available for FAR is $7.5 million. Loan funds not disbursed or reserved by FAR submission as of December 31, 1980 will be deobligated.

Pakistan's Provincial Governments, using their own funds, proceed with project implementation. The Mission, precedent to reimbursement, conducts periodic inspections to insure the work implemented is according to specifications. USAID, to stimulate project implementation, uses a system of loan fund advances in relation to field team deployment. As each team is formed and posted in the field, $50,000 are advanced to the Federal Government. This amount is related to the team's first year operational costs. The provincial government liquidates these team advances within one year through completed works.

(1) Present Loan Status: Table 10 shows that $1.4 million were advancedthe Federal Government for the formation of 28 teams. Of this amount, $787,371 have been liquidated through FAR payments: the outstanding team advance balance awaiting liquidation is $612,628. Table 11 shows FAR payments totaling $1,030,351. Table 12 shows a $952,378.25 in process of reimbursement. Therefore, the total of 3 FAR payments and FAR submissions awaiting processing is approximately $1,982,760.14. Additionally, Table 11 shows the total amount of the 3 FAR payments made to date as compared to the requested amounts. Inspections reduced payments by 11.8%.

(2) Projections to December 31, 1980: Due to the phasing-out of USAID in Pakistan, all project loan funds not reserved through FAR requests by December 31, 1980 will be deobligated. Page 7 shows the projected loan fund payment requests up to the deobligation date. The Evaluation Team believes their recommendation discussed below should substantially increase the disbursement rate to allow the total commitment of the loan by the end of 1980. The pertinent recommendations include the concentration of all team efforts in contiguous watercourse command areas and on a tertiary distributary, emphasize watercourse improvement and de-emphasize PLL, and eliminate all acreage ownership limitations. Additionally, testing

TABLE 9

CURRENT FIXED AMOUNT REIMBURSEMENT RATES

Project Elements	New FAR Payment Per Unit	Previous FAR Payment Per Unit
A. Watercourse		
1. Diversion structures		
a) Nakka (check/turnout)	Rs. 237 each	200
b) Drop structure	Rs. 64 each	N/A
2. Pucca lining	Rs. 103 per running meter or Rs. 31 per running foot	
3. Pipe culvert with wing walls	Rs. 628 each	N/A
4. Structures to be reimbursed according to calculated volume of materials used i.e., buffalo wallow, arched culvert, siphon, silt trap, or others	Rs. 286 per cubic meter or Rs. 8.10 per cubic foot	N/A
5. Engineering cost based on length of watercourse	Rs. 4.67 per running meter or Rs. 1.45 per running foot	3.28 per running meter or 1.00 per running foot
B. Precision Land Leveling		
Each	Rs. 2.60 per cubic meter	2.25 per cubic meter

TABLE 10 - SUMMARY OF ADVANCES AND LIQUIDATIONS
ON-FARM WATER MANAGEMENT Loan 391-T-172

PROVINCE	ADVANCES		MONTH AND YEAR OF DISBURSEMENT		DUE DATE FOR LIQUIDATION	
	AMOUNT ($)	FIELD TEAMS				
PUNJAB	100,000	2	October	1977	October	1978
	150,000	3	November	1977	November	1978
	150,000	3	May	1978	May	1979
	100,000	2	October	1978	October	1979
	250,000	5	June	1979	June	1980
Sub-Total:	750,000	15				
SIND	150,000	3	January	1978	January	1979
	100,000	2	October	1978	October	1979
	350,000	7	June	1979	June	1980
Sub-Total:	600,000	12				
N. W. F. P.	50,000	1	March	1978	March	1979
Total Punjab	750,000	15				
Total Sind	600,000	12				
Total N.W.F.P.	50,000	1				
TOTAL:	1,400,000	28				

Liquidation of Advances:

GOP Reimbursement Request No. 1	$135,932.48
GOP Reimbursement Request No. 2	408,428.00
GOP Reimbursement Request No. 3	486,021.41
Total Reimbursement:	$1,030,381.89
Total Amount of Advances	$1,400,000.00
Total Amount Liquidated as of September 1979	787,371.19
Outstanding balance remaining for liquidation	$612,628.81

* This amount has not been fully liquidated. $12,628.81 are still outstanding to fully liquidate the $100,000 advanced for the Sind field team in October 1978.

TABLE 11 - The Following Three GOP Requests for Reimbursement Have Been Processed for Payment

GOP REQUESTS FOR REIMBURSEMENT			REQUESTS PROCESSED FOR PAYMENT		
Province	Date	Amount in ($)	Date of Check	Amount in ($)	Date of Transmittal
Punjab	Sept. 9, 1978	$161,119.12	12-21-1978	$135,932.48	3-19-79
Punjab	Jan. 22, 1979	347,881.54)	5-31-1979	408,428.00	6-3-79
Sind	May 5, 1979	45,174.81)		+ 9,247.40	
NWFP	Sept. 30, 1978	21,858.99)			
		414,915.34			
Punjab	May 30, 1979	591,995.83	9-12-1979	486,021.41	9-14-79
	TOTAL:	$1,168,030.29		$1,030,381.89	

% Payment Reduction = 11.8%

September 23, 1979

TABLE 12 - ON-FARM WATER MANAGEMENT LOAN 391-T-172
GOP REQUESTS PENDING FOR REIMBURSEMENT

PROVINCE	Date of GOP Request for Reimbursement	Amount ($)	Total No. of Watercourses	Precision Land Leveling Volume of Earth Moved in M^3	Precision Land Leveling Total No. of PLL Plots	
PUNJAB	August 4, 1979	$480,073.94	48	257,599.58	420	
				288,082.45	376	Pending for Inspection from R. Request #3
SIND	August 19, 1979	16,587.00	2	-	-	
PUNJAB	August 30, 1979	318,281.09	31	101,540.37	132	
SIND	August 30, 1979	18,433.98	-	70,190.91	96	
SIND	Sept. 19, 1979	54,170.31	-	-	-	
NWFP	May 30, 1979	17,092.23	2	39,869.50	40	
"	August 5, 1979	15,702.73	1	48,555.00	63	
"	Sept. 2, 1979	16,707.80	1	16,792.00	Not provided	
TOTAL:		$937,949.08	85	822,629.81	1,127	

GOP request for additional improvements to the water-courses already reimbursed:

PUNJAB	Sept. 9, 1979	$5,699.13
PUNJAB	" " "	7,183.04
NWFP	Sept. 17, 1979	1,547.00
		14,429.17
GRAND TOTAL:		$952,378.25

of increased lining options in certain limited project areas will both enhance disbursement and allow economic comparisons between the treatments. In order to totally commit the loan, it is required that provincial budgets contain adequate allocations to finance the increasing project work.

D. Problems with FAR system

(1) Delayed Disbursement Due to Delayed Inspection: During the evaluation interviews GOP Officials expressed concern over the slow rate of loan disbursement and its effect on the nation's liquidity and foreign exchange. Inspection delays were cited as a constraint to rapid disbursement and a cause of reduced reimbursement. It was noted that inspections are often delayed from six months to a year after completion of work. Presently, Punjab has approximately 100 uninspected improved watercourses. While visiting Faisalabad on September 25, 1979, a USAID engineer was inspecting plots which were leveled more than six months earlier. Table 12 shows that as of September 2, 1979, 85 improved watercourses were awaiting inspection and at least 113 PLL plots (1/10 of 1,127 plots).

This "delayed inspection" complaint was noted during the last project evaluation of May 19. The present Evaluation Team agrees with the validity of this complaint and recommends that USAID provide additional inspectors. Inspectors should be so located that projects could request and receive inspection of PLL plots or improved watercourses within 4 weeks of work completion.

Contributing to delayed inspection and FAR payments is the Mission requirement that FAR requests must total at least $50,000 before they can be processed. This requirement prevents the workload on a limited USAID staff from becoming excessive. With the phase-out of the USAID Mission and the reduction of personnel, this point is important. Nevertheless, the Team requests that the Mission reduce the minimum submission level to $25,000 in order to accelerate disbursement and allow Baluchistan and NWFP to show greater contributions in terms of loan disbursement and liquidation of team advances.

(2) Reduced FAR Due to Inspection: Complaints were expressed concerning reduced FAR payments resulting from

unsatisfactory inspections. It was stated that since they completed the work, there should be reimbursement for it. (Based on the first 3 FAR submissions, Table 11, the average FAR payment was 88.2%.) In particular, it was expressed that undue delays in inspection contribute to unsatisfactory inspections. The Team concedes this possibility and hence, its recommendation that inspections be more rapidly expedited. Nevertheless, the Team also feels that inspection is a necessary component of the project, and penalties should be sanctioned for unsatisfactory work in order to maintain the essential quality control.

E. Credit Availability

(1) PLL: The Project Paper expresses the opinion that small farmers require credit to participate in PLL. This need was discussed by AID with the Pakistan Banking Council prior to drafting the Project Paper and they agreed to participate in principle in the project scheme. The Project Evaluation of May 1978 noted that an effort should be made to provide credit for PLL. At a meeting with the Banking Council in the office of Punjab Secretary of Agriculture on January 11, 1979, the Banking Council assured the members present that credit of Rs. 4000 is available to farmers without collateral. Repeat questions on this point throughout the Provinces indicate that in reality, small farmers cannot readily receive such credit. Since in the previous three years of this project this problem has not been solved, the Team feels it cannot be solved in the remaining year and therefore additional efforts in this behalf by USAID would not be profitable. This decision is consistent with the Team's recommendation to de-emphasize PLL.

(2) Contractor: The Project Loan Agreement (391-T-172) in Section 3103(f) specifies, as a condition precedent to disbursement, that a plan providing credit and tractors as well as other agricultural equipment within the framework of Government-approved policies be developed which assures that adequate numbers of private contractors will be available in the Provinces to carry out land leveling activities under the project. Again, three years later the problem still exists. Despite most Provinces attempting to assist and promote private PLL contracting, little progress is evident.

On January 11, 1979, the Pakistan Banking Council indicated they legally were unable to reduce interest rates on purchases below the current 12% (11% interest and 1% service charge) to 8% as requested, nor could they remove the requirement of unmoveable property as collateral.

One Province purchased a few tractors with project and grant rupees and sold them to selected contractors free of all interest except for a 2% service charge. In this program it is required that the contractor devote at least 50% of the tractor's use to PLL. This requirement needlessly burdens the project with enforcement obligations it probably couldn't carry out. To a degree, the Team even doubts the value of purchasing additional project tractors for PLL use. In effect, this burdens the project with additional bookkeeping, maintenance, etc. The example of Baluchistan having purchased 6 tractors and only leveling 60 acres during the last 2 years hardly establishes an encouraging example for the purchase of project tractors for PLL.

That private PLL contracting can be profitable is evident from the example of Mr. Malik, a contractor from Hyderabad, who has purchased five tractors for PLL and reportedly keeps them busy. This was done with virtually no financial assistance and demonstrates what the motivated entrepreneur can accomplish.

In view of the poor land leveling record and the difficulties in securing credit concessions for PLL contractors, the Team sees no purpose, for the remaining project life of 14 months, in further attempting to gain credit or other financial concessions for tractor purchases. It is felt that the current levels of earthmoving subsidy and the subsidy of technical assistance are sufficient stimulus for PLL for the remainder of this project.

F. GOP Financial Problems

(1) Project Funding: Recently, the NWFP Provincial FY-79/80 budget allocation for OFWM was cut from Rs. 3.8 million to Rs. 2.3 million. Discussion with the Provincial Planning and Development Department indicated that cuts were initiated because of the high overhead cost versus the low expenditures on project works. They calculated that 70% of the funding was spent on overhead;

it was also noted that 10% of the expenditures were for fuel. In view of the work completed this indeed appears excessive and points out not only the need for efficient use of funds, but also increased team production.

The NWFP Project Director indicated the above-mentioned cuts delayed work implementation. With assistance from the Joint Secretary of Agriculture, Ministry of Food and Agriculture (also OFWM Project Director), Rs. 1 million were restored to the Province with the Provision that means would be sought to reduce overhead expenditures. This action agrees with Team recommendation in Section 7A.

Additionally, a funding problem existed in the Sind. Apparently, only the Project Director was authorized to expend project funds. For every expenditure, no matter how small, area and team leaders approached the Project Director. The result was needless delay. In the Director's absence, implementation was seriously constrained. Requests were made to the financial department to allow area leaders to establish personal ledger accounts in order that material purchases not be delayed and day-to-day expenses be conveniently paid. The Project Director stated that this financial problem had been solved, but there was no indication at this writing that these accounts had been established.

The experience of several team members is that at the field the lack of contingency funds and authorization to expend funds always severely restrains projects implementation. Excess safeguards against corruption are frequently counterproductive. Therefore, the Team recommends that all area and team leaders in all Provinces have personal ledger accounts so that project contingency needs can be met immediately and project implementation not delayed.

(2) Cost-Shared Reimbursement: The Project Paper and each of the Provincial PC-1's make provision for cost shared PLL. While the maximum cost-shared reimbursement varies from province to province, depending on perceived average slopes and the amount of earth moving required to achieve precision leveling, the percentage is a country-wide 50%. The difficulties in farmers receiving and negotiating their PLL cost-shared reimbursement checks are well known. Renfro in his PLL constraint report indicates this is a major complaint heard over

and over again from farmers. He recommends the process be simplified so that farmers can easily negotiate these reimbursement checks through any private bank. This check negotiation problem is of long standing and has on numerous occasions been brought to the attention of the Government. The problem apparently still exists as judged from recent comments heard in the field, particularly in Punjab. The Team now believes there is no way to expedite check negotiation and thus makes no recommendation to this effect. It does point out, however, that lack of progress in this area is one of the contributing reasons for their decision to de-emphasize PLL as a major project component.

8. PERSONNEL RECRUITMENT

A. Selection Procedures:

Recruitment of OFWM personnel is primarily governed by provincial regulations and such is not discussed in the Project Paper. To date, in all provinces the primary methods for acquiring project personnel are: intra-department transfers (Agriculture Department), ad hoc selection, regularized selection, and Director's appointments.

(1) Intra-Department Transfer: Personnel holding department appointments, with required project skills are simply transferred into OFWM project positions. Generally, such transfers are at the higher grade levels and positions such as Project Director, Deputy Project Director, Area Water Management Specialist or Coordinator, etc. However, in Baluchistan all project personnel were secured in this manner. While this method is advantageous in that it expedites filling positions with experienced personnel, it frequently presents serious problems in personnel morale as explained below in Section 8.C.(3).

(2) Ad hoc Selection: Provincial project directors are able to appoint personnel on a temporary basis for up to six months. Extensions may be given for additional time periods. While these appointments do not provide the security of regularized appointments, they do expedite team recruitment and allow employment on a trial basis.

(3) Regularized Selection: Regularization is that process of selection which grants job security and freedom from dismissal without due cause and process. The procedure is initiated through advertisements in local newspapers

followed by submission of application to and appearance before a Provincial Public Service Commission which makes the final selection presumably on the basis of merit. Positions advertised for regularization are frequently those filled by ad hoc appointees (but may be newly created positions). This is the usual path by which temporary appointees acquire regular status. Since, however, all qualified personnel are eligible to apply, there is no guarantee that the present ad hoc appointee will be regularized.

(4) Directors Appointment: Positions up to grade 11 can be filled and terminated by the Project Director. This expedites selection of lower grade project positions. In the North-West Frontier Province, sub-engineering positions are established at this level. The NWFP Project Director stated that such discretionary powers of hiring and firing cause appointees to be more attentive to project needs.

B. Technical Qualifications

While the Project Paper does not directly address the matter of required technical skills, it does specify that the project will experiment with "various combinations of professional skills." In suggesting the team composition, i.e.,

1 - Team Leader
2 - Watercourse Engineers
5 - Land Development Officers
1 - Agricultural Officer
1 - Field Assistant

the paper implies that university graduates in agricultural engineering and other agricultural disciplines should be recruited for the field teams. The Project Loan Agreement (No. 391-T-172) but briefly refers to the recruitment issues in Section 3.03, Province Specific Conditions Precedent to Disbursement, Paragraph (c) which simply specifies that the Provincial Project Director be appointed; that Provincial staff positions to implement the project be sanctioned and that sufficient positions are filled with qualified personnel in order to implement initial field activities.

