A.I.D. EVALUATION SUMMARY PART 1

(BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS)

IDENTIFICATION DATA

A. REPORTING A.I.D. UNIT: USAID/Pakistan (Mission or AID/W Office) (ES#)

B. WAS EVALUATION SCHEDULED IN CURRENT FY ANNUAL EVALUATION PLAN? yes ☒ slipped ☐ ad hoc ☐ Eval. Plan Submission Date: FY 93 Q 1

C. EVALUATION TIMING Interim ☐ final ☒ ex post ☐ other ☐

D. ACTIVITY OR ACTIVITIES EVALUATED (List the following information for project(s) evaluated; if not applicable, list title and date of the evaluation report)

Project #	Project/Program Title (or title & date of evaluation report)	First PROAG or equivalent (FY)	Most recent PACD (mo/yr)	Planned LOP Cost ('000)	Amount Obligated to Date ('000)
(391-0467)	Irrigation Systems Management - Command Water Management Component	6/5/83	6/4/93	$122,900 ($25,000 for CWM)	$122,900 ($25,000 for CWM)

ACTIONS

E. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

Action(s) Required	Name of officer responsible for Action	Date Action to be Completed
The project ended on June 4, 1993 and USAID will not be funding any further irrigation or irrigation-related activities. Therefore, there are no required actions stemming from the recommendations presented in the evaluation.		

(Attach extra sheet if necessary)

APPROVALS

F. DATE OF MISSION OR AID/W OFFICE REVIEW OF EVALUATION: mo ___ day ___ yr ___

G. APPROVALS OF EVALUATION SUMMARY AND ACTION DECISIONS:

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Signature				
Typed Name	Asif Mahmood	S. Faiz Ahmed Zaidi	Judith Schumacher	John Blackton
Date:	8/2/93	Aug 3, 93	7-28-93	

H. EVALUATION ABSTRACT (do not exceed the space provided)

The CWM component of ISM was a development activity jointly designed, financed, and implemented by the Government of Pakistan (GOP), the World Bank and USAID. CWM was to provide the basis for relevant agencies to cooperate with water users in better matching available irrigation water and cropping patterns, and in providing necessary materials and services to increase agricultural productivity. The final evaluation of this component of the larger Irrigation Systems Management project was conducted in order to assess the impact of the project in achieving its objectives, assess the validity of the CWM strategy and make recommendations to the GOP, USAID, the World Bank and other donors about the value of designing and implementing similar irrigation interventions.

The evaluation concentrated on assessing accomplishments in three areas: civil works, agricultural production and water management, and institutional development. The major findings include:

- Civil works received the most emphasis and achieved the best results; most project output indicators concerned civil works targets and most funds were budgeted for civil works; institutional development received much less attention and was hindered by a lack of clear direction.
- The Subproject Management Office (SMO) was not found to be an effective model of decentralized management.
- The concept of expanding the role of Water Users Association (WUA) model to other activities beyond water delivery was flawed.
- Some agriculture development and water management activities (e.g., land leveling, more appropriate crop and crop variety selection, improved methods for sowing and fertilizer application) helped some farmers achieve higher net incomes and may be replicable on a wider scale; other activities.

Recommendations also focus on the three major areas stated above. In addition there are numerous recommendations on the project design which the evaluators found to be a major shortcoming. The major recommendations include:

- The concept of a two-stage development, in which civil works must be essentially complete before other important agricultural or institutional activities are started, should be categorically rejected in future project. Civil and non-civil works must proceed in tandem and civil works should not be used as an incentive for accomplishing other project activities.
- Any future CWM-type project should operate through decentralized management having full administrative and financial powers; institutional goals and objectives must be clearly defined at the design stage and objectively verifiable indicators to measure progress toward their attainment must also be specified and monitored over the life of the project.
- Future activities in agricultural development and water management should be more appropriate to prevailing farming systems, should place greater emphasis on low-cost extension programs, and should promote greater use of high yielding crop varieties.