Actually, the various Provincial PC-1's have the final authority to designate the staff composition and qualifications.

In most instances, the provinces followed the lead suggested by the Project Paper and specified that agriculturalist and agricultural engineering graduates be recruited for team positions. Recently, however, important differences between the Provinces have developed. Punjab specifies that all training and field positions be filled with B.Sc or M.Sc degree holders whereas the other three Provinces have sanctioned the use of technical diploma holders (2 year sub-engineering degree).

In the Sind, technical diploma holders are functioning as part of the team doing both Precision Land Leveling and Watercourse Improvement engineering. Sind revised their team composition; one Land Development Officer was removed and 2 Sub-Engineers (2 year technical diploma holders) were added. These Sub-Engineers were given the same exact training as other team members. According to the Project Director, their performance has been satisfactory. Discussions with various other provincial project officials and technical advisors leads to the conclusion that they are capable of learning and applying the engineering skills required in precision land leveling and watercourse improvement without sacrificing quality. The Evaluation Team recommends that Provincial OFWM Projects recruit and train sub-engineers for team engineering responsibilities in PLL and WCI and that present experienced team graduate engineers and agriculturalists serve as the supply source for future team leaders. The use of such personnel will not only save some money for the projects, but would reduce future constraints to project expansion resulting from a shortage of graduate engineers and agriculturalists. Presently, Pakistan's Agricultural Universities cannot train personnel at a rate sufficient to meet the demands of an expanded national program.

Diploma holders cannot provide the skills and responsibilities required of the team Agricultural Officer. We are unaware of any technical 2 year school which gives training in this discipline. The Team thus recommends that Agriculture Officers continue to be recruited from university graduates in agriculture with majors in crops or soils.

C. Constraints to Project Expansion:

(1) Ad hoc Recruitment: As explained in Section 8. A. (2), this procedure is a temporary appointment by the Provincial Project Director which can be extended. Because of the pilot nature of the program, regularization of these OFWM ad hoc positions has frequently been delayed.

This led to low morale among many team appointees, but apparently not to excessive resignations. Of more concern was the recent Government-wide prohibition on ad hoc recruitment which delayed formation of new teams and thus constrained project implementation. Fortunately, the Government proved responsive to the project needs and rescinded the restriction of ad hoc recruitment for OFWM. This constraint to team formation no longer exists.

(2) Regularization: Regularization cannot be divorced from ad hoc recruitment, since one is the logical extension of the other. While six months seems to be the appropriate time interval for conversion, in some cases length ad hoc extensions resulted rather than the anticipated regularization. While the team was unaware of cases which led to resignation, it obviously resulted in dissatisfaction and poor morale. The team feels that ad hoc is essential in recruiting people for training since it allows hiring on a trial basis. If after training, however, and upon completion of three months field work their service is not satisfactory, ad hoc appointees should be dismissed. If, however, their service has been satisfactory, they should be given preference for regularized appointments. In order to benefit the project and the personnel who have satisfactorily performed, the Evaluation Team recommends that graduation from an OFWM training school be a mandatory requirement for regularized appointments to OFWM project positions.

(3) Recruitment by Transfer: Project positions have frequently been filled by transfer from other sections of the Provincial Agriculture Departments. While it expedites staffing, it generally proves unsatisfactory, particularly in team positions. Problems result because most OFWM positions require field work of a far more demanding nature than the positions which the transferees formerly held. The work is difficult, dirty, requires longer hours, and frequently requires transfer to unfamiliar cities and rural areas. In addition, these positions do not project the "officer image." This, incidentally, is one reason team members are appreciated by farmers. Since in most cases transfers only result in more work with no increase in salary or benefits, they almost always lead to dissatisfaction and additional requests for transfers from the OFWM project. It is recommended that OFWM positions not be filled with trans-

ferees. Where possible, higher OFWM positions should be filled from within the OFWM Projects to demonstrate that opportunities for promotion, based on excellence, do exist.

9. TRAINING

This is an essential element of the OFWM Project. There is no indication that graduate agriculturists or engineers either at the B.S. or M.S. level have the training or experience to function in the OFWM Project without additional practical training. Most supervisors and administrators indicated that even after OFWM training, field training on the job under an experienced officer was necessary before new recruits could function independently.

A. Curricula:

All provinces except Baluchistan have developed formal training programs. The most obvious difference in Provincial curricula is that Punjab has more than one training program. One at the OFWM training school (Lahore) is concerned with PLL and watercourse improvement while the training course at the University of Agriculture at Faisalabad concerns extension training for all Provincial OFWM Projects. (The UAF training course is discussed further below.) In Punjab and Sind, the OFWM offers training in both precision land leveling and watercourse improvement technologies. Graduates are capable of working in either discipline. Punjab OFWM teaches an approximate 12 week course at its Niaz Beg training center near Lahore and the demonstration farm near Chung Village just outside of Lahore. The land leveling component consists of 3 weeks classroom training and 5 weeks practical field training and applications. Included in the PLL training are such non-engineering courses as soils, agronomy, and economics. The total PLL training is 62 hours of classroom instructions and 37 days in the field. The watercourse improvement curriculum consists of 52 classroom hours and 22 days field training. The Sind training is similar in content to that in the Punjab, but is structured somewhat differently. The Sind teaches a 90 day PLL course and a separate 45 day watercourse improvement course.

All locations use a SCS prepared precision land leveling manual. A manual for watercourse improvement is apparently not available. Instead, a series of handouts are used, including a series of design graphs, based on Manning's

equations which show the relationship between flow rate, slope, hydraulic radius, etc. The technical advisors report a need for a more formalized watercourse improvements course with an appropriate instruction manual. The Team strongly recommends the preparation of a watercourse improvement teaching manual which stresses all improvement aspects including organization of water user associations, cleaning and maintenance, watercourse design, and earthern brick and concrete construction.

The training offered in NWFP and Baluchistan is considerably different. Baluchistan indeed has no training program. The small number of teams to be formed does not warrant establishment of a Provincial Training Center. In fact, those trained members of the OFWM project received their training either in Faisalabad or in Hyderabad. NWFP provides training only in PLL, although it is reported that a watercourse design course was once offered.

The minimal training demand of both Baluchistan and NWFP for now and in the future cast doubt on the need, and indeed the economic feasibility for maintaining their own training programs. It has been argued that since physical conditions are so dissimilar in the mountain regions, the technology appropriate to Sind and Punjab are not adequate for Baluchistan and NWFP. As a basis for justifying training centers, this argument doesn't hold; the hydraulic and design principles are the same and trained people could adopt them to the Frontier areas. Certainly, a few weeks work with an experienced field team in the mountain areas would teach them the appropriate techniques. The Team, therefore, recommends that both NWFP and Baluchistan use the facilities in Punjab or Sind for their future training needs. This consolidation should help reduce project overheads in all concerned Provinces (particularly NWFP) and release additional staff for field work.

In addition to the Provincial Training Centers specializing in engineering skills, the University of Agriculture at Faisalabad offers training courses in water management and improved agronomic extension skills. These training courses are of two levels. A 4½ month course is designed to train the Agricultural Officers of the OFWM teams and trainers from the Provincial Extension Service Institutes. Inclusion of the Extension Institute trainers was to prepare them to teach these skills in their institute training programs. Additionally,

the University offers a 6 week course designed to teach extension service agricultural officers (not OFWM agricultural officers), working in the project areas, improved water management and agronomic techniques with emphasis on watercourse cleaning and maintenance.

The OFWM Agricultural Officer and Extension Trainer course consists of 25 days of lectures and 69 days of field practice. With allowance for national holidays, check in time, etc., the course requires 4½ months. Unfortunately, the Team had no opportunity to study the course subject matter handouts. However, brief discussion with individuals trained through this program, as well as the training course director and the course advisor (CSU), indicated the teaching materials are adequate for the needs of the OFWM project and trainees from the extensions institutes. However, a minor criticism based only on a perusal of the training course curriculum is that too little attention is given to the problems of drainage, waterlogging, saline and sodic effected soils, etc. Additionally, it was reported but not verified by the team, that many team members have difficulty approaching and contacting farmers. Certainly, "personal approach" is a very important skill especially for extension agents. Agricultural Officers receive only one hour instruction in this technique. While such skill develops with experience, it nevertheless is suggested that the course instructors re-evaluate the need for strengthened instruction in this critical area.

The above discussed extension functions should be the responsibility of the Provincial Extension Service. The Team does not support the idea that every program should have its individual extension sub-service. Unfortunately, the Provincial Extension Services are unwilling or perhaps unable to assign personnel to the OFWM projects. Therefore, for the remainder of this pilot program the OFWM should continue to recruit and train their Agricultural Officers. <u>However, the Team recommends that the Extension Services prepare to assume the OFWM extension duties in a future expanded OFWM national program. In a future program extension service personnel would be directly assigned to the OFWM teams.</u>

B. <u>Teaching Methodology</u>:

The Evaluation Team was unable to observe the various course teaching methods; at the time of this evaluation, training courses were not in session. From limited field

interviews, it appears the teaching methodology was typical classroom lectures with students taking notes, asking questions, etc. Fortunately, most classroom lectures are supplemented with extensive field applications. The use of extensive field study situations by the training staff, both in the provinces and at UAF, are to be highly commended. This is a definite departure from traditional teaching methods and offers new personnel an opportunity to experience field operations before being given responsibility for implementation.

At the province level, better library facilities would be helpful. However, the use of visual aids and a variety of teaching methods has enhanced the learning experience. The enthusiasm of the teaching staff also added to the environment for a good learning situation. Observation of graduates in the field working on land leveling and watercourse layout confirmed that, in fact, learning had taken place.

One outstanding development by the Punjab OFWM training school (Niaz Beg) was a trapazoidal template used as a teaching tool and guide for watercourse channel construction. The templates were built for various side slopes and adjustable to various bottom widths, gradients, and flow rates. From the design criteria, the mark corresponding to the desired flow rate is set at the watercourse engineers bank elevation and the channel excavated to accomodate the template. This procedure continues at discrete intervals down the channel and serves as a guide on which laborers can excavate the entire channel. With minor adjustments, this principle could be used for constructing lined channels as well as improving earthen ones. This template system is not only an excellent teaching tool, but also minimizes the required construction supervision. Its simplicity allows use of lesser qualified supervisory personnel. <u>It is a tool which the Team recommends be adapted, to the extent possible, in all provinces</u>.

C. <u>Physical Facilities</u>:

All three Provincial training centers had hostels and classrooms adequate for their present needs. Sind's hostel and classrooms were located in a Hyderabad residence with capacity to train 20 students. NWFP hostel and classrooms were also similarly arranged, but could only house 15 students at one time. New facilities in the Punjab are presently under construction to meet the future needs of expansion. These include both hostel and classrooms as well as housing for the

training and research staff and their families. The only criticism of the provincial facilities is that in some cases they are too distant from the field training areas where instructions are given in surveying, precision land leveling, etc., and thus require additional expenses in fuel, vehicles, etc. In all provinces there appear to be adequate equipment, i.e. tractors, scrapers, planes, etc. for present project needs.

At the University of Agriculture time was insufficient to allow inspection of the hostel and classroom facilities. It was reported that the University had recently secured a residence and remodeled it to serve as a hostel. University facilities were used for classrooms. The arrangements as related are acceptable.

D. Training Staff:

The trainers at all locations were university graduates with several holding masters degrees. The Team was unable to directly determine the experience and capability of the various trainers other than those few who were personally known by various Team members. Based on the ability of the graduated students, the trainers are apparently knowledgeable and experienced in their assigned disciplines.

E. Student Selection:

Selection procedures vary from province to province. Previously some provinces selected and trained students without ad hoc appointments and later were unable to place them. These students, trained at project expense, were lost from the project. Presently, Baluchistan has three men who received 90 days training at Hyderbad in PLL but have not as yet been appointed to the project. It is recommended to all projects that no recruitees be trained unless he has previously received a project appointment.

The selection of team Agricultural Officers indeed represents a special case. In the Punjab this trainee is selected from graduates of the PLL and Watercourse Improvement Course. It was reported that the poorest performing student in the engineering disciplines are selected as Agricultural Officers trainees. This procedure results from the emphasis on achieving FAR covered PLL and Improved Watercourse targets; the extension component is not eligible for

FAR payments. Selection in this manner is counterproductive and shortsighted since it is through the skills of the Agricultural Officer that water savings are translated into increased crop production; a primary goal of this project. Sind Province selects University graduates directly for Agricultural Officers training; their positions are not filled by default. The Team recommends that University graduates, preferably with degrees in crops or soils, be recruited specifically as Team Agricultural Officers and that their only project training prior to team assignment be the 4-1/2 month course offered at the University of Agriculture at Faisalabad.

10. SUPPORTING RESEARCH

A. Project Status:

Since this is a pilot project, one would assume that applied research plays an important project role in developing better technologies, determining true benefits and costs of various approaches, and especially in identifying implementation constraints and reliable methods of removing them. The pilot nature of the project has been somewhat neglected at the expense of becoming operational; there has been little opportunity for altering procedures or time to study new approaches. Meeting targets seems to be the mark of success for field teams rather than the development of improved methods for implementing a national program. Implementors, with very good reason, get caught up in meeting targets. However, the project design should have provided some flexibility for experimentation.

The pilot program, which should be concerned with operational procedures, has been overshadowed by the requirement to accelerate the program. There are several important factors to be considered which could be especially useful in improving the overall national program.

(1) What are the benefits? There has been considerable research regarding the amount of water, time, and labor saved with various technologies. However, the conversion of these savings into increased production has not been adequately quantified over time even though there is strong evidence that initial production benefits are substantial. (See study by Ashraf and Hooker Appendix E.)

(2) What is the possibility of bullock powered precision land leveling on small farms? The farmers presently try to level land with bullocks and a crudely constructed wooden blade (karah). If he is provided the same engineering design as with tractor powered scrapers, can he do a precise job of leveling? What procedure should he use? What is his cost?

(3) What is the expected life of the technical components? Data must be taken under field conditions to determine how long the various improvements can function and provide the initial benefits.

(4) What are the field team experiences in organizing farmers? Each team spends a significant portion of its time working with farmers, persuading them to work together, and keeping them on the job. No one seems to be capturing this important experience in a manner that permits its use for improving techniques.

(5) Several watercourse improvement technologies have been proposed ranging from complete lining to improved earthen. Some combinations have been tested under research conditions at research stations. Such techniques, however, should be tested under farmer operated conditions and throughout an entire watercourse length. For example, there is research evidence that the improved concrete gates (pucca nakkas) at each turnout and division point provide significant water savings. This idea should be tested by providing nothing more than pucca nakkas along a watercourse. Other improvement designs should be tested in the same way.

Considerable research was done on the various technologies being implemented under the On-Farm Water Management Project. These research activities were carried out at various institutions. Although linkages among the research and the pilot project are weak, research results do get into the operational system. Brief descriptions of important research programs are as follows:

B. Research Institutions:

(1) Mona Reclamation Project (WAPDA): Research at Mona led to the quantification of excessive water losses along watercourses. Since that discovery, various methods of watercourse construction and linings have been tested. These improvements include heavy brick lining (13 inches thick), single brick lining, earthen improvements, concrete gates and turnouts, buffalo wallows, concrete lining, prefabricated concrete slab linings, and soil cement brick linings. These improvements have all been studied to determine the construction costs and the amount of water saved. However, very little has been learned concerning their maintenance costs and life expectancy.

Mona recently adopted the technique of testing new lining concepts by improving an entire watercourse with one technology; this permits a fair test to be made under actual operating conditions. This also provides excellent information on the true costs, implementation constraints, maintenance problems, and benefits if data are collected for several years after the improvements.