ABSTRACT

COSTS

1. EVALUATION COSTS

1. Evaluation Team Name	Affiliation	Contract Number OR TDY Person Days	Contract Cost OR TDY Cost (US$)	Source of Funds
John H. Erikson Gilbert L. Corey Allen K. Jones S. Amanullah Husaini M. Akhtar Bhatti Jamshed Tirmizi	Irrigation Support Project for Asia and Near East (ISPAN)	ANE-0289-C-00-7044-00	$158,177	ISM project (391-0467)

2. Mission/Office Professional Staff Person-Days (estimate) 10

3. Borrower/Grantee Professional Staff Person-Days (estimate) 20

A.I.D. EVALUATION SUMMARY PART II

SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS (Try not to exceed the 3 pages provided)
Address the following items:

- Purpose of activity(ies) evaluated
- Purpose of evaluation and Methodology used
- Findings and conclusions (relate to questions)
- Principal recommendations
- Lessons learned

Mission or Office: USAID/Pakistan

Date this summary prepared: June 24, 1993

Title and Date of Full Evaluation Report: Final Evaluation of the Command Water Management Project

1. Purpose of the ISM/CWM Component: The CWM component of ISM was a development activity jointly designed, financed, and implemented by the Government of Pakistan (GOP), the World Bank and USAID. CWM was to provide the basis for relevant agencies to cooperate with water users in better matching available irrigation water and cropping patterns, and in providing necessary materials and services to increase agricultural productivity. The specific objectives of the CWM component were to:

- Substantially increase agriculture production in selected pilot areas through improved water management, i.e., by delivering water in response to crop water requirements to the maximum extent possible, and to integrate into this program the necessary agricultural support services and non-water inputs;

- Develop water management techniques and programs replicable over a wide range of agro-climatic zones and land and water environments for subsequent application in other parts of the country;

- Reduce inequities in actual water deliveries in the tail reaches as compared to the head reach of canals at all levels through both revised scheduling and improved conveying efficiencies; and

- Build within the provincial agencies a continuing capability for planning, implementing, and operating integrated programs for irrigated agriculture.

SUMMARY

2. Purpose of the Evaluation and Methodology Used: This final evaluation of USAID's CWM component, conducted during November/December 1992, was to assess the impact of the project in achieving the stated objectives and inform the GOP, USAID, World Bank and other donors about the value of similar irrigation interventions elsewhere. The evaluation was undertaken by a six-person team that reviewed project documentation, visited sub-project sites, and interviewed all available concerned persons in Pakistan.

3. Findings and Conclusions In assessing the impact of the CWM Project in achieving its objectives, the evaluation team concentrated on accomplishments in three areas: irrigation civil works, agriculture production and water management, and institutional development.

Civil Works: Of these three components evaluated, civil works received the most emphasis and achieved the best results. As a result of canal lining, seepage losses were reduced. In addition, the quality of construction was adequate at all sites, the remodelling improved water deliveries to tail-end farms, and the remodelled outlet design was generally good, resisting tampering and facilitating head measurement on the outlet.

In all, according to the evaluation team's estimates, project activities may have produced significant increases in crop production for individual farmers in the sub-project areas over the life of the project, although any increases in aggregate production were not attributable solely to project activities. Of the activities producing improvements on individual farms, the evaluation team judged two civil works efforts to have been most beneficial -- watercourse improvements and canal lining and rehabilitation. Nevertheless, civil works activities had little success in reducing fluctuations in canal flows or ensuring equity in water deliveries. These problems are generally not the result of shortcomings in physical infrastructure, but often result from theft and, more importantly, poor management, which is to blame for a significant share of the water losses from Pakistan's irrigation system.

Agricultural Development and Water Management: Agriculture development and water management activities produced some results. Among the successes, precision land levelling increased water application efficiency and permitted a limited number of the large farms to cultivate an average of 10 to 15 percent more land, the increase coming from land that has been wasted in the corners of unleveled fields. The project also may have succeeded in helping some farmers achieve higher net incomes by adopting drought and salt resistant crops, improving sowing methods, planting high-yielding crop varieties, applying fertilizer more effectively, and adopting recommended packages of crop technology. These innovations may be replicable on a wider scale in the future with appropriate GOP support.

Other activities met with less success. Data from demonstration plots were collected haphazardly and were never subjected to rigorous analysis, limiting demonstration plots' effectiveness. Also, many of the demonstration sites chosen were areas with unusually good access to water and other resources. As a result, the improvements achieved at these sites may not be widely replicated. Attempts at improving irrigation scheduling also proved disappointing, as the calendars established by the technical assistance team were not followed after the team's departure in 1991.

Institutional Development: During project implementation, institutional development received much less attention than civil works improvements, and suffered as a result. Institutional development activities were hindered by a lack of clear direction. Line agencies, the technical assistance team, and donors never had a clear and unified understanding of the project's specific objectives in institutional building. Both these deficiencies were primarily the fault of project design, which failed to specify what indicators should have been used in monitoring progress in this area.

One of the few institution-building goals that was specified -- expanding the role of the water users association (WUA) -- proved ill-considered. Underlying this goal was the assumption that members of WUA's could be encouraged to participate in joint purchasing and other collaborative activities. However, it became clear that members of the WUA's had too few common interests to sustain such increased joint action.