A new promising technology presently being tested is a trapazoidal watercourse cross section lined with walls one brick thick. This should be cheaper, more stable, and easier to construct than vertical walled sections.

The Mona Research work has been especially valuable to the OFWM Program; in fact, their early work led to the development of the program.

(2) University of Agriculture - Faisalabad: The University at Faisalabad provides training to OFWM field team Agricultural Officers. In order to develop both faculty interest in and new techniques for the training program, a research program in water management has been initiated.

These research activities include (a) crop production as affected by irrigation methods and practices; (b) using saline water to produce crops; (c) improving methods of rehabilitation of watercourses; (d) optimizing water application techniques; (e) hydrologic and salt balances as affected by watercourse improvements; (f) developing extension methods; and (g) organizing and testing water users associations.

These research programs are carried out by the training staff. This program was initiated by the University, but its continuation is highly dependent upon a USAID offered rupee grant. It appears possible this rupee grant will be rejected by the Federal Government.

(3) Demonstration and Research Farm, Chung Punjab: This Punjab OFWM research/demonstration farm is an excellent vehicle to demonstrate various aspects of the program concentrated in a place one can readily visit. It is easily accessible to provincial officials in Lahore.

Applied research is conducted on (a) different alternatives of watercourse improvement and maintenance; (b) quantification of increased efficiencies through water course improvement; (c) consumptive use requirements on major crops, (d) working efficiencies of land leveling machinery, and (e) economic impact of watercourse improvements and precision land leveling.

This farm is excellent for demonstrational purposes but there are not enough personnel to conduct a significant research effort. However, the training group here have conducted an eleven watercourse survey on the impact of improved watercourses. In summary, this survey showed that after improvement, the time saved in irrigating one acre was 38 minutes or 28%; the cropping intensity increased 20%; farmers changed to crops requiring more water, such as rice and sugarcane. The yield increases were: sugarcane 26.6%, cotton 21.5%, maize 17.3%, and wheat 18.5%. The average before and after watercourse delivery efficiencies were 59 and 82 percent, respectively.

(4) Colorado State University (CSU): The CSU team provided advice to all of the above institutions. Their technical, planning, encouraging, and facilitating advice will be missed. However, all groups appear to clearly understand their role and what is necessary to improve the overall project implementation. The effect of CSU withdrawal on the program remains to be seen.

A major project deficiency is the lack of a monitoring operation to quantify what has taken place, to learn from the operational day to day experiences, and more important, to quantify the project effects on production, labor, and standard of living of the various groups affected by the project. This should have been accomplished by an agency not directly associated with the operational program.

It is our understanding that WAPDA is ready to initiate such a monitoring program and that USAID is prepared to fund it with a rupee grant. If not approved by the Government of Pakistan, a serious deficiency will exist regarding planning of future program efforts.

Recommendations:

1. The GOP approve the monitoring program immediately and that monitoring teams learn as much as possible within the next year regarding expected life of various technical components and the true benefits of the project.

2. The research at Mona on watercourse improvement be accelerated, and their practice of testing each new lining or technology by applying it throughout the length of a watercourse be continued.

3. Linkage between OFWM and Mona research must be strengthened. Without CSU advisors, the informal link will be weakened. The WAPDA monitoring cell could provide a suitable linkage.

4. The linkage between the University of Agriculture at Faisalabad and OFWM must be maintained. The natural link is the training program; however, any new research innovations must also be presented to the OFWM operational units.

5. The Demonstration and Research Farm at Chung must be maintained. Research on watercourse linings and improved structures should be de-emphasized and left to the Mona research station. This particular farm should devote its research attention to developing improved extension techniques and providing farmers with recommendations on efficient utilization of water saved through improvement of watercourses.

There is strong evidence of significant increases in production due to watercourse improvement alone. (See Ashraf and Hooker Appendix E.) However, with proper use of this additional water, the benefits can be increased to the extent that lining entire watercourses might be economically feasible.

11. TECHNICAL ASPECTS

A. Watercourse Lining:

The lined portion of watercourses varies depending on conditions. Usually sections nearest the canal outlet are lined, but frequently heavy-use portions running through villages are also lined. In practically all cases, the provinces are stretching the allowable limit on lining; obviously, farmers desire as much lining as possible.

Two types of lining were observed: trapazoidal shaped concrete lining in the Sind and brick-plastered (9 inches thick) rectangular sections in the Punjab and NWFP Province. As yet, no watercourses have been improved in Baluchistan. Because of the high cost of bricks and their transport, they probably will use concrete linings. All observed lined watercourse sections were in excellent condition; some were lined more than one year earlier. Indications are that the quality control is being maintained. On two watercourses older farmer installed lined sections were in excellent condition. One was a 10 year old 4 inch thick brick lined section. This suggests that brick lining, properly installed on compacted earth, with good mortar will have a very long life under the weather conditions in Pakistan.

B. Permanent Structures:

The reinforced concrete round gates which were developed for the project are installed at points where farmers withdraw water from the watercourse or where a watercourse branch exists. Installation of these gates into masonry walls appeared to be of high

quality. Only one of several hundred observed had completely broken out. Some of those observed in the Sind appeared to be of lower quality. In some cases, the gates were improperly sized to the gate opening. Many gates with chipping around the edges were observed. The gates have gone through at least two evolutions of improvement and are presently being improved by making a thicker lip. In general, these gates operate extremely well and obviously are liked by the farmers. In cases where leaks developed due to chipping or a poor fit, the farmer placed mud around the gate to stop leakage. Many were observed with absolutely no leakage, which is unusual for any type of irrigation gate.

When properly manufactured, this gate is an improvement over many irrigation gates in use throughout the world. It is a definite contribution to irrigation technology!

C. Earthen Improved Channels:

The channels of most earthen improved watercourses are constructed by providing a compacted pad into which is dug a trapazoidal shaped channel. In some cases, the pad was not constructed first; the watercourses were made merely by straightening, cleaning, and enlarging the existing channel. In one case, there was almost no improvement. Most channels shown to the team appear to be in fair condition, but none had been in operation more than one year. In some cases, rat holes were causing leakage with apparently no one caring. It is obvious that grass and weeds will be a maintenance problem of these earthen channels. Probabilities are high that maintenance of earthen channels will be a significant problem despite the fact that farmers signed agreements to maintain them.

D. Silt Traps:

Several silt traps were observed. These are enlarged channel sections at the head of the watercourse which catch most of the silt as the water passes slowly through them. While these were maintained, they were disliked by the farmers because the silt creates a disposal problem. Apparently, farmers prefer it be scattered throughout the watercourse length or onto their fields. The building silt traps has been discontinued.

On most watercourses observed, silt had been removed at least once after construction. Apparently, farmers view silt removal as watercourse maintenance and do not realize that channel reshaping, rebuilding banks, plugging rat holes, and grass and weed removal is also a part of their required maintenance.

E. Precision Land Leveling:

Precision land leveling is obviously not as popular with small farmers as is watercourse improvement. Land leveling is going on and is apparently being done to standards, but there is no connection between the two technologies other than both techniques save water. Often the PLL is far removed from any improved watercourse and reduces the team efficiency. The project design idea that these two technologies go hand in hand is proving a fallacy. Granted, each is worthwhile, but there is no reason to integrate them into one project.

Many reasons are given for the slow adoption of land leveling by farmers. Renfro (Appendix F) lists the farmers perceived constraint to PLL as loss of cropping season (no available land), lack of knowledge of program, not convinced of benefits, equipment and tractor rental subsidy rate, lack of approach to OFWM. The Team observed thousands of acres lying idle during this karif season so the first argument appears weak. Precision land leveling appears to be more readily accepted by large landowners, who can accept some financial risk, than by small ones. Whatever the full reason, PLL has not attracted the attention of the farmer nor been as readily sought and accepted as watercourse improvement.

F. Farmer Acceptance:

There is unanimous agreement among Government officials, from the highest levels down to and including the field teams, that farmers are pleased with the watercourse improvement technology. They willingly donate their labor to get the work done and undoubtedly see the lined sections and pucca nakkas as their real incentive. They report increased water in terms of the time saved in irrigating one acre of land. Their claims that increased yields have resulted is not as convincing. Nevertheless, the increased water is reflected in increased production because with a more reliable water resource, there is evidence that additional land is cultivated.

All farmers interviewed were highly in favor of watercourse improvement. They were also unanimous in saying they wanted more lined section. There was some indication that farmers would pay for additional lining through long-term loans.

In spite of their strong acceptance of the technology, farmers do not cooperate 100 percent in organizing and working together to improve their watercourses. On the contrary, field teams report

this is the most frustrating and time-consuming part of their work. If field teams were involved with only the technical aspects, their rate of watercourse improvement would increase several fold. For many reasons, there is conflict and suspicions among the farmers and this affects their willingness to work cooperatively. The field teams acting as arbitrators and salesmen manage to overcome these constraints, but at the expense of time. In the Punjab, it requires 3 to 6 months to renovate a watercourse, which ordinarily could be done in one month. The Sind reports similar experiences, although less severe because of more tenant farmers who provide their labor in response to owner's desires.

In spite of the frustrations and problems in watercourse improvement, we were often told that this is the best assistance program provided to farmers in recent history. The Additional Secretary of Planning and Development in Sind said that if all external assistance were dropped, the program would continue at the present 15 field teams operating level.

12. EXTENSION (Demonstration of Improved Water Management and Agronomic Practices)

A. General:

This is the neglected element of the OFWM program. It is partially understandable since in the initial stages, until an improved watercourse or precision land leveling (PLL) project is in place, the potential for increased yields through extension activity is limited. Further, targets were set for both watercourse improvement (WCI) and PLL and funds available to assist in the attainment of these targets. None of these incentives available for demonstrations or farmer training. Punjab and Sind Provinces provided some funds for extension activity, but the demonstration plots visited by the Evaluation Team were of marginal value.

B. Extension Models:

Five types of extension activity were discussed or observed by the Team. These included: (1) the Agricultural Extension Service (AES), which generally has not been active in the project areas; (2) the World Bank sponsored Training and Visitation (T&V) program, again with only one district overlapping the OFWM project area; (3) the WAPDA Mona Research and Training Institute; (4) the IRRI Rice Extension Program and (5) the OFWM activities.

The World Bank and WAPDA programs are highly structured, intensive programs that provide inputs to farmers for demonstrations, regular training to staff and farmers on a seasonal cropping basis and close supervision of field staff. The WAPDA project at Mona had the best field demonstrations observed, showing weed control, improved varieties, and improved cultural methods. IRRI reports excellent farmer cooperation in a 6,000 acre block in 12 villages of Sind and, while less than planned, some good demonstration plots were also established in the rice growing area of the Punjab. Both WAPDA and IRRI make good use of demonstrations for farmer field days and training.

The WAPDA extension effort covers 110,000 acres and is divided into seven regions. One agricultural officer and three field assistants are assigned to each region. Each region has approximately 16,000 acres with 1,800 to 2,000 farmers. The field assistants work intensively with 50 farmers, visiting them weekly and providing monthly training. These farmers act as demonstrators and informal teachers in their community. Seed and fertilizer are provided to farmers by MONA for demonstrations and private suppliers provide general inputs. Though herbicides are being researched in the MONA area, none have been released to farmers. A seed production program has been established in the project area for released seed varieties. A policy of doing adaptive research on farmer farms is also practiced closely involving farmers in the research.

The World Bank Training and Visitation extension program is similarly structured with close supervision of staff, regular training and good production input availability. We did not make site visits, but discussions with both Pakistani and foreign observers indicated that as it was a new program much more institutionalizing was required before it would be a fully viable program.

The IRRI model was built around a specific commodity and is more suited to a monoculture type agriculture. Improved rice culture is both the message being transferred by the program and the vehicle for the extension activity.

Most extension programs are general in nature with little in the way of specific information to transfer or resources to make the transfer. By contrast, the IRRI program has a specific crop technology to transfer to farmers and the resources to accomplish the change. Further, the change in technology properly applied to rice culture produces such a magnitude of change that it is highly attractive to farmers.

In developing extension strategies, the Government of Pakistan (GOP) should watch closely the effectiveness of this rice extension effort and determine if such an approach in cotton, sugarcane, maize and other priority crops would be productive. To date, the extension service has had little impact on farmers in general and small farmers in particular. This primarily is due to being spread too thinly among large numbers of farmers, lack of resources with which to work, and in general, teaching technologies that do not produce those dramatic changes that are incentives to conservative, risk averting small farmers.

With limited staff and operational resources, it may be better for the GOP to concentrate extension activity on priority crops and areas and provide the necessary resources to make a strong impact in selected priority areas.

As mentioned previously, the OFWM program has not emphasized the extension activities. However, as more level lands and improved watercourses are available to farmers, then improved cultural practices and water management must follow to obtain a proper return from these capital investments. Particularly during the pilot stage of the OFWM project, extension activities should be handled within the project to assure a proper emphasis and that the necessary resources are available to demonstrate both to government policy makers and the farmers the benefits of a strong, active and competent extension service. Only then can the potential usefulness of good OFWM practices be demonstrated and realized.

C. OFWM Extension Assessment:

As pertains specifically to the project extension activity, little effort devoted to water management or cropping programs was observed. Demonstration plots were not satisfactory and from discussions and observations it appears that emphasis on farm demonstrations was minimal. There was little opportunity to observe methodology, control practices or site selection ability. What was evident was the good rapport with farmers that had been established by OFWM project staff. This support by farmers for OFWM staff was reported by OFWM administrative staff, provincial government planning and agriculture departments, and by the central agriculture ministry executives. Apparently, the competent field work performed by OFWM officers impressed the farmers.

While little demonstrations or farmer training activity was performed by OFWM staff, the amount of promoting and organizing in the villages on watercourse improvement was most impressive. At this early stage, there is considerable justification for emphasizing

this phase of the work and assigning agriculture officers to this activity. The stage has now been reached however, with a large number of watercourses improved and a growing acreage of land leveled, that extension agronomy and water management activity is necessary to fully benefit from increased and improved water availability and to prevent deterioration of recently improved facilities.

Targets should be established and funds made available for farmer demonstrations and training to be available during the remaining 15 months of the project life.

D. Recommendations:

(1) Maintain the extension function in the OFWM project during its status as a pilot project to demonstrate the effectiveness of a well managed extension service, adequately staffed and funded, and with definitive goals and objectives.

(2) OFWM staff should be assigned to completed watercourse projects, to assist in maximizing net benefits from the capital and labor expenditures by providing training, demonstrations, and technical assistance in improved agronomic and water management practices.

(3) To emphasize the importance of agronomy and water management extension activities in the OFWM project area, establish targets and provide funding for farmer demonstrations and training and for proper staff training.

(4) Evaluate the various extension models working in the country and determine the best model for different extension activity needs.

(5) Assist in developing the Agricultural Extension Service (AES) capability in irrigated agriculture via field days and formal training. In the move from pilot to the general implementation stage of OFWM, the AES will need to provide the extension function.

(6) OFWM staff should establish close coordination and cooperation with other extension programs in the country that are active in irrigated agricultural areas.

13. WATER USER ASSOCIATIONS

A. Present Status:

The watercourse improvement component of the OFWM project is much in demand, the benefits of water savings and water control appeal to all farmers. However, the program's success depends on the duration of these benefits. Numerous field reports and observations indicate that earthen improvement will have a shorter than expected life expectancy.

The original benefits/cost analysis on the earthen improvement technology assumed that farmers would provide the necessary cleaning and maintenance. The Project Paper and various Provincial PC-1s also saw the need for farmers to provide such maintenance. Therefore, OFWM requires that prior to watercourse improvement, a Water User Association must be formed. Among the required duties of the WUA's are: (1) to provide, organize, and supervise the labor for improvement; (2) to provide, on a continuing basis, the required cleaning and maintenance.