The Subproject Management Office (SMO) was not found to be an effective model of decentralized management. This is so because: 1) the SMO'S did not have full administrative control over provincial staff from the line agencies; 2) they had only limited controls over the allocation and disbursement of project funds; and, 3) the SMO's should have been structured so that a subproject manager within his own authority could use the operating staff of the canal and the staff for watercourse improvement and agriculture extension as he saw fit to realize integrated management of water and non-water inputs in the subproject area. For this model to have worked, there should have been a radical reorientation away from compartmentalized line agency thinking, with extensive training in a more holistic and multi-disciplinary approach to the development of irrigated agriculture. Since this was not done, the SMO model promoted neither strong line agencies nor strong autonomous irrigation authorities. It had none of the benefits of either institutional arrangement and all of the weaknesses of an organization halfway between the two competing models. In the evaluators' opinion, therefore, it was not possible to have effective decentralized management at the field level without devolving the necessary authority to the unit manager for administrative and programmatic controls over the line agency units operating at that level.

4. <u>Principal Recommendations</u> The report contains numerous recommendations for consideration in any future irrigation and irrigation-related activities. The more important center on the following areas:

Civil Works

- Civil works should not be used in future projects as an incentive or catalyst for accomplishing other more difficult project activities. Civil and non-civil works must proceed in tandem to maximize returns from donor investments in irrigated agriculture.

- Future efforts should emphasize: preventing tampering with canal outlets; encouraging the construction and use of tubewells to augment canal deliveries; and, giving greater emphasis to other water development activities to be undertaken in conjunction with efforts to improve civil works.

Agricultural Development and Water Management

- Design of any irrigated agriculture project on the public canal system in Pakistan must take into account the fact that the system is water scarce by design. In the absence of conjunctive use of tubewell water on a wide scale, cropping patterns in the irrigation perimeters of Pakistan must be tailored to the available water supply.

- Future activities should be more appropriate to prevailing farming systems, should place greater emphasis on low-cost extension programs, and should promote greater use of high-yielding crop varieties.

- Any project with the explicit goal of increasing agricultural production and farmer income must delineate a formal and well-defined role for the provincial agricultural extension department. If provincial agricultural extension staff are involved from the start of a project, there will be better prospects for developing realistic low-cost extension models and ensuring continuity in transferring these models after the project ends.

Institutional Development

- Any future CWM-type project should operate through decentralized management under an autonomous authority headed by one manager at the command level of a canal. Operating staff of the irrigation department, OFWM teams, and extension agents must be placed under the administrative control of this authority. Project financial resources must flow to and be allocated by this authority.

- Any project with institutional development objectives must identify specific institutional goals and objectives at the design stage and then develop objectively verifiable indicators to measure progress towards their attainment.

- Designers of projects need to keep in mind that it is best for farmers to organize themselves, according to their own perceived needs and interests, not an externally-imposed agenda or model.

SUMMARY (continued)

5. Lessons Learned: In addition to the findings and recommendations related to the three major areas of activity, the evaluators reported that, with the advantage of hindsight, it was apparent that the ultimated direction and outcome of the project were, in large measure, determined by decisions made in the design process.

- The concept of two-stage development, in which civil works must be essentially complete before other important agricultural or institutional activities are started, should be categorically rejected in future CWM-type project.

- Where attainment of a project goal and purpose are to be the responsibility of provincial line agencies, a specific operational process, which has clear objectives and targets, must be agreed upon, put in place, and strengthened through appropriate institutional building activities.

- Project design must not so rigidly specify institutional models and approaches that flexibility during project implementation is precluded and there are no opportunities to use project resources to develop innovative approaches not envisioned during the design period.

- It should not be assumed that monitoring and evaluation functions will be fulfilled simply by designating staff. Any future project must provide necessary equipment, training, and on-the-job supervision in developing objectively verifiable project indicators, designing data-gathering exercises, and putting in place appropriate systems for prompt data analyses, report production, and information transfers.

ATTACHMENTS

K. ATTACHMENTS (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier)

Final Evaluation of the Command Water Management Project

MISSION COMMENTS ON FULL REPORT

L. COMMENTS BY MISSION, AID/W OFFICE AND BORROWER/GRANTEE

Comments by Mission

The evaluation team was comprised of members with extensive experience in agriculture, irrigation engineering and institutional development. The team closely followed the assigned scope of work for this evaluation and assessed progress achieved towards the stated project objectives over the life of the project. The team has made some very useful recommendations that will be of great value to the GOP as well as other donors interested in undertaking similar projects.