The WUA in general functions adequately through the improvement phase. The follow-up cleaning and maintenance does not materialize. Due to various conflicts, etc., watercourse farmers frequently will not coopeate with one another. Cooperation in the construction phase occurs because most farmers perceived a personal benefit. That benefits of cleaning and maintenance are not as obvious.

The continued use of the earthen improvement technology depends on maintenance and therefore, farmer cooperation. Yet many WUAs reject the concept of forcing farmers to cooperate; they don't want to introduce additional conflict into their community and watercourse. They prefer that forced cooperation be the responsibility of some outside agency.

The Evaluation Team recognizes that the present WUAs are weakly organized without legal status or legal recourse. To help strengthen the organization, the following actions are recommended:

1. The responsibility of the WUA should be restricted to improving and maintaining (including cleaning) their watercourse. The organizational burden and responsibilities of cooperatives should not presently be assumed.

2. They should be given a legal status which binds them to the OFWM and a legal responsibility to clean and maintain.

3. Cooperation in cleaning and maintenance should be achieved through persuasion and social pressures. Non-cooperation must, as a legal requirement, be reported to the OFWM Project.

4. OFWM, upon request of the WUA, must clean and maintain sections assigned to non-cooperating farmers. Such farmers will be billed for the work. (This requires OFWM to maintain cleaning and maintenance crews.)

5. If farmer cleaning and maintenance payments are not forthcoming, the Irrigation Department, upon request of OFWM, would be legally required to take sanctions against non-cooperating farmers.

B. General Character of WUA:

The above recommendations should be initiated immediately. However, it is recognized that these are expedient measures to preserve the benefits of work completed and presently in process. Additional research is required to perfect appropriate organizational concepts.

Previous research on WUA in Pakistan primarily focused on the situation in the Punjab. However, Punjab's land holding patterns, power structures, and cultural values differ from those in the Sind, North-West Frontier, and Baluchistan. Recommended organizational characteristics for WUA should, therefore, be appropriate and applicable to the provinces.

The research conducted on Punjab watercourses has been very useful. This is particularly true of the survey conducted by Mirza and Merrey[1], which identifies certain watercourse users' characteristics, particularly those which are apt to contribute to successful WUA. These, for example, include a predominance of small but viable land holdings, about 5 to 25 acres on a watercourse; relative equality of power/influence among farmers on the watercourse; a large percentage of farmers have some influence with their fellow farmers; location of relatively influential persons toward the 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, education level, and use of mass media; a small number of shareholders on the watercourse; single-biraderi social structure on the watercourse; and single branch watercourses.

1/Mirza, A. H., and D. J. Merrey, "Organizational Problems and Their Consequences on Improved Watercourses in Punjab," Agriculture University, Faisalabad and Water Management Research Project in Pakistan, Colorado State University, 1979.

In interviews with Mirza and Merrey, farmers expressed some common views concerning various aspects of WUA organization. Although their research was concentrated in the Punjab, their wide experience in Pakistan enables them to make broad, basic suggestions that are applicable to watercourses in the Sind, North-West Frontier, and Baluchistan. Among their suggestions were the following:

(1) The WUA should be legally sanctioned by the Government with explicit recognized rights which can be worked out in detail later.

(2) The organization of the WUA should not be highly structured. Such institutions are relatively new for the farmers and will require a period of adjustment. Further, since power structures vary from one watercourse to another (and generally from one province to another), a flexible organization will permit each WUA to work its own arrangements, for example regarding such things as elections (some WUA members may favor secret balloting, while others may not). It is important that the Government refrain from imposing a series of regulations on the WUA.

(3) Some type of federation of WUA should be formed so as to give more institutional authority to the individual association through participation in collective actions with higher authorities. Such a federation also would allow the member WUA to identify with one another, recognizing common problems and achievements.

(4) Each WUA should have a well-defined working relationship with either the Irrigation Department or the On-Farm Water Management Agency in order to give the WUA some channel or responsibility for the irrigation system beyond the mogha.

(5) Formation of any permanent WUA in the Punjab should be preceded by experimental organizations on selected watercourses based on some of the important variables identified in the 1979 Mirza and Merrey report cited above.

(6) Research such as that conducted by Mirza and Merrey on the Punjab watercourses should be conducted in the other provinces.

Whether the WUA should be organized on the basis of entire watercourses or portions of them will have to be determined through further investigation (including the experiments and continued research noted in numbers (5) and (6) above). Tenancy patterns in the Sind will more than likely affect such decisions as well as the traditional kareze management in Baluchistan.

Given the need for experimentation and further research, it is premature to propose any highly-structured, detailed legislation on the organization and functions of Water Users' Associations (e.g., Radosevish, Dr. E. E., Proposed Legislation to Authorize the Formation of Irrigation Associations in Pakistan." Proceedings of Seminar on Water Users Associations for Improving Irrigated Agriculture, 1978, pp. 47-62.)

14. TECHNICAL ASSISTANCE (SCS)

The Soil Conservation Service PASA Team assists in the implementation of the On-Farm Water Management Project. Technicians provide advisory services in precision land leveling, watercourse improvement, irrigation water management, and improved agronomic practices.

A. Team Composition (Disciplines):

Three, two-man teams consisting of an Irrigation Agronomist and and Irrigation Engineer, provide advisory assistance at the Provincial level; a Team Leader and an Agricultural Economist provide administrative and technical assistance on a country-wide basis. The reduction of USAID assistance to Pakistan has affected the SCS Advisory Team. Table 13 represents the most recent composition, location, and scheduled departure dates of the SCS team serving the OFWM program in Pakistan. At the time of this evaluation, two members had already returned to their parent agency in the United States. The projected dates of the departure of the remaining team members is also shown with the last team members scheduled to leave by December 30, 1980.

B. Team Locations:

SCS team members serving the Sind, Punjab and the North-West Frontier Provinces are located respectively at Hyderabad, Lahore, and Peshawar. The two team members from Peshawar also provide advisory assistance to the OFWM program in Baluchistan. The team leader and the now departed agricultural economist are located in Islamabad. The team leader recently was housed with the Project Manager, Water Management Cell, Ministry of Food and Agriculture to assure closer working relationships with the TOP.

TABLE 13

PHASE-OUT OF SCS TEAM SERVING THE OFWM PROGRAM IN PAKISTAN

Advisor	Position	Post	Scheduled Departure
Donald W. Haslem	Team Leader	Islamabad	7.31.80
Donald F. Jones	Agric. Economist	Islamabad	6.30.79*
Eugene W. Shaw	Irrig. Agronomist	lahore	12.30.80
Carrol A. Hackbart	Irrig. Engineer	Lahore	12/30.79
Kermit E. Larson	Irrig. Agronomist	Peshawar	10.15.80
Philip A. Whiting	Irrig. Engineer	Peshawar	12.13.79
William J. Cox	Irrig. Agronomist	Hyderabad	8.15.80
William G. Peterman	Irrig. Engineer	Hyderabad	7.28.79*

* Had departed from post prior to evaluation.

Source: SCS staff Islamabad, Pakistan

Table 14 gives the SCS man months of work on the project from the beginning of the precision Land Leveling project through the OFWM project to date.

C. Team Duties and Responsibilities:

Advisory assistance as provided by the SCS/PASA team has the overall goal of demonstrating to farmers the production increase that can be realized through precision land leveling (PLL) and watercourse improvement (WCI) coupled with the adoption of improved agronomic practices. The SCS team assisted in building within the government the institutional capability to implement and manage a nationwide water management program. The duties and responsibilities of the team in this respect consisted of:

(1) Assisting with the establishment and conducting of training programs for provincial agricultural officers in the planning and implementation of PLL, WCI, and improved water management methods.

(2) Encouragement of private enterprise participation in custom land leveling services to farmers.

(3) Support and guidance in working through farmer groups (Water Users Associations) for the planning, construction, and maintenance of improved watercourses.

In addition, the team has provided motivation and guidance for the collection and analyses of data on the benefits of PLL and WCI to assess the project impact on water savings and increased crop production. Assistance and leadership is being provided in the preparation of National Standards and Specifications for On-Farm Water Management practices and a Field Manual.

The Irrigation Engineer and Agronomist, with administrative and technical support from their team leader, were assigned to provide direct assistance at the Provincial level in:

(1) Planning, design, and construction of farm irrigation systems.

(2) Irrigation water management.

(3) Crop production and tillage practices on irrigated lands.

(4) Operation and maintenance of land leveling, tillage and watercourse improvement equipment.

TABLE 14

SOIL CONSERVATION SERVICE STAFF ASSIGNED TO WORK WITH PRECISION LAND LEVELING AND ON-FARM WATER MANAGEMENT - DEC. 73 - OCT. 79

Advisor	Post	Date of Arrival	Date of Departure	Man-Months
Murray P. Cox	Lahore	12.16.73	12.30.77	48
Thomas H. Dempster	Lahore	3.17.74	5. 8.76	25
Eugene W. Shaw	Lahore	2. 3.74	12.30.80*	66
Walter K. Twitty	Lahore	3. 7.74	6.30.78	27
Carrol A. Hackbart	Lahore	12.19.78	12.30.80*	10
Donald F. Jones	Lahore/ Islamabad	9.20.76	6.28.79	33
Donald W. Haslem	Islamabad	3. 9.78	7.30.80*	18
J. V. McDonald	Karachi/ Hyderabad	3.19.74	8.12.78	52
Paul C. Koluvek	Karachi/	3.24.74	7.15.76	28
Homer C. Moore	Hyderabad	6.15.76	6.16.78	24
William J. Cox	Hyderabad	7.14.78	7.30.80*	15
William G. Peterman	Hyderabad	2. 8.79	7.28.79	6
Paul Corak	Peshawar	5.15.76	4.12.77 (Died)	11
Kermit E. Larson	Peshawar	8. 3.76	8. 4.80*	37
Philip A. Whiting	Peshawar	11.26.77	12.13.79*	23
<u>T.D.Y.</u>				
William G. Peterman		9. 1.78	10.29.78	2 Months
Donald W. Haslem		11.14.77	12. 6.77	3 Weeks
Carl Anderson		10.12.77	11.15.77	4 Weeks
Philip A. Whiting		7.12.77	9.23.77	2 Months
John R. Long		1.16.77	4.15.77	3 Months
Donald W. Haslem		7.15.75	10.15.75	3 Months
Kermit E. Larson		6.15.75	9.15.75	3 Months

* Projected departure dated conforming to phase-out plans.

Source: SCS Staff Islamabad Pakistan.

(5) Planning, design, construction, and maintenance of watercourses.

(6) Monitoring field progress.

Unfortunately, minimal efforts have been devoted to the extension functions (2) and (3) above. The Team saw demonstration sites while touring the four Provinces. An exception was the demonstration farm near Lahore. The Project has concentrated on the FAR covered components of watercourse improvement and precision land leveling; lack of FAR coverage on the extension components has undoubtedly contributed to the minimal emphasis given.

D. Team Rapport with GOP Counterparts:

The Evaluation Team visited each of the OFWM projects in Pakistan's four Provinces. They also talked to each of the SCS Advisors remaining in country and interviewed many of the program personnel with whom they are associated.

In general, the relationships and rapport with GOP counterparts are good. However, in Provinces where progress has been slow, some stresses have been reported. It is only natural that where there are strong desires and repeated urgings on the part of the SCS Advisors to overcome Provincial bottlenecks that relationships can at times become strained. While it appears that the basic friendly relationships have not been altered by these rare situations, the Evaluation Team recommends that advisors remain aware that their counterparts' operational procedures and constraints may be far different from their own.

E. Need for Continuing Technical Advisory Assistance:

The technical advisors serve the OFWM project in many different ways. Each provincial project has its individual staff and its particular set of problems, the solutions of which often are more rapidly expedited by an advisor working with a project officer. It could be said that the advisor often serves as a catalyst providing the needed stimulus to further project progress when traditional methods fail. The progressive phase-out of USAID, will cause technical advisory assistance to become less available to certain Provinces. With the departure of the engineer advisor from NWFP, all SCS engineers except the team chief will have left Pakistan. Some Provinces, particularly Baluchistan, are very weak in project disciplines, particularly in watercourse design. Since Punjab is nearly self-sufficient in terms of engineering needs, it is recommended their SCS engineering advisor spend approximately 60 percent of

his time assisting and advising the other Provinces, particularly Baluchistan, in their engineering needs.

Departure of the SCS team chief at the end of July, 1980, (five months before the PASA Contract termination) will leave a leadership gap. Strong leadership and assistance is required up to the end in order to facilitate the transfer and expansion of the pilot program into a succeeding national program. (Here, it is assumed that international donors will fund a following program.) Obviously, continuing advisory assistance will be needed and the team chief can assist in their orderly integration into the on-going program. A team chief's continued presence is required to further the process of documenting project accomplishments and failures and developing and promoting alternative operational and technical procedures to improve a subsequent program. Therefore, the Evaluation Team recommends that team chief be retained in his present position until advisory leadership on a succeeding program is available. The transition could best be effected by overlapping their times in the projects.

15. GOP PROJECT SUPPORT

One of the objectives assigned the Evaluation Team was to assess the degree of project support given by the GOP. Always of concern is whether a host government really wants and supports a project, or whether it merely accepts a project.

During an earlier research phase which led to this project development, certain governmental departments appeared skeptical and even antagonistic concerning findings of high conveyance losses within watercourses. Does this antagonism and skepticism still exist and does it influence the present support from the GOP?

The Project visited all Provinces and interviewed many higher concerned officials. With the exception of NWFP, contacts were not made with the Irrigation Departments. In the Federal Government, contacts were made up to the level of Minister of Agriculture.

At all levels interviewed, Government officials expressed support for the project and, except for Baluchistan, indicated the project was of very high priority. Baluchistan's Development Commissioner indicated the project presently rated a low priority based on performance. Conceptually, he appeared very supportive and indicated a higher priority would be given if performance improved.

At the field or project level, all people interviewed were supportive of the project and wanted to develop and implement it as rapidly as possible. However, one Project Director was not available

for Team interview and therefore the Team has no basis for evaluating his attitudes, performance, and support.

Although all officials expressed high support for the project, the lack of actual support in certain critical areas creates some doubt. In addition to the Project Loan, USAID has previously funded and proposed funding with grant PL-480 rupees several OFWM supportive projects which are considered essential to the overall program. Amendment #2 of the Water User Association Research was rejected by the Government. This amendment proposed continuing critical research concerning Water User Association Organizations and expansion of related sociological research into other Provinces. Another project proposed grant rupee funded was "Strengthening of Water Management Activities". This project contains a sub-project called "Monitoring and Evaluation" and is, during a five-year study, to document the impact and benefits of the OFWM Project. Almost every government official interviewed placed a high priority on this study, and yet after more than a year the project has not been accepted by the GOP. At this writing, teams assembled to conduct this work have been asked to disband. Other examples which cause concern are the past funding difficulties in the Sind; the GOP inability to contribute two persons for the Evaluation (one participated part time), etc.

After some consideration, the Team concludes the GOP truly intends support for this project and assigns to it a very high priority. The fact that most Provinces indicated they would continue the program at the present rate, even if all foreign aid is withdrawn, is certainly a measure of their approval and support -- especially in light of the present economic conditions in Pakistan. The problems and omissions cited above do not imply GOP lack of concern and interest, but rather demonstrates that bureaucratic constraints and limitations within the GOP, and equally in most other governments, often subvert the Government's intent and constrains their efforts. Despite the resulting delays and frustrations, perhaps these should be viewed as normal development implementation problems.

16. CONCLUSIONS

There is encouraging evidence that the watercourse improvement program in Punjab and more recently in Sind has begun to accelerate and that the OFWM project directorates have demonstrated their ability to implement the present program. The reputation of OFWM staff among the farmers appears to be high and, in contrast to some other officials, they appear willing to spend time in the field working with the farmers. Given this encouraging beginning, the Evaluation Team considers that they will develop the capacity to implement a major expansion in the watercourse improvement program and that to effect this the Provincial Directorates should be established on a permanent basis.