The Mission concurs with the team's major conclusion that the two stage approach towards development, i.e., completing civil works before starting the institutional development activities, was an impediment to achieving project purpose. Both civil works and institutional development should proceed in tandem in order to complement each other and maximize impact. Furthermore, specific indicators for monitoring the progress of non-civil work activities had not been developed at the start of the project. This was recognized by the Mission and conveyed to the TA team. However, before this issue could be extensively addressed, the TA team was evacuated from Pakistan during the Gulf War and immediately thereafter early termination of the TA was forced due to the cuts imposed by the Pressler Amendment.

There is a genuine interest amongst senior line agency personnel in the CWM project concept and related efforts and favor a continuation of similar project activities in their provinces. This evaluation report will provide them with valuable guidance in the planning and implementation of these activities in the future. In addition, the evaluation also contains a number of other recommendations and lessons learned concerning design of institutional strengthening activities that are applicable to other sectors.

Comments by Joint Secretary (Water)/Federal Coordinator, CWMP

Since past efforts to increase agricultural production in Pakistan have not produced the intended results, a conceptual change in the application of future efforts towards the irrigation and drainage sector is warranted. Since Pakistan's main agricultural produce comes from 43 production (canal) systems functioning in the Indus Basin, integrated efforts should be applied to one complete canal system instead of undertaking activities scattered over large diversifed areas.

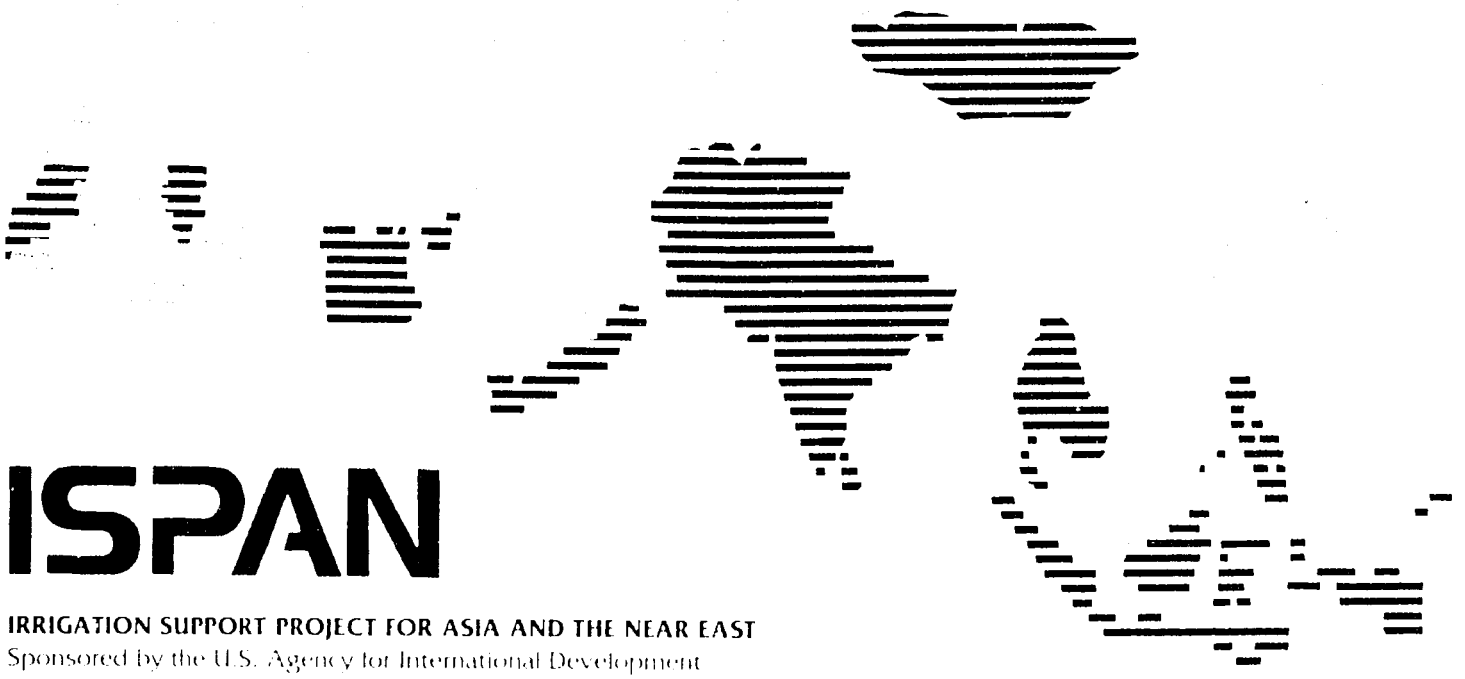
Project No. 391-0467

PAKISTAN COMMAND WATER MANAGEMENT PROJECT

FINAL EVALUATION

March 1993

ISPAN Report No. 52



ISPAN

IRRIGATION SUPPORT PROJECT FOR ASIA AND THE NEAR EAST

Sponsored by the U.S. Agency for International Development

ISPAN

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PAKISTAN COMMAND WATER MANAGEMENT PROJECT

FINAL EVALUATION

John H. Eriksen
Muhammad Akhtar Bhatti
Gilbert Corey
S.A. Husaini Jagirdar
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March 1993

Prepared for the USAID Mission to Pakistan
by the Irrigation Support Project for Asia and the Near East
under ISPAN Activity No. 740E

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ANNEXES

TABLES

PREFACE

This final evaluation of the Command Water Management Project [CWM] was carried out by a team brought together under the auspices of the USAID-funded Irrigation Support Project for Asia and the Near East [ISPAN]. The participants in the evaluation team were:

- John H. Eriksen, Team Leader and Agricultural Economist.
- S.A. Husaini Jagirdar, Agricultural Economist.
- Gilbert Corey, Irrigation Engineer.
- Muhammad Akhtar Bhatti, Irrigation Engineer.
- Allen Jones, Institutional Development Specialist.
- Jamshed Tirmizi. Sociologist.

The information contained in this report was assembled during the evaluation team's work in Pakistan from 30 October through 4 December 1992. During this period, team members visited each of the seven CWM sub-project sites (see Annex A for site reports) and interviewed officials in each of the four provincial governments implementing the CWM Project. The team also held discussions in Islamabad and elsewhere with representatives of the United States Agency for International Development Mission, the World Bank Resident Mission, and other international agencies (see Annex C for the list of persons contacted and team schedule).

During the evaluation, many discussions were held with farmers, project staff, government officials at several levels, and representatives from the private sector and international agencies. The many respondents who spoke with team members were most helpful, open, and frank. We are most appreciative of their kind assistance to team members.

LIST OF ACRONYMS AND TERMS USED IN THIS REPORT

ACE	Associated Consulting Engineers (Pvt.) Limited
ACOP	Alluvial Channels Observation Project
ADA	Agricultural Development Authority
ADBP	Agricultural Development Bank of Pakistan
AF	Acre feet
APM	Adjustable Proportional Module
ARD	Associates in Rural Development
CADA	Command Area Development Authority
CCA	Cultivable command area
chak	Lowest order command area covering approximately 400 acres and 35 farm units
cusecs	Cubic feet per second
CIMMYT	International Center for Maize and Wheat (*Centro Internacional de Mejoramiento de Maiz y Trigo*)
CWM	Command Water Management Project
EDC	Enterprise and Development Consulting (Pvt.) Limited
EOPS	End of Project Status
FCC	Federal Government Coordinating Cell
FY	Fiscal Year [U.S. Government: 1 October to 30 September]
GCA	Gross command area
GOP	Government of Pakistan
IDA	International Development Association of the World Bank
IDS	Institute of Development Studies
IIMI	International Irrigation Management Institute
IRRI	International Rice Research Institute
ISM	Irrigation Systems Management Project

ISR	Irrigation Systems Rehabilitation Project
markaz	Smallest extension services unit
mogha	Outlet from a minor or distributary canal
MWP	Ministry of Water and Power
NESPAK/NDC	National Engineering Services [Pakistan] Limited/National Development Consultants, a joint venture
NGO	Nongovernmental organization
NWFP	North West Frontier Province
O&M	Operations and maintenance
OFWM	On-Farm Water Management Project
PACD	Project Activity Completion Date
PAD	Provincial Agriculture Department
patwari	Government employee charged with making crop measurements and preparing yield assessment statements
PC-1	Pro Forma Commitment 1 Document
P&D	Planning and Development Department
PERI	Punjab Economic Research Institute
PID	Provincial Irrigation Department
PIL	Project Implementation Letter
PPC	Provincial Policy Committee
SAR	World Bank Staff Appraisal Report
SASO	Sindh Agricultural Supplies Organization
SCARP	Salinity Control and Reclamation Project
SE	Superintending Engineer
SMO	Sub-Project Management Office
SOW	Scope of Work
SPCC	Sub-Project Coordination Committee
SRPO	Sindh Regional Planning Organization
TAT	Technical Assistance Teams

tehsil	Small administrative unit at the sub-district level
TOR	Terms of Reference
T&V	Training and Visit Extension Program
UAF	University of Agriculture at Faisalabad
UNDP	United Nations Development Program
USAID	United States Agency for International Development Mission in Pakistan
WAPDA	Water and Power Development Authority
warabandi	Systematic rotational schedule for water deliveries to farmers served by a single watercourse
WUA	Water Users Association
WUADS	Water Users Association Development Specialist
XEN	Executive Engineer