Such a recommendation in no way precludes other Government agencies becoming involved in similar or related programs. A number of possibilities have been discussed above and the potential for future involvement of such agencies is considerable. In some ways, the Irrigation Department is a more appropriate agency for implementing watercourse improvement programs, given the powers it enjoys under the Irrigation and Drainage Act and its general responsibilities. Similarly, the Directorate of Agricultural Extension may in theory be the more appropriate agency for ensuring continued maintenance and the general promotion of improved irrigation practices. Nevertheless, neither of these institutions has yet demonstrated interest in undertaking an active part in the field of watercourse improvement and rehabilitation. Even if this position changes, it will take time for suitable programs to evolve. Given the encouraging start by the OFWM program, especially in Punjab and in Sind, there seems to be strong justification for continuing and expanding its role in the future. Nevertheless, as discussed in previous sections, experience during the first few years has raised a number of major issues which need to be resolved before a major expansion takes place. These can be summarized as follows:

A. Overhead and Administrative Costs:

The program remains costly relative to its physical achievements. Emphasis needs to be placed on increasing the number of field teams, improving their productivity and economizing where possible on overhead costs. The Punjab program has shown the potential for increasing productivity and it appears likely that Sind will follow suit. Efforts should be made in NWFP and Baluchistan to achieve a similar breakthrough. An important reason for recommending removal of farm size restrictions on watercourses selected for improvement is to permit a reduction in average overhead costs through concentrating team effort in particular localities and increasing their productivity. Additionally, it frees the team of the time consuming responsibility of checking land holding titles and acreages. Removal of precision land leveling targets should contribute to increased team efficiency. Although team resources are primarily oriented towards PLL, this component has not been readily accepted by farmers. De-emphasis of PLL will allow greater team effort in watercourse improvements, an option which is certainly sought and appreciated by farmers.

B. The Continued Maintenance of the Improved Watercourses:

This remains an important consideration, particularly in light of recommendations to concentrate project efforts on watercourse improvement. Major responsibility for ensuring adequate maintenance must

remain with the farmers; this is a vital consideration behind our recommendations relating to Water User Associations and related matters. Nevertheless, we consider it necessary to strengthen the capability of the OFWM directorates to monitor maintenance on completed watercourses; advise farmers on maintenance and further improvements, and, if necessary, undertake maintenance work on their behalf and at their cost. To this end, we recommend that the field staff be expanded to include under each Area Team a Maintenance Inspection Unit, and that appropriate powers be given to the OFWM directorates to enforce maintenance, with cooperation from Provincial Irrigation Departments, on those watercourses where farmers fail to undertake it adequately.

C. Supporting Research is required to develop improved implementation methods for regions where cultural attitudes and values differ. Due to possibly a lack of understanding, the Government recently rejected a proposed grant funded sociological research project whose purpose was the development of project implementation recommendation for these differing cultural conditions. Prolonged project benefits are directly related to the developed institutional and organizational arrangements for both implementing the project and maintaining the systems' physical requirements. The Government must be sensitized to the importance of such research.

D. Extension:

Plot demonstrations, farmer training, etc., are mechanisms by which water savings are translated into increased crop production and economic assistance to the rural poor. Despite the intent that extension of improved agronomic and water management techniques be a major project component, with but minor exceptions, there has been almost no implementation within the project. This deficiency no doubt relates to FAR coverage for watercourse improvements and precision land leveling, but not for extension works. In short, there was little financial advantage to the Government for demonstrations, field days, etc. Since the project is of little use unless increased production results, extension must be considered a key project element and every effort should be made immediately to implement the extension components.

E. Intensive Project Monitoring and Evaluation was to be implemented and conducted by WAPDA, an external agency, with proposed rupee grant funding. The team and most Government officials consider this function as mandatory; it is a necessary prerequisite to establishing the overall impact and benefit of the program and a means

of determining the modifications and changes necessary in order that programs evolve which are more applicable and responsive to the needs of Pakistan. The GOP needs to immediately request funding such long term monitoring.

Other concerns are that with the departure of Colorado State University from Pakistan, the linkage between the research organizations of the OFWM Project have been weakened. A formal relationship needs to be developed between Mona, UAF, the OFWM Coordination Cell, and the Provincial Projects so that the research need of the Projects may be addressed and that the Project be fully aware of current research and findings by the Water Management Research Institutes.

Additionally, the pilot nature of the present program needs to be recognized and freedom and latitude be granted to incorporate and test within the program alternative implementation and improvement procedures and technologies.

Despite the many deficient program areas noted above and the long list of recommended changes, the Evaluation Team was impressed by the potential of the program and the progress made in developing viable institutions and in promoting certain key project components, mainly watercourse improvement. The Team impression is that the benefits and services offered are in great demand by the farming population; in the Team experience this has the makings of one of the more successful programs they have encountered. The recommendations offered by the Team are with the intent of both strengthening the project and increasing its implementation rate; they do not detract from accomplishments already made. This project offers a rare opportunity for assisting the nation and its rural poor. It is a project in which the GOP, USAID, and other involved agencies can take considerable pride.

APPENDIX A

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT PAPER FACESHEET
TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE ("X" appropriate box)
[X] Original [ ] Change
[ ] Add [ ] Delete

DOCUMENT CODE: 2

2. COUNTRY/ENTITY: PAKISTAN - ASIA

3. DOCUMENT REVISION NUMBER:

4. PROJECT NUMBER: 391-4130

5. BUREAU: a. Symbol: ASIA; b. Code: 4

6. ESTIMATED FY OF PROJECT COMPLETION: FY 81

7. PROJECT TITLE - SHORT (stay within brackets): ON-FARM WATER MANAGEMENT

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: a. INITIAL mo. 6 yr. 76; b. FINAL FY 78

9. ESTIMATED TOTAL COST ($000 or equivalent, $1 = 9.90)

a. FUNDING SOURCE	FIRST YEAR FY ____ b. FX	c. LC	d. Total	ALL YEARS e. FX	f. LC	g. Total
AID APPROPRIATED TOTAL		7,500	7,500		22,500	22,500
(Grant)	( )	( )	( )	( )	( )	( )
(Loan)	( )	(7,500)	(7,500)	( )	(22,500)	(22,500)
Other U.S. 1.						
Other U.S. 2.						
HOST GOVERNMENT		95	95		16,163	16,163
OTHER DONOR(S) (Farmers)		43	43		5,675	5,675
TOTALS		7,638	7,638		44,338	44,338

10. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

a. Appropriation (Alpha Code)	b. Primary Purpose Code	c. Primary Tech. Code	FY 1976 d. Grant	e. Loan	FY 1977 f. Grant	g. Loan	FY 1978 h. Grant	i. Loan	ALL YEARS j. Grant	k. Loan
FN	110	022		7,500		-		15,000		22,500
TOTALS				7,500		-		15,000		22,500
11. ESTIMATED EXPENDITURES						400		3,600		

12. PROJECT PURPOSE(S) (stay within brackets) [ ] Check if different from PID/PAP

The purpose of the project is to establish public and private sector capability to plan and deliver On-Farm Water Management services (improvement of irrigation watercourses, precise leveling of farm-land and improvement of crop and water management practices), on an economic basis.

13. WERE CHANGES MADE IN BLOCKS 12, 10, 14, or 15 OF THE PID FACESHEET? IF YES, ATTACH CHANGED PID FACESHEET.

[ ] Yes [ ] No a PID was not submitted.

14. ORIGINATING OFFICE CLEARANCE

Signature: Chester S. Bell, Jr.

Title: Assistant Director
Capital Development and Engineering

Date Signed: mo. day yr.

15. Date Received in AID/W, or for AID/W Documents, Date of Distribution: mo. day yr.

AID 1330-7 (7/71)

SUMMARY AND RECOMMENDATIONS

B. Recommendations: Approval of the following:

-- an AID Loan of $7,500,0
(Terms: 40 years, 10 years grace
2% during grace -- 3% thereafter)

C. Description

The project is a five year pilot program to establish capability within government agencies, private contractors and farmer groups in planning and carrying out activities necessary for efficient on-farm water management. Research findings and new management procedures will be used to improve watercourses, level farmers' fields to a precise degree and to improve farmers' crops and water management practices.

Project activities will be carried out in each of Pakistan's four provinces, on schedules appropriate to the degree of readiness of personnel, budgets and plans in each.

By the end of the project physical accomplishments will be:
-- 1,500 improved water courses
-- 25,000 acres of precisely leveled land
-- improved crop and water management techniques.

D. Summary Findings

The technical design of the project is reasonable and the cost estimates are reasonably firm. All analysis of the project, from the technical, financial, social and economic standpoints, contributes to the view that the project is appropriate for Pakistan at this stage in its development, is adequately planned and will benefit small or low income farmers.

The project meets all applicable statutory criteria, as demonstrated in Annex F, hereto.

E. Project Issues:

None.

USAID Project Committee

Stanley M. Remington, Chairperson
Richard R. Newberg
James G. Cassanos
Arthur S. Lezin
Dilawar Ali Khan
Gerald H. Zaar
William A. Chevoor
F. M. Khan
Niel A. Dimick
Masood A. Siddiqui

Government of Pakistan

Project Planning Committee

Mian Mumtaz Ali, Chairperson
Agricultural Development Commissioner
Ministry of Food and Agriculture

S. Iftikhar Ahmad Shah
Chief, Water Resources
Planning Division

Ch. Altaf Hussain
Chief Engineering Advisor
Ministry of Fuel, Power & Natural Resources

PART II

PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. Background[1/]

The dependence of Pakistan's agriculture on irrigation is well known. With 30 million acres of farmland drawing water from the Indus River and its four major tributaries, Pakistan has one of the world's largest and most complex irrigation systems, a system of major dams, barrages, large canals linking rivers, tubewells and irrigation canals and watercourses, of various capacities, bringing water to the farmer's field.

In the past, agricultural sector strategies have generally reflected more concern over supply of water for the irrigation system than system efficiency, particularly at the lower end of the system where water reaches, and is used by, the farmer. This oversight has been highlighted in the last few years by research and development work carried out under two AID-assisted projects: the research of Colorado State University, working on watercourse conveyance losses and methods of increasing conveyance efficiency and the Precision Land Leveling project, in which the U.S. Soil Conservation Service is providing technical assistance in land level methods. It is now established that losses of water in the farmer-operated section of the water delivery system, uneven and inefficient application of water on fields and farmer cultural practices not geared to water economy are major causes of low farm output, despite large investments in irrigation. The research evidence indicates that production increases of five-fold or more would be possible from available land and water, if a carefully integrated program were adopted, incorporating:

- Improvement of water courses to reduce delivery losses;
- Precision leveling of fields to permit application of water uniformly to all parts of the field; and,
- Training of farmers in improved crop and water management techniques, including optimal water application rates and timing, and fertilizer applications.

The need for a broader program of water management improvement is recognized by the Government of Pakistan, which has included the proposed AID project in its Fifth Five Year Plan, 1977-1981, and by the World Bank[2/]

1/ In Annex A to this Paper "Pakistan's Agricultural Sector", the setting for this project is described.

2/ For reference: The Word Bank's Pakistan Special Agriculture Sector Review, five vols., January 28, 1976. Water management and irrigation comments are contained in vols. I, II and III.

and other donors, which are planning activities related to improved water management.

B. Detailed Description

1. The Project:

The project is a five year pilot program to establish capability within government agencies, private contractors and farmer groups in planning and carrying out activities necessary for efficient on-farm water management. Research findings and new management procedures will be used to improve water courses, level farmers' fields to a precise degree, and improve farmers' crop and water management practices.

Project activities will be carried out in each of Pakistan's four provinces, on schedules appropriate to the degree of readiness of personnel, budgets and plans in each. Plans for the project have been drawn up to assure, insofar as possible, the maximum degree of accomplishment. Many aspects, though, are experimental, and may require modification during the five year term of the program, as experience indicates that logical framework assumptions, or other understandings, have not been supported by events. For this reason, the annual evaluations, described later in the Paper, will be extremely important.

Two AID development loans are envisaged during the five years: $7.5 million in FY 1976 and $15.0 million in FY 1978. The loans will be disbursed on a Fixed Amount Reimbursement (FAR) basis, with a series of advances of funds followed by disbursements tied to certification of work units completed.

Important features of the project design include:

- Demonstration of watercourse improvements, precision land leveling, etc., in large project areas within each province, each area having a variety of soil and water characteristics;

- Building the institutions essential for a subsequent nationwide water management program:

  - New governmental arrangements for extension services in the special field of water management,

  - New farmer organizations, and

  - New contractors entering the field of precision land leveling;

- Direct farmer involvement in planning work to be undertaken and in financing the project by contributions of labor and cash;

- Special measures to assure small (low income) farmer participation;

- Aggressive promotional efforts to elicit farmer participation generally; and

- The entrance of Pakistan financial institutions into a new field of agricultural lending.

Details of these features are given in the Project Analysis, Part III.

2. The Logical Framework

The matrix of the Logical Framework of the project is Annex D of this Paper.

The joint program goals of increased agricultural production and improved income for the low income farmer are both objectives of all AID agricultural activities in Pakistan. The sub-goal is closer to the purpose of the project -- establishment of public and private sector capability to plan and deliver on-farm water management services to farmers at economic costs. The Irrigation Department's responsibilities end at the "mogha" (outlets from branch, minor or distributary canals). The sub-goal seeks to establish the principle that improved management of irrigation water supplies, beyond this point, is competitive with other investments in agriculture and with other investments in other sectors. The purpose-to-sub-goal link depends upon the assumption clearly supported by research results to date, that this investment competitiveness is real and will continue both during the project period and after.

Some important assumptions linking outputs to purpose must be tested during the project and it is clear that less than three years would be insufficient for the testing. Large numbers of field workers must be trained, equipped and motivated to perform well. Farmers in different areas must see favorable demonstration results. There must be new incentives, monetary and educational, to persuade farmers to try the procedures out. There must be support by publicity. Most important, institutions which do not presently exist to the degree required -- an extension service trained in the subject, banks willing to seek the work -- must be given the experience necessary if a major nation-wide effort is to be mounted as early as 1981.

The project inputs supplied by the Government, AID, and bankers are, or will be, assured in project documents. The inputs of the farmers and contractors are less certain. Financial and technical assistance incentives provided to farmers are assumed to draw forth the necessary farmers' labor and cash contributions. Qualified contractors for precision land leveling are already operating in a limited number of locations. It is believed that special incentives to firms or individuals who might become contractors -- access to credit, licenses to import or purchase equipment -- plus the substantial size of the program offering greater employment opportunities will draw forth the necessary interest.

3. Magnitude of Outputs

Five year physical accomplishments are planned as follows:

- 1,500 watercourses will have been improved to proper grade and cross section specification with compacted earth banks and concrete, brick or other hard material lining as needed, and concrete control structures.

- 425,000 acres of precisely leveled land, of which 200,000 acres will be directly adjacent to the watercourses which are improved; the balance of 225,000 acres will not be directly adjacent to the watercourses, but will be within the designated "project area" (or areas) of each province.

- Improved crop and water management techniques adopted on farms where precision land leveling has been carried out and watercourses improved. The judgement of success will be based on whether at least half of the 60,000 to 100,000 participating farmers will have doubled their water use efficiency, adopted improved technology and increased agricultural output by 30%.

APPENDIX B

ON-FARM WATER MANAGEMENT PROJECT

A JOINT US-PAKISTAN EVALUATION

MAY 1978

I. SUMMARY

A. While it is too early to fully judge the success or viability of the pilot On-Farm Water Management (OFWM) program during the first phase of the implementation, it is evident sound procedures have been established for assisting small farmers to improve their watercourses and to level land for more efficient irrigation. The initial goals were optimistic. The start-up time was under-estimated and the project is about one year behind schedule in achieving planned targets.