EXECUTIVE SUMMARY

The Purpose of the Command Water Management Project

According to the Project Grant Agreement of March 26, 1985, "The goal of the Irrigation Systems Management (ISM) Project, of which the Command Water Management (CWM) is a part, is to increase agricultural production and farmer income by improving the management of irrigation water resources. The CWM component will contribute to this goal by introducing a new approach to irrigated agriculture which will optimize the use of water resources for agricultural purposes."

Specifically, the ISM Project was to improve institutions' capabilities in irrigation system planning, design, research, operations, and maintenance; to carry out physical improvements to the system; and to bring about policy changes needed for proper irrigation water management. The CWM component was to help achieve these goals by strengthening the management of existing institutions, infrastructure, and services to remove constraints to increased irrigated agricultural production in selected sub-project areas.

Methods Used by the Evaluation Team

In assessing the impact of the CWM Project in achieving these objectives, the evaluation team concentrated on accomplishments in three areas: irrigation civil works, agricultural production and water management, and institutional development. In making its assessments, the team conducted a thorough review of project documents, reviewed field data from the seven sub-project areas, and visited each sub-project and each seat of provincial government. In these visits, staff from the evaluation team interviewed government officials, farmers, members of water users' associations, and representatives of international agencies, such as USAID, the World Bank, and the International Irrigation Management Institute.

Evaluation Findings and Conclusions

Civil Works

Of the three project components evaluated—irrigation civil works, agricultural development and water management, and institutional development—civil works received the most emphasis and achieved the best results. As a result of canal lining, seepage losses were reduced. In addition, the quality of construction was adequate at all sites, the remodeling improved water deliveries to tail-end farms, and the remodeled outlet design was generally good, resisting tampering and facilitating head measurement on the outlet.

In all, according to the evaluation team's estimates, project activities may have produced significant increases in crop production for individual farmers in the sub-project areas over the life of the project, although any increases in aggregate production were not attributable solely to

project activities. Of the activities producing improvements on individual farms, the evaluation team judged two civil works efforts to have been most beneficial—watercourse improvements and canal lining and rehabilitation.

Nevertheless, civil works activities had little success in reducing fluctuations in canal flows or ensuring equity in water deliveries. These problems are generally not the result of shortcomings in physical infrastructure. Instead, these problems often result from theft and, more importantly, poor management, which is to blame for a significant share of the water losses from Pakistan's irrigation systems.

After observing the impact of civil works activities, the evaluation team recommends that future efforts emphasize:

- preventing tampering with canal outlets;
- encouraging the construction and use of tubewells to augment canal deliveries; and
- giving greater emphasis to other water development activities, to be undertaken in conjunction with efforts to improve civil works.

Agricultural Development and Water Management

Agricultural development and water management activities produced some results. Among the successes, precision land leveling increased water-application efficiency and permitted a limited number of the large farms to cultivate an average of 10 to 15 percent more land, the increase coming from land that been wasted in the corners of unleveled fields. The project also may have succeeded in helping some farmers achieve higher net incomes by adopting drought- and salt-resistant crops, improving sowing methods, planting high-yielding crop varieties, applying fertilizer more effectively, and adopting recommended packages of crop technology. These innovations may be replicable on a wider scale in the future with appropriate GOP support.

Other activities met with less success. Data from demonstration plots were collected haphazardly and were never subjected to rigorous analysis, limiting demonstration plots' effectiveness. Also, many of the demonstration sites chosen were areas with unusually good access to water and other resources. As a result, the improvements achieved at these sites may not be widely replicated.

Attempts at improving irrigation scheduling also proved disappointing, as the calendars established by the technical assistance team were not followed after the team's departure in 1991.

The evaluation team recommends that future activities in agricultural development and water management should be more appropriate to prevailing farming systems, should place greater emphasis on low-cost extension programs, and should promote greater use of high-yielding crop varieties.

Institutional Development

During project implementation, institutional development received much less attention than civil works improvements, and suffered as a result. Institutional development activities were hindered by a lack of clear direction. Line agencies, the technical assistance team, and donors never had a clear and unified understanding of the project's specific objectives in institution building. Both these deficiencies were primarily the fault of the project's design, which failed to specify what indicators should have been used in monitoring progress in this area.