B. As would be expected, the major problems occur in administrative management rather than technical areas of the project. Recruitment of qualified personnel, training them and once trained, retaining them on the teams has been difficult. The provinces are experiencing difficulty in regularizing the positions. Staff recruitment and retention is particularly acute in the Sind where only 12 percent of the positions have been regularized. It appears that morale and productive work of field team members is low because they are uncertain of their future.

C. The three provinces report the following work accomplishments as of March 31, 1978:

	Sind	Punjab	NWFP
Field teams	5	8	1
Watercourses improved	-	24	1
Precision land leveling (ha.)	861	1,863	102

D. Transfer of funds to the project director for cost sharing payments has been irregular and filled with delays. The project directors receive funds to be deposited in a personal ledger account at a local treasury from which the cost share payments are made to farmers. Farmers have had trouble cashing the checks and the project directors have not recouped their funds in a timely manner. Careful attention of project leadership will be required to resolve the issues.

E. Provinces have not been allocating the full amount budgeted in the PC-1. Present fiscal procedures of the Government of Pakistan provide the transfer of an amount of money to the provinces to cover a variety of projects. Funds are not specifically earmarked for any individual projects. As a result, The OFWM Project is in competition with other provincial programs even though a budget was previously approved in the PC-1. Most provincial officials were not particularly concerned over this procedure and felt that all funds in the PC-1 would be made available when and if needed. Delays encountered in the transfer of funds almost precludes the expenditure of all funds before the end of the fiscal year, at which time unused funds revert to the treasurey.

F. The technology for improvement of watercourses and precision land leveling is appropriate for small farmers and has been adequately tested and demonstrated to be effective in reducing water losses and increasing crop production. Colorado State University has been doing research in this area since 1972 and Soil Conservation Services assisted in a pilot land leveling project in the Punjab and Sind in late 1973.

G. Water User Associations are ad hoc groupings along a watercourse, organized for the purpose of providing labor for improvements of the watercourse and for later operation and maintenance. These associations do not have legal nor permanent status. Colorado State University in coöperation with the University of Agriculture Faisalabad is conducting research in this area. Establishment of permanent Water User Associations is very important and is the key to long-term, sustained improvement in irrigation efficiency and increased crop production.

II. RECOMMENDATIONS

Institutions

A. A permanent institutional arrangement needs to be established in order to implement the OFWM Project and to continue to provide similar services after this project terminates. In addition to the usual government agency, consideration should be given to establishing a semi-autonomous corporate entity. (2.15; 2.65; 3.4).

B. Legal status for the Water User Associations (WUA) is very important to their establishment as permanent institutions for the operation and maintenance of the watercourses and possibly for taking on other responsibilities. (2.75-8; 3.10).

C. Responsibilities for extension and related farmer services with the WUA needs to be assigned to a new dynamic agency(s) designed to help members with organizational and agricultural problems. (2.56; 3.11).

Personnel and Training

A. Personnel recruitment must be given careful attention in order to select qualified persons who have a strong desire to work with additional training and experience should be substituted for the presently rigid required qualifications for recruitment. The number of trainees should be increased slightly in order to compensate for drop-outs and still complete the requisite teams. (2.15; 3.6).

B. Personnel should be regularized as rapidly as possible to provide for needed job security. Otherwise, morale will suffer and personnel turnover will impede project progress. This problem is particularly acute in the Sind and should be addressed immediately. (3.4).

Finance

A. District personnel should be given financial powers (Category III in Punjab), which enable them to approve estimates of watercourse improvements and to make cost sharing payments to farmers. Team leaders should also be given Category IV financial powers for certain specified purchases. (2.34; 3.8).

B. Project directors of all the provinces have problems in receiving funds when needed. The Finance Department in each province must be encouraged to ensure that funds are made available to the project directors in a timely manner to implement the program. It also appears that personal ledger accounts should be operated through commercial banks to ensure that farmers receive payments promptly upon completion of work. (2.16-9; 2.34).

C. In order to achieve the targets as set out, the provinces should be urged to give priority to the OFWM Project. The OFWM should not compete with other developmental projects at the time of budget allocation. One way to overcome this would be by indicating or reflecting the USAID commitment for the project in the overall Provincial Annual Development Program. (3.7).

D. In order to insure that adequate rupee funds are budgeted each year to support the program, there should be a direct link between the dollars released and rupees made available at the provincial level. One possible way would be to ensure that the funds advanced by USAID are placed in a non-lapsable account at the federal level each year and earmarked for the provincial programs. (3.9).

E. Since small farmers have little land lying fallow, and it is time consuming to level land by non-mechanical means, it is recommended that farmers be permitted to level land over a period of several years. Furthermore, FAR payments should be increased to 10 acres per farm to allow for the additional costs of technical assistance by the Government of Pakistan. (2.31; 4.1).

Credit

A. An extensive effort to provide credit for farmers to level their land should be provided in one or two Tehsils of each province. The previous guidelines provided by the Federal Government and the Banking Council should be used in establishing specific procedures for setting up a pilot effort. (2.36-40).

B. The proposal by the banks of providing credit to private contractors to level land has not made much headway. These contractors have to compete with other borrowers and are not considered a good risk by the banks. Some concessions need to be extended by the banks, e.g. East Khairpur Loan Agreement with IBRD. (2.38; 2.44).

Beneficiaries

A. The project beneficiaries need to be more fully identified before the follow-on project paper is submitted. A better understanding is needed for defining (or identifying) a "small farmer" in Pakistan. Additionally, the issue related to large/small, owner/tenant farming patterns needs to be fully explored in order to find ways of helping those in the low income brackets. As part of this effort, consideration should be given to provide cost sharing and land leveling services to tenant farmers and should be tried and studied in one tehsil of each province. These problems need immediate attention in the Sind where there are more tenants and larger land holdings than in other provinces. (2.67).

B. Considerable time and expense is involved for small farmers to obtaining patwari certification of land ownerships that generally lacks credibility; it is recommended that a signed statement by the farmer, submitted through the Water User Association, be permitted in lieu of patwari certification. (2.69).

Standards and Specifications

A. All provinces are using slightly different designs, adapted to fit local conditions, especially for such items as diversion structures and outlets. Procedures and design criteria should be standardized to a limited extent, but adaptibility to local conditions should be permissible. More research should be conducted to develop alternative designs for a variety of conditions. (4.1).

Contractors

A. Private contractos should be encouraged by identifying the scope of precision land leveling work available in selected areas. Tractor owners who hire out their tractors for ploughing or transport should be encouraged to make tractors available for precision land leveling by making the rates more attractive. (2.41).

Planning

A. Each of the provinces should rephase their current programs to make them realistically coincide with the five year plan, i.e. 1978-83. This would include extension of the program by one year in the Punjab and NWFP and extensions by two years in Sind. (3.1; 4.1).

Publicity

A. The project has not been well publicized among farmers. It is therefore recommended that a seminar be held to determine a strategy to better publicize OFWM. (4.1).

B. Interchange between provincial officials as well as researchers, should be encouraged as a means of spreading tested ideas. (4.1).

APPENDIX C

EVALUATION TEAM ITINERARY

September 16	Arrive Islamabad
September 17	Discussion in USAID
September 18-19	Meet GOP officials in Islamabad
September 20-21	Meet NWFP officials in Peshawar
September 20-21	Meet OFWM Project personnel and advisors
	Visit project field activities
September 22-23	Meet Punjab Provincial officials in Lahore
	Meet Project Director, office staff and Advisors
September 24	Meet Director and staff of the Mona Reclamation Experimental Project
	Visit field activities
September 25-26	Visit Faisalabad OFWM area office
	Meet area Director and staff
	Visit field activities
	Meet Director of Training Program at University of Agriculture
September 27	Visit Sahiwal OFWM field activities
	Meet Area Director and staff
September 28	Visit OFWM training school at Niaz Beg near Lahore and Demonstration Farm at Chung
September 29	Meet Sind Provincial Officials in Karachi

ITINERARY

(Continued)

September 30	Visit OFWM office in Hyderabad
	Meet Project Director, staff and SCS advisor
	Visit field activities
October 1	Visit Nowabshah OFWM area office
	Meet area Director and staff
	Visit field activities
October 2-3	Meet Baluchistan Provincial Officials in Quetta
	Meet Project Deputy Director and staff
	Visit field activities
October 4	Visit OFWM field activities at Dhadar and Sibi
October 5	Return to Islamabad
October 6-13	Draft Evaluation Report

GOP AND USAID OFFICIALS INTERVIEWED

(Listings are in the order of occurrence)

1. Arthur M. Handly
   Director, USAID/Pakistan

2. Raymond W. Hooker
   Chief of Agriculture
   USAID/Pakistan

3. Donald Haslem
   Team Chief, Soil Conservation Service
   USAID/Pakistan

4. Mr. A. M. H. Kango
   Director, On-Farm Water Management Cell
   Ministry of Food and Agriculture

5. S. Alam Dar Raza
   Joint Secretary
   Ministry of Food and Agriculture
   Islamabad

6. S. Iftikar Ahmed
   Chief, Water Resources
   Planning Division
   Islamabad

7. Amir Mohammed
   Chairman, Pakistan Agricultural Research Council
   Islamabad

8. Manzur Ahmed
   Additional Secretary
   Ministry of Food and Agriculture
   Islamabad

9. U. D. Khan
   Deputy Secretary
   Economic Affairs Division
   Islamabad

10. Shiekh Dost Mohammad
    Director, On-Farm Water Management Project
    Department of Agriculture
    Peshawar

11. Kermit Larson
    SCS Advisor
    USAID/Peshawar

12. Phillip Whiting
    SCS Advisor
    USAID/Peshawar

13. S. Zada Impiaz Ahmed Kham
    Secretary of Agriculture
    Peshawar

14. Main Tayyab Hassan
    Additional Secretary of Planning and Development
    Peshawar

15. A. Rauf Khan
    Chief, Engineer, Irrigation Dept.
    Peshawar

16. Bashir Ahmed
    Joint Chief Economist, Planning and Development
    Lahore

17. M. S. Cheema
    Director, On-Farm Water Management Project
    Department of Agriculture
    Lahore

18. Saeed Ahmed Qureshi
    Chairman, Planning and Development
    Lahore

19. Mohiuddin Khan
    General Manager, Master Planning, WAPDA
    Lahore

20. Mian Moh'd Ashraf
    Chief Engineer, Master Planning, WAPDA
    Lahore

21. John O. Reuss
    Chief of Party, Colorado State University
    Lahore

22. Dwayne Westfall
    Agronomist, Colorado State University
    Lahore

23. Ch. Mohammad Munir
    Project Director
    Mona Reclamation Experimental Project

24. Ashfaq Mirza
    Dept. of Rural Sociology
    University of Agriculture
    Faisalabad

25. Qurban Ali
    Dept. of Agricultural Engineering
    University of Agriculture
    Faisalabad

26. A. Mungat
    Area Water Specialist
    On-Farm Water Management
    Faisalabad

27. Malik Afzal
    Director General, Dept. of Agriculture
    Lahore

28. Eugene Shaw
    Agronomist, Soil Conservation Service
    Lahore

29. Saleem Ashraf
    Area Water Management Specialist
    On-Farm Water Management Project
    Sahiwal

30. Musthaq Gill
    Deputy Director, Training and Research
    On-Farm Water Management Project
    Lahore

31. Carrol A. Hackbart
    Irrigation Engineer, Soil Conservation Service
    USAID/Lahore

32. K. A. Akhund
Additional Chief Secretary
Planning and Development
Karachi

33. Hazarat Pasha
Joint Chief Economist
Planning and Development
Karachi

34. Aftab Khan
Director, On-Farm Water Management Project
Hyderabad

35. William Cox
Agronomist, Soil Conservation Service
USAID/Hyderabad

36. Muzzafar Ali
Deputy Director, On-Farm Water Management Project
Quetta

37. M. Osman
Secretary of Agriculture
Quetta

38. Omar Khan Afridi
Development Commissioner
Quetta

39. Admiral Janjua
Minister of Food and Agriculture
Islamabad

40. Sami Qureshi
Secretary
Ministry of Food and Agriculture
Islamabad

APPENDIX D

THE RURAL POOR AS BENEFICIARIES

The On-Farm Water Management Project through its primary components of Watercourse Improvement and Precision Land Leveling has the potential of benefiting not only the small farmer, but the rural poor in general. This potential can more effectively be realized if the present focus on medium to small farmers is broadened to include the rural poor. This thereby eliminates the restrictions on land holdings, which in many respects are biased against larger landlords and their tenants as well. The new beneficiaries would include farm and off-farm laborers and low income rural specialists such as barbers, blacksmiths, potters, shoe repairmen, carpenters, transport workers, brickmakers, masons, bakers, tailors, and those involved in rice milling and sugar cane processing.

Viewed as socioeconomic innovations, watercourse improvement and precision land leveling can help stimulate a process of development by increasing agriculture production, which will bring about a concomitant increase in the demand for goods and services within the local area. While the well-to-do landowners are apt to be the most receptive to these innovations (they have the capital to invest and they can afford the risks involved), the communal character of the watercourses is such that a program of improvements will also benefit the tenants (most of whom are among the rural poor), and the small farmers. Since the large landlords are the ones who most often hire farm labor, there will be an increased need for their services, thereby reducing the prevailing underemployment in some places.

Increased production and rising incomes would have a widespread impact on the local socioeconomic situation. Laborers and specialists engaged in the storage, transport, processing, and marketing of farm produce would benefit directly as would many of the artisens providing services to the farm communities. Indirectly those involved in the fertilizer and pesticides industries also would benefit.

As innovations, both watercourse improvement (including the creation of Water Users' Associations) and precision land leveling should be seen in terms of the dynamics of change taking place in rural Pakistan. In his mid-1960's study of the Punjab village of Sahiwal, anthropologist Saghir Admad noted some important socioeconomic innovations concerning the roles of the landlords and tenants, cropping patterns, and the changing market situation.[1] He reports that:

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1 Ahmad, Saghir, Class and Power in a Punjabi Village, Lahore, Punjab, Adbi Markaz, 1977, pp.58-59, 61-62.

"Until recently a tenant made his own decisions about the variety of crops and the amount of land planted with a particular crop. Traditionally this meant that most of the land was under wheat and fodder, less was under cotton, and still less under sugarcane. This pattern has changed, with the landlords increasingly emphasizing cash crops over subsistence crops. This change appears to have been one of the unanticipated consequences of the land reforms, which raised in the minds of many landlords the possibility of more drastic reforms and stricter implementation. In this respect, they appear concerned about their declining power and prestige in the face of the growing influence of the business and industrial class. In an effort to maintain their power and wealth, many landlords have begun to participate in indus-rial and business activities. One of the landlords in Sahiwal, for instance, was exploring the possibility of starting an enamel factory; the other had begun a transport company. The accumulation of cash, which is essential for any business enterprise, has in turn been stimulated by the development of new market possibilities. In the past the grower had to transport his cotton to the market town; now market agents come to the village. Similarly, the establishment of a sugar mill about twenty miles away ensures a quick disposal of the sugar cane.

In short, landlords have begun to find it advantageous to make their own decisions regarding the variety of crops and the amount of land to be planted with a particular crop, in order to profit from the expanding markets for cash crops. Further, by investing their profits in business and industry, they ensure themselves against future losses of land through more stringent land reforms."

The situation that Ahmad describes clearly indicates potential mixed blessings for the rural poor. On the one hand the increase in cash cropping and local small industries bodes well for the laborers and specialists, but it signals some dangers for the tenants who might be displaced by the landlords in their attempts to develop estates.

Various interviewees, however, indicated that there were other sweeping social changes throughout rural Pakistan that may be of general benefit to all of the rural poor. The most important would appear to be the eroding of traditional rural power structures. Two causal factors are the overall process of modernization abetted by such things as improved communication in the more remote regions (many farmers now listen to radio announcements about new techniques, cropping, prices, and other news items), and the increased monitization of the peasants. The

expectations of the poor also have been rising as a result of past government policies concerning "participatory democracy", so that now they view their lot differently than before. Further, for many of the rural poor the cycle of poverty has been broken by the opportunity to migrate to urban areas or to the Middle East (an estimated 1.5 million Pakistanis have gone to this region). Those who return to their villages bring not only capital, but also new ideas about their statuses and rights.

The creation of Water Users' Associations would be compatible with these currents of change. They would give the small farmers and the tenants a legal role in decisions concerning an important village institution - water management.

Small Farmers Within the Rural Poor Majority: From the available evidence it appears that the small farmer (figured on the basis of either 12.5 or 25 acres) do not comprise a major segment of the rural poor. Small farmers are concentrated in Punjab Province where the majority of farm units are less than 25 acres (the average is around 10 acres). A recent survey in Punjab Province[1] reveals that in Sahiwal District, 54.2 percent of village households were landowners (both large and small) while the remainder were tenants, permanent laborers, artisans, shopkeepers, and others. In Gujranwala District the landowners comprised 44.5 percent while in Punjab district they were 52.6 percent of the total.

Small landowners are less numerous in the Sind, North-West Frontier, and Baluchistan. The 1976 AID Project Paper for On-Farm Water Management reports that 60 percent of the cultivators in the Sind are tenants (a recent survey of 622 households organized by Dr. Soomro Badrudim, Additional Director of the Sind Regional Planning Organization reveals that tenants account for 64-65 percent of the cultivators). In the North-West Frontier some 36 percent of the total land area farmed is irrigated, and although land holdings tend to be small (5 to 6 acres), there is no data on tenure. Vast areas of the province, however, are owned by landlords who have arrangements that are described as "feudalistic". In Baluchistan, land holdings are tied to the complicated tribal system, but it is apparent that there are very few small landowners.

Categories of Rural Poor Other Than Small Farmers: The various rural poor categories have been identified:

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[1] Eckert, J. B., et. at., "Rural Labor in Punjab: A Survey Report", Planning and Development Department, Government of the Punjab (mimeographed), Lahore.

A. Tenants: Although all tenants cannot be numbered among the rural poor, the vast majority can be classified as such. Conditions of tenancy vary throughout Pakistan. Available information indicates that in the Punjab and Sind most tenants are sharecroppers, and the usual portion of the harvest paid to the landlord is 50 percent (particularly in the Punjab). There also are tenants who pay rent in cash. The Eckert, et. al., survey noted above reveals that in Punjab District the kind tenants accounted for 14.1 percent of the household while the cash tenants were only 1.6 percent. In Gujranwala and Punjab Districts the figures for kind tenants were 15.1 and 11.7 percent and for cash tenants 0.7 and 1.4 percent respectively. A common pattern for both types of tenants is that they maintain their own farmsteads, keep their own bullocks, and own their farm implements.

Another pattern of tenancy, however, is that which often is described as "feudal" and it appears to be much more predominant in the Sind, North-West Frontier, and Baluchistan. Basically this involves the landlord providing the tenant with housing, bullocks (although the tenant may share in maintenance costs), and other necessities, so that the tenant receives less than the usual 50 percent of the harvest. In the Sind, for example, the tenant's portion of the harvest often is between 20 and 50 percent depending on what he receives from the landlord. In parts of the North-West Frontier a tenant can retain one-third of the maize crop and one-half of the wheat harvest. (See Case #1 for a type of tenancy found in Punjab).

B. Laborers: Among the rural poor, laborers can be divided into two general categories: Those engaged in farm work, and those who perform off-farm labor.

1. Farm laborers include permanet laborers and a range of temporary workers. In the Eckert et. al., survey referred to previously, it was revealed that in Sahiwal, Gujranwala, and Punjab Districts, permanent laborers comprised 6.4, 6.8, and 6.0 percent of the total rural households respectively while temporary laborers were reported to account for 7.8, 9.5, and 9.9 percent respectively.

2. Permanent laborers include those who live in villages and work for farmers in the surrounding area. By and large they are unskilled and work seasonally on such things as harvesting (leaving them unemployed for part of the year). Then there are the more skilled "farm hands", who perform a number of tasks such as repairing farm tools, dikes and bundings,

maintaining irrigation systems, and caring for animals. These laborers may have their own houses in the settlement or reside on the farm of a landlord who provides them with necessities (house, clothes, and food) rather than paying them wages (see Case #1). In herding areas (noteably in parts of the North-West Frontier and Baluchistan) there are permanent laborers who specialize in caring for flocks of sheep and goats.

3. Temporary labor patterns vary considerably throughout Pakistan. In the Punjab it is customary to recruit local labor for the harvest, and this involves giving temporary work on the farms to those available during this busy time. They include not only laborers, but also village specialists such as barbers, potters, blacksmiths, and other artisans. In his study of a Punjabi village cited previously, Saghir Ahmad describes this type of labor as it is organized by tenants in the following passage:

> "Harvesting involves three distinct steps: cutting, threshing, and winnowing. The first is only performed by the tenant and his household if the area is small or the household large. Usually the tenant is assisted by others in one of two ways: VANGAR (collective labor) or LACAR (seasonal or migrant labor). In the case of VANGAR, one of the seipi-kammis (the barber or the potter) tells the villagers that a particular tenant will "have a VANGAR" on a particular day. On that morning the village drummer goes to the tenant's plot and beats his drum, those who wish to help start to gather, and when enough have congregated they begin cutting, with shouts and laughter. The tenant mingles with the workers, smoking his HOOKA, and greeting and exchanging friendly remarks. The women of the tenant's household help tie the cut wheat, but the women and children of the participants' household do not assist. A rich tenant may offer a cold drink. The wheat is cut within a day and the men return home to feed their cattle or do other chores. Soon after sunset the drummer once again beats his drum, this time outside the tenant's house. The day's workers return for a meal, and what is served is a significant indicator of the tenant's prosperity. In all cases it is a better meal than that eaten daily by the tenants. Serving a meal is obligatory, as is the return

> of a day's labor when any of the participants holds VANGAR, unless one is unable to do so for some acceptable reason. The number of colunteers for the VANGAR is an indication of a tenant's prestige and status, as well as a rough indication of social divisions in the community."

Migratory workers are a source of labor throughout Pakistan, but they vary considerably in terms of their migratory patterns and their social characteristics. In his study of a Punjabi community, Saghir Ahmad also describes one type of migratory labor:

> "Another orm of traditional assistance is LAVAR. At the beginning of the harvesting season a large number of men travel from village to village in search of work. These men are mostly KAMMIS, or, if agriculturists, they come from rainfall-irrigated areas. They travel with their cattle but without their women and children. As they pass through a village, those farmers who are short of hands seek their assistance. Wages are traditionally determined, and the LAVAR is provided with a sleeping place, a few pots and pans, grain, and fodder for his cattle. He stays with the farmer until the end of the harvest. He is paid in grain, the quantity of which is determined by his conduct, his work, and the amount of produce. Many LAVARS come back to the same farmer every year. The rural public works program, which depends on the villages for its labor, is said to be adversely affected during this time of year."

Other rural migratory laborers move in seasonal patterns - from north to south as summer ends and back to north in the spring. Dr. Soomro Badrudim, Additional Director of the Sind Regional Planning Organization points out that an important source of labor in the rural Sind is the migratory groups that come out of the mountainous regions further north and northwest during the fall to spend the winter months in the warmer zones. He adds that Sindis by and large do not participate in migratory labor, preferring to move into the towns and cities such as Faisalabad and Karachi to find work as laborers in industry and construction (an important source of work for poor woemn).

In the North-West Frontier and Baluchistan large numbers of migratory workers are of the tribal groups such as the Pathan and Broni. Nawab Ghaus Bux Raisani, Chief of the Sarawan Branch of the Broni (and former Minister of Agriculture and

former Governor of Baluchistan) pointed out that the Brohi were traditionally nomadic people whose home was in the uplands, and each winter they moved into the Kalat plain. Conflict with the indigenous people of the Kalat plain prompted them to obtain land in the region so they would have a winter haven. Now the Brohi migrants continue their nomadic pattern, and Nawal Risani employs large numbers of them on his farm as seasonal laborers. Camps of such migrants are common sights in rural Pakistan, and in Baluchistan they can be seen in camel caravans and on trucks migrating southward in October.

4. Off-Farm Laborers include those working in the rural commercial establishments such as markets, shops, hotels, transport services, brick kilns, and a host of other activities, most of which are involved in providing goods and services to the farm communities.

C. Rural Specialists: Reporting on the Punjabi village of Sahiwal, Saghir Ahmad (in the study cited above) uses the generic term Kammi to describe "village servants" or "village specialists", which include "members of hereditary occupations, groups of artisans or other village servants as well as anyone who serves the village in a specialized category". The 3 kammi include blacksmiths, carpenters, barbers, shoe-repairmen (mochi), kumhar (who carry loads of wheat, sugarcane or fodder), mehnati (specialists in winnowing), and mussali (employed to keep the farmstead clean, wait on guests and keep the hookas (water pipes) ready. Ahmad notes that these specialists are paid from the joint produce of the tenant and landlord, and the kammis live in rent-free houses provided by the landlords in Sahiwal. When Ahmad did his study in the early 1960's the kammis were obligated to contribute free labor (begar) on demand even though this was legally abolished by the Government in 1952.

In addition to the specialists found in the villages there are rural specialists engaged in such things as brickmaking, masonry, sugarcane processing, rice milling, tailoring, gold working, baking and a number of other metiers.

D. Case Studies

1. Case #1. Big-Landlord Patronage in a Punjab Village:

In the vicinity of Tube Well #94 in the Mona Project area, Mr. Shah, who nominally owns 50 acres of land has a large farmstead which encompasses his own sizeable residence, a guest house, a row of quarters for laborers and tenants, a

private mosque, and various subsidiary buildings, including a small blacksmith shop, stables, and various workshops.

Three tenant families farm 25 acres on a sharecropping basis, but at considerably less than the usual 50 percent of the harvest because their housing and bullocks are supplied by the landlord. A rent-free house also is provided. Dost, the 35 year old laborer was born on the farm (his father and paternal grandfather also were laborers). The landlord buys Dost's clothing and food (whatever is not supplied by the farm), and he also pays for the education of Dost's two sons, who also will be laborers. He manages the irrigation of the fields, repairing bundings, cleans watercourses, and also does a number of other jobs related to the operation of the farm.

One of Mr. Nawab Shah's retainers in Lala, is the 35 year old blacksmith. A small blacksmith shop is provided by the landlord so that Lala will be available to perform work when needed. Lala is paid one maund (37 milos or 82 pounds) of wheat every six months for shoding the six pair of bullocks on the farm. The cost is shared by the landlord and tenants. The blacksmith's other clients come to the farm to have their work done. Lala, his wife, and seven children live in the nearby village where he built a house on land he leases from a farmer. Lala sometimes supplements his income by working as a mason. Earlier this year, for example, he spent one month doing masonry on a local waterdourse improvement project, receiving a salary of Rps. 200 ($20.00). He also works as a laborer during the wheat harvest, getting the fee of 1 1/2 maunds (123 lbs) of grain per acre harvested.

Riding his own horse and clutching a bag with his instruments, Ali, the 25 year old barber, rode into the farmstead. He lives with his wife and two sons in a small house located in the village, and travels to the surrounding farms to cut hair as his father and grandfather did before him. Mr. Nawab Shah retains Ali to take care (Trim hair, beards, and fingernails as well as shave armpits) of the male members of his family and those of the laborers and tenants as well. For each family Ali receives two maunds of grain (164 lbs) annually. In addition, he works as a laborer during the harvest season, receiving 1 1/2 maunds of grain for every acre. From time to time, on the occasion of marriage or other family celebration, Mr. Shah will reward Ali with Rps. 100 (R10.00) or a piece of cloth.

Ali receives a comparable barbering fee from other farm families, and what grain he and his family do not consume is sold on the local market. His buffalo and cow provide milk for the family, and Ali normally gathers free fodder from his farm clients, who also sell him produce at low prices. He does what little marketing his family requires, purchasing salt, soap, and cloth for the most part. Periodically he also buys fresh beef, which his wife prepares in a curry.

2. Case #2. <u>An Example of Baluchistani Village Leadership and Water Management</u>:

The village of Chashma (a Persian word meaning "Spring") in the vicinity of Quetta has a population affiliated with the Kasi, Brohi, Kakar, and Sayed tribes. Landowners are of the Kasi and Kakar while all of the Brohi are tenants and the Sayed are engaged exclusively in commerce.

For many generations irrigation water has been supplied by a <u>kareze</u> in the nearby mountainside and more recently some tubewells have been installed in the village. Traditionally an irrigation headman (the <u>amir</u> or irrigation) selected by the farmers, regulates the use of water, informing each user when water will flow through his channels (watercourses in the village are privately owned). A committee has long had responsibility for maintaining the kareze and the channels. The head of the committee is a Kasi named Haji Mohammud Nahim, and the eleven members are drawn from the Kasi, Kakar, and Brohi. The most influential member of the committee and unofficial village headman is Haji Hadi, a man of 54 years and a graduate in economics from a Pakistani university. Haji Hadi's father, Haji Rahmal Ullah, had served as headman, and currently Hadi's paternal uncle, Haji Abdu Hamid is headman, but he is too elderly to be active. All of the water users in the village are shareholders in the kareze, and the major function of the committee is to maintain the system, particularly the annual cleaning and repairing of the koreze itself.

Haji Hadi (who had had some of his fields leveled) is one of the leaders instrumental in bringing the On-farm Water Management Program to the village. The survey already has been done and a design is being completed. Hadi pointed out that the traditional committee will function as the organizer of the project in the village. The committee will provide the necessary labor (paying them with money collected from the landowners), and it will see to the continued maintenance of the watercourses.

Haji Hadi is of a deeply rooted traditional leadership in the locality. The Kasar are of the Pathan ethnic group, which in Baluchistan (according to Hadi) is divided into the Tareem and Kakar. The head of the Kakar is Temur Shah, whose major function is to arbitrate any conflicts that cannot be resolved at the lower levels of the tribe. The Kakar are divided into several branches one of which is the Dumar, whose chief is Abdul Rahim Khan, a resident of Sunjabi. In addition to maintaining the grand genealogy (shejra) of all the Dumar, he makes an annual tour of the province, advising all of the Dumar families. Haji Hadi is a member of the Dumar, and he pointed out that there are numerous sub-branches, such as the Daulatzai, which is found locally.

Haji Hadi reported that all of his fields (he managed to ignore a question concerning how large his holdings were) is worked by tenants, who receive one-third of the harvest (the principle winter crops are barley and wheat and summer crops include tomatoes, potatoes, turnips, and onions). Hadi provides the tenants with bullocks, whose manure is used on the fields (chemical fertilizers also are employed). Cash crops (including fruit from Hadi's orchards) are sent to markets in Quetta, Lahore and Karachi. There is no shortage of labor in this region. Most of it is supplied by migrants of the Baluch and Brohi tribes who spend six months of the summer planting season here and then move south to the Sibi area for the winter months.

APPENDIX E

SURVEY OF IMPROVED WATERCOURSES

PUNJAB PROVINCE

ON-FARM WATER MANAGEMENT PROJECT

BY

DR. MALIK ASHRAF AND DR. RAYMOND HOOKER

USAID/PAKISTAN

SUMMARY AND CONCLUSIONS

The construction of IWCs under the OFWM project got off to a poor, slow start. Three of the five IWCs installed during the first round of construction turned out to be problem watercourses to the farmers using them. Much to the credit of the OFWM organization, the mistakes were quickly recognized and subseqnent construction was redesigned. The second and third rounds of construction saw a vast and progressive improvement in both the design and number of IWCs installed.

While the OFWM organization was quick to discover problems and make modifications to prevent them from reoccuring in future construction, the organization has done little or nothing to correct mistakes made on IWCs constructed in the past. The problem IWCs are few in number and the modifications required to make most of them "successful" would not be costly. Clearly, a way should be found to address this problem.