One of the few institution-building goals that was specified—expanding the role of the water users' associations (WUA)—proved ill-considered. Underlying this goal was the assumption that members of WUAs could be encouraged to participate in joint purchasing and other collaborative activities. However, it became clear that members of the WUAs had too few common interests to sustain such increased joint action.

The Sub-Project Management Office (SMO) was not found to be an effective model of decentralized management. This is so because, first, the SMOs did not have full administrative control over provincial staff from the line agencies (PID, OFWM, and PAD). Second, they had only limited controls over the allocation and disbursement of project funds. And, third, the SMOs should have been structured so that a sub-project manager within his own authority could use the operating staff of the canal and the staff for watercourse improvement and agricultural extension as he saw fit to realize integrated management of water and non-water inputs in the sub-project area.

For this model to have worked, there should have been a radical reorientation away from compartmentalized line agency thinking, with extensive training in a more holistic and multi-disciplinary approach to the development of irrigated agriculture. Since this was not done, the SMO model promoted neither strong line agencies nor strong autonomous irrigation authorities. It had none of the benefits of either institutional arrangement and all of the weaknesses of an organization halfway between the two competing models. In the evaluators' opinion, therefore, it was not possible to have effective decentralized management at the field level without devolving the necessary authority to the unit manager for administrative and programmatic controls over the line agency units operating at that level.

The recommendation was made, therefore, that any future CWM-type project operate through decentralized management under an autonomous authority headed by one manager at the command level of a canal. Operating staff of the irrigation department, OFWM teams, and extension agents must be placed under the administrative control of this authority. Project financial resources must flow to and be allocated by this authority. The operational objectives of all the component units of the authority must be delineated at the outset. The manager, his staff, and those of the operational units must be reoriented and trained to meet the objectives and the entire process closely monitored.

Given the problems with these activities, the evaluation team strongly recommends that similar projects in the future should more clearly specify the goals and processes of institution building.

Chapter 1

INTRODUCTION

1.1 Project Goal and Purpose

According to the Project Grant Agreement of 26 March 1985, "The goal of the Irrigation Systems Management (ISM) Project, of which the Command Water Management (CWM) component is a part, is to increase agricultural production and farmer income by improving the management of irrigation water resources. The CWM component will contribute to this goal by introducing a new approach to irrigated agriculture which will optimize the use of water resources for agricultural purposes."

The agreement states: "The purpose of the ISM Project is to increase the capabilities of institutions involved in irrigation system planning, design, research, operations and maintenance; to carry out physical improvements to the system; and, to bring about policy changes needed for proper irrigation water management. The CWM component will help achieve this purpose by strengthening the management of existing institutions, infrastructure, agricultural inputs, and services in an integrated and collaborative manner in order to remove the major constraints to increased irrigated agricultural production in selected sub-project areas."

1.2 Project Description

The CWM Project was a development activity jointly designed, financed, and implemented by the Government of Pakistan (GOP); the World Bank, through the International Development Association (IDA); and the U.S. Agency for International Development (USAID). In this endeavor, specific activities were financed by USAID under the CWM component of the ISM Project. These activities centered on rehabilitation work, institutional improvement, and research under the parent ISM Project.

These three project components were to have laid the foundation for the improved delivery of water through the canal system. Efficient operation and maintenance of the irrigation system was seen as essential in improving the productivity of land and water resources in Pakistan. CWM was to provide the basis for relevant agencies to cooperate with water users in better matching available irrigation water and cropping patterns, and in providing necessary materials and services to increase agricultural productivity.

The specific objectives of the CWM component were to:

- Substantially increase agricultural production in selected pilot areas through improved water management—i.e., by delivering water in response to crop water requirements to the maximum extent possible—and to integrate into this program the necessary agricultural support services and non-water inputs;

- Develop water management techniques and programs replicable over a wide range of agro-climatic zones and land and water environments for subsequent application in other parts of the country;
- Reduce inequities in actual water deliveries in the tail reach as compared to the head reach of canals at all levels—branches, distributaries, minors, and watercourses— through both revised scheduling and improved conveyance efficiencies; and
- Build within the provincial agencies a continuing capability for planning, implementing, and operating integrated programs for irrigated agriculture.

CWM was to introduce three new elements into the management of the irrigation system in Pakistan. They were:

- Increased farmer participation in the planning and management of the irrigation system;
- Coordinated institutional, physical, and operational improvements in specific sections of the command areas; and
- Creation of a single entity, the sub-project management office (SMO), to coordinate delivery of water and non-water inputs needed to increase agricultural production.