Farmers on some of the problem IWCs have not benefited from the construction. Some have been substantially harmed. Such farmers account for a small fraction of the total farmers with IWCs, however, and our quantitative analysis found that overall the project yields a handsome return to participating farmers. This is true even when including the problem IWCs in the analysis and employing unrealistically conservative assumptions. This finding is strongly supported by the general enthusiasm shown for the program by IWC farmers when they were interviewed, as well as the desire expressed by farmers on near-by unimproved watercourses to have their watercourses improved. It should be pointed out, however, that participating farmers pay less than half of the construction cost of IWCs.

The project is also financially viable for the country as a whole, but is only marginally viable economically. In calculating the latter, substantial (grant) expatriate technical assistance was charged to the project, as was the cost of constructing a new training

center. It is asking much of a pilot project as this is to support such activities and we are confident that in the longer run context a program based on the pilot project would yield very attractive economic returns. For the longer run, there would be the additional savings of not having to construct as much national irrigation storage capacity. Such a savings component was not included in the economic analysis of the pilot project, but would have to be included in a longer run analysis as the aggregate irrigation water supply at the farm level was increased to meet the nation's growing farm production needs.

We believe that the project is substantially achieving most of its major objectives. While we need to do (and will do) more work on the distribution of project benefits, the size distribution of the IWC farms suggests that the equity objective is being substantially met. The fact that the cropping intensity for sample farms is inversely related, and decidedly so, to farm size also suggests the same. However, we have yet to analyze production/income data by farm size.

There is now a government awareness and appreciation of the merits of the project. This is attested to by the fact that the project in the Punjab is exempt from the current hiring freeze on government personnel. Furthermore, funds are being made available to finance the expansion of the project. We believe that the number of IWCs targeted for construction during the project life will be achieved. Reportedly, the 1978/79 target was more than met.

Farmers on successful IWCs indicated they used the additional irrigation water to increase cropping intensities, produce more high water consumption crops, irrigate more land, supply more water to the same crops and to reduce their use of tubewell water. While few statistically significant differences were found between the IWC farms and the controls, the quantitative data generally supported what farmers said they were doing qualitatively. The effect of all the adjustments combined is reflected in the difference in the value of farm output as between the IWC farms and their controls. The differential amounted to an average of about 17% per acre of farm land for the successful IWCs. Compared to the increase in the value of output, savings resulting from the use of less tubewell water, the other source of direct benefits, was quite small.

Our data indicate that the project has not increased the rate of fertilizer application by participating farmers as had been anticipated in the Project Paper. OFWM extension has been concerned mainly with getting watercourses cleaned and maintained, or at least cleaned, and

it has done little in the extension of agronomic practices. Nor do the data indicate that the project has increased employment on IWC farms, although they do suggest that the project has reduced underemployment on such farms.

An effective, systematic cleaning and maintenance program is essential in order to obtain a high proportion of the potential net social and private benefits from the IWCs installed under the project. With such a program, a 75% conveyance efficiency could be maintained on the IWCs almost indefinitely, reducing conveyance losses by an average of at least 50% over unimproved watercourses. During our survey, we were encouraged in that the sample IWCs were generally cleaned and maintained better than expected, the latter admittedly being not optimistic. Also, the actual measurements taken on a small sample of IWCs by the OFWM office for the survey indicated a respectable performance in the conveyance of those IWCs measured. However, there is clearly substantial room for improvement and the present arrangement has to be strengthened.

The project relies mainly on OFWM agricultural officers (AOs) and local "water users associations" (WUAs) for implementing the cleaning/maintenance program. We conclude that it is the AO who is mainly responsible for the cleaning/maintenance being as good as it is. Only a third of the WUAs remained active once construction of the IWC was completed. When discussing the problems of watercourse cleaning and maintenance, a common comment by villagers was that there was a reluctance to impose sanctions on non-cooperators since this created ill will and conflict within the community. It thus seems that the imposition of sanctions on violators of cleaning/maintenance standards would have to originate from outside the village.

The agricultural extension associated with the project is mainly that of promoting the cleaning of watercourses. The extension of improved on-farm water management practices receives less attention and agronomic practices hardly any. In the absence of any other means to effectively promote cleaning, this is an acceptable use of the AO's time. But it is clearly not a long run solution.

We close this section by noting that this study was looking at IWCs that had been in operation for only a short time. Thus, only two of the non-problem IWCs had been in operation for as long as three full crop seasons. We would have liked to have had more experience to have drawn from. We would also have liked to have had a larger sample

and more time to have selected the controls. It is on the latter that the quantitative results of the study are most vulnerable. We are nonetheless confident of the relatively optimistic findings. They reflect both (qualitative) attitudinal and quantitative data. The former was obtained mainly from group interviews where participation ran as high as 80% or more of a watercourse's farm operators, all of whom it seemed would have their say.

RECOMMENDATIONS

1. The findings and conclusions of this study suggest a thorough review of this project be undertaken with the Irrigation Department and high level agricultural policy makers of the Punjab Province and Federal Agencies. We also recommend a similar quantitative analysis be undertaken in 1-2 years when many more watercourses have been improved and improved watercourses over a larger number of cropping seasons can be analyzed. The very high benefit streams documented in this study suggest important implications for public sector investment in this project. High financial and economic returns to the program of watercourse improvement attest to the suitability of the water increasing technology and suggest a major expansion of the project in the Punjab Province. However, if an enlarged program of more costly and permanent lining and structures are to be undertaken, a strategy for recovering a greater percentage of capital costs from the beneficiaries should be developed. We would argue that as watercourse improvement expands in the Punjab, a system which requires greater cost sharing by the beneficiaries would allow a faster rate of expansion of the program and provide an impetus for more efficient maintenance of improved watercourses.

2. The size of benefit streams from improvement of watercourses depends upon the life of structures installed. A good maintenance program by the farmers themselves is essential to maintain the water delivery efficiency and enhance the life of watercourse structures. Local farmers organizations/associations must be created without too much delay. A priority attention should be given to research the indigenous socio-cultural foundations of building an effective locally administered formal organization around the watercourse. OFWM program must seek, and it should be provided with, social organizational research assistance for articulating the nature, scope and form of water user's organization suited to different ethno-cultural social groups in the irrigated regions of the country.

3. OFWM Organization should establish a special cell that assumes the responsibility of gathering research data and compiling extension guides for the maintenance of various structures (lining, nukka, drop, culverts, buffalo vellows, curves, earthen lining, etc.) and the extension of information on irrigation practices for various plot sizes and crops. The cell should also prepare advisory information for the Agricultural Extension Officer on the complementary inputs use of chemical fertilizer, pesticide, crop variety, etc., to maximize the production impact of watercourse improvement program.

4. That the OFWM organization begin immediately to work with farmers on the problem watercourses to find solutions to the problems. For watercourses with silt-traps this might be achieved by assisting farmers in working out a community arrangement for keeping sediment basins cleaned. If this cannot be achieved, the OFWM program should remove the silt-traps from all the 7 watercourses. There is also need to provide advice/assistance in means of rodent control.

A P P E N D I X F

Colorado State University

Water Management Research Project in Pakistan

Pakistan Report No. 44

CONSTRAINTS ON SMALL FARMERS IN THE PRECISION LAND LEVELING PROGRAM IN THE PAKISTANI PUNJAB

By
Raymond A. H. Renfro (CSU)

with assistance from
Muhammad Iqbal Akhtar Niazi (CSU)
and
Abdul Ghaffar (CSU)

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Colorado State University
Box 660
Lahore, Pakistan

SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

In this report, it has been demonstrated that there are many constraints on small farmers in the PLL program. The category of No PLL farmers (those who were to some degree aware of the program, but either chose not to or were unable to participate in the program) was shown to be different in many respects from PLL farmers, and perceived different types of problems and constraints. No PLL farmers interviewed tend to own and operate smaller farms than PLL farmers, are less educated, possess more fragmented land holdings, sell or trade considerably less of their farm produce on the market (i.e., are more subsistence farmers), and own considerably fewer tractors and tubewells. Many of these differences are probably related to the fact that farm ownership size of PLL farmers as reported to us was larger than that reported on OFWM records. Thus, the PLL farmers sampled were larger than that reported on OFWM records. Thus, the PLL farmers sampled were larger than the No PLL farmers sampled. The farmers who did not participate in PLL are also more likely to hear about the PLL program through second and third hand sources (instead of from OFWM personnel directly). They are more likely to mistrust OFWM personnel and government people in general, to be unaware of the full details of the PLL program, and to be opposed to credit facilities for PLL. Their major perceived constraints, in order of importance, are (1) loss of a cropping season and double cropping of land, i.e., no available land for PLL, (2) a lack of knowledge about the PLL program and not being convinced of the benefits of PLL, (3) tractor and/or implement rental is too costly, (4) a mistrust of OFWM and a feeling that the reputation of OFWM workers is not good, (5) the rate of subsidy is too low, and (6) a lack of approach to OFWM.

At this point, the author would like to make some subjective and personal observations which may help to put some of the findings of the survey in better perspective. Even though we are unable to say definitely that PLL farmers tend to be larger than No PLL farmers in terms of farm size, due to unfortunate sampling difficulties, we (the researchers) feel that this is a true statement. In several village areas, we found a relative abundance of No PLL farmers in the very small category, but were hard put to locate and interview even one No PLL farmer in the small category (ownership acreage size between 12.5 and 25 acres). Large No PLL farmers were extremely rare in those areas visited where PLL work had been done. It was our subject finding that PLL farmers tended to be larger, more educated, less fragmented, less subsistence oriented, more wealthy, more influential, and more progressive than No PLL farmers. We found that OFWM personnel tend to cater to the needs of the larger and more influential farmers for PLL, but that all farmers had a good opinion of the OFWM people and the type of work they do. The reputation of OFWM is

considerably higher than that of any other government system, Revenue Department, Irrigation Department, WAPDA, and system of extension agents. We found the farmers in the Chiniot area very difficult to interview and deal with, and we sympathize with the problems faced by the A.T.O. in that area. We found almost all the No PLL farmers genuinely interested in finding out more about both the PLL and watercourse improvement programs.

The major benefits of PLL as perceived by farmers are, (1) reduced time to irrigate (less water per acre), (2) better crop production and higher yield, (3) easier operation of tractor and equipment (increase in plot size) and more effective utilization of modem agricultural equipment, (4) reduction in hired labor costs, (5) improvement of status, and (6) reduction in family labor time. The major perceived costs of PLL are, in order of importance, (1) tractor fuel and labor time, (2) tractor rental, (3) getting the subsidy check cashed from the bank, (4) OFWM equipment rental, (5) hired labor costs, and (6) loss of a cropping season. The subsidy averaged approximately one-half of the direct costs of PLL, but only about one-third of the total costs. The indirect costs of PLL were larger than expected -- about half the average direct costs of PLL.

Farmers suggestions generally fell into two classes, those requesting increased subsidies of one type or another, and those relating to the need for OFWM personnel to be more effective in contacting farmers and explaining the program.

This author is of the personal opinion that the PLL program is an excellent program, and that with several modifications will continue to raise agricultural productivity and promote the more efficient use of limited supplies of water throughout the Punjab province. It is hoped that with modification, the program will be able to more effectively reach the small and very small farmers.

Farmers seem generally willing and anxious to avail themselves of more (future) PLL, even though most of them do not, of course, qualify for future subsidies unless they are able to somehow subdivide more of their land holdings in the names of other family relations.

In addition to the suggestions made by surveyed farmers themselves, this author would like to make the following recommendations:

1. Since the project is aimed at the small farmer, considerably more effort should be made to determine precise ownership acreages. OFWM should be given access to all land ownership records (i.e., from the Revenue Department) and have the legal power to obtain such records at any time. No attention

should be given at this time to operational size of holdings, since this will no doubt prove very difficult and time-consuming for OFWM to verify.

2. More effort should be made by OFWM to reach and inform all farmers and especially small farmers about the full details of the PLL project. This pertains also to the improvement of watercourses. It is to be expected that the larger, more educated and more "progressive" farmers will usually be the first ones in a village or chak to seek out the OFWM people in order to elicit more details about the program and to make the actual decision to do some precision land leveling. OFWM are correct in going to assist in the PLL work of these farmers and in granting them a subsidy if they so qualify. However, there is no reason why the OFWM workers cannot make attempts to, for example, call a general meeting in the village or chak where they have gone to do PLL work, in which they can effectively explain the PLL program including its benefits and costs, to at least those farmers who were interested enough to attend such a meeting. Several meetings may have to be held, upon request, in order to reach all interested farmers. At the conclusion of these meetings, efforts should be made by the OFWM teams to level the lands of all those who have completed an application form for PLL in one particular village area, before proceeding to other village areas. There should be no discrimination against small farmers who have expressed the desire for PLL and completed an application form. Because of PLL target-goal stipulations, many OFWM officers are tempted to give more consideration to those farmers who are willing to level more acres, and to give less consideration to small farmers who wish to level less than four or five acres. While there are problems with the target-goal procedure, there would probably be more serious problems without it, since without target-goals there would be little or no incentive for OFWM personnel to perform PLL work.

3. Since the demand for PLL is greater than the supply of PLL teams and equipment and the demand will increase further with more attempts of OFWM to reach small farmers; more personnel, implements, and training should be made available for PLL work. It is only by adequately meeting the demand of all farmers for PLL that the small farmer will be attended to and benefited. When the demand exceeds the supply, the tendency is for larger, more influential farmers to benefit more than smaller, less influential farmers.

4. The rate of subsidy (based upon the volume of earth moved as determined by surveying techniques) should be higher for "very small" farmers than for "small" farmers; (author's definitions of very small and small). This would effectively allow for smaller farmers to overcome their major constraints of losing a cropping season due to PLL and not being able to afford the costly rental of tractors. If feasible, an advance subsidy should be offered to very small farmers. If this is not feasible, then credit arrangements should be made easily available for PLL; this could be implemented in addition to the granting of advance subsidies. This author does not feel that additional subsidies should be granted for the decrease in yield resulting during the first cropping season after PLL (in the form of cash or chemical fertilizer), nor for repairing tractors owned by farmers after the great strain put on them by the PLL work, since these are not among the major constraints on farmers in the PLL program.

5. The procedure of getting subsidy checks cashed must be simplified. Over and again this was a major complaint we heard from farmers about the program. The OFWM personal ledger accounts (P.L.A.) used for the payment of subsidies should be operated exclusively through private banks, instead of the current procedure of all subsidy checks being required to go to the Revenue Department for approval and release of funds.

6. To coincide with attempts to reach all farmers, and especially smaller farmers, more efforts should be made to develop and make available bullock-drawn scrapers, since tried and tested bullock power and labor intensive technologies may appeal more to very small farmers than tractor power and capital intensive technologies. The establishment and encouragement of private agencies and contractors to perform PLL would tend to ease the pressure on existing OFWM teams to service the demands of all farmers. Private agencies could concentrate on servicing both those farmers who do not qualify for a government subsidy and those farmers who prefer not to be dependent on OFWM for PLL. Such private agencies could be encouraged at first by tax incentives and by OFWM advertising the existence of private services in areas where they are doing PLL work.

Effective implementation of these recommendations will not only improve the quality of the existing PLL program, but will also serve to more effectively reach and benefit small farmers, in addition to larger farmers who have been in the past the principal recipients of the benefits of the PLL program. There have been difficulties with the program in reaching and benefiting the target group of small farmers. However, any program designed to reach and benefit small farmers will undoubtedly encounter similar difficulties. With this in mind, it would be a mistake to misinterpret the criticisms and shortcomings of the program or to suspend or terminate the program due to these problems. The current PLL program is in a critical phase; it is beginning to gain recognition and acceptance in many village areas, and with some modifications it can not only continue to gain popularity but can also better reach the targeted group of farmers. Suspension or termination of the program at this phase would strike a major blow to farmers in general, OFWM morale, and to the other (future) development programs aimed at small farmers in Pakistan.