CWM's activities were to be carried out in seven sub-project areas in the four provinces of Pakistan. Over 700,000 people were estimated to live in the sub-project areas, which were selected for their range of agro-climatic and socio-cultural characteristics. Each sub-project area is served by a branch (secondary) or distributary (tertiary) irrigation canal, from which distributary and/or minor canals branch out to serve public watercourses.

Under the program, the World Bank financed the rehabilitation and remodeling of the canals that serve the seven sub-project (command) areas, as well as improvements to surface and sub-surface drainage in each area. USAID financed rehabilitation of watercourses and other downstream physical improvements and provided technical assistance and training to examine the feasibility and replicability of CWM's approach to improve management of water and non-water inputs.

Table 1 below presents the status of project funding as of November 1, 1992.

Table 1
Status of Project Funding as of November 1, 1992
(in U.S. Dollars)

Funding Category	Funds Earmarked	Funds Committed	Funds Disbursed	Unexpended Earmark
Technical Assistance	8,802,310	8,626,188	8,511,973	290,337
Training	2,867,917	2,867,917	2,867,918	N/A
Commodities	1,178,447	1,178,089	1,123,742	54,705
Other Costs	12,292,281	12,291,178	10,284,208	2,008,073
Evaluation	375,641	361,918	134,921	240,720
Total	25,516,596	25,325,290	22,922,762	2,593,834

Chapter 2

AN ASSESSMENT OF INSTITUTIONAL DEVELOPMENT ACTIVITIES

2.1 Government Line Agencies

The CWM Project has been implemented principally through two line agencies in each of the four provinces—the Provincial Irrigation Departments (PIDs) and the Provincial Agriculture Departments (PADs). In the Punjab and Sindh provinces, the project was led by staff from the PADs. In the North West Frontier (NWFP) and Balochistan provinces, the project was led by the PIDs.

2.1.1 Dialogue Among Line Agencies

In all four provinces, the additional secretaries of the Planning and Development Departments (P&Ds) were designated as chairmen of Provincial Policy Committees (PPCs), which included the secretaries of the PID, PAD, and Finance Departments. These committees were expected to meet at least quarterly to review progress and resolve any implementation issues. They were to approve annual work plans for the sub-project(s) within their respective provinces. They were also to provide a forum for dialogue between provincial line agencies. Finally, the PPCs were to formulate policies to help realize the goals of the CWM Project.

The PPCs met with some regularity in all of provinces except NWFP, where no meetings were held. The committees made only a limited contribution in furthering the project's success. While they did bring together staff of the provincial line agencies to increase awareness and understanding of their respective roles in the CWM Project, they did not bring about any significant changes in provincial government policies, nor did they establish any new institutional arrangements.

In fairness, the PPCs may have been hampered by unrealistic expectations. For instance, PAD field staff hoped the dialogue between the PID and PAD in each province would produce changes enabling the PIDs to deliver water to match crop requirements. However, this could not be done because the Indus River canal system is water-scarce by design and cannot function as an on-demand irrigation system.

This dialogue also had mixed results in prompting restructuring of provincial line agencies and the emergence of new institutions better able to cope with the challenges of irrigated agriculture. Punjab, Sindh, and Balochistan provinces made little or no progress in this direction. In NWFP, however, serious thought is being given to creating new command-area development authorities to assume the irrigation functions of the provincial line agencies. These new area-based organizations would be charged with managing irrigation canals and increasing agricultural production. This evolution in thinking is not wholly attributable to the CWM Project, however.

It also reflects discussions at the national level in the Water and Power Development Authority (WAPDA), the Federal Chief Engineering Advisor's Office, and at the World Bank.

2.1.2 PADs and Increasing Agricultural Production

The PADs did not give any policy direction to their departmental staff on meeting the agricultural production objectives set out under the CWM Project, except in the On-Farm Water Management (OFWM) divisions.

In all provinces, OFWM field teams from the PADs were detailed to carry out improvements on all watercourses along canals that were to be rehabilitated and/or lined in each sub-project area. These teams worked hard to meet their construction targets but were less concerned with increasing agriculture production.

Since agricultural research and extension staffs were not formally involved with the CWM Project, they played no formal role in furthering the project's objectives. Similarly, the PADs made no policy to encourage public or private suppliers to coordinate sales operations in the sub-project areas, except in Sindh where the Sindh Agriculture Supply Organization, a public agency, was asked to set up outlets more accessible to local farmers.

Some efforts were made at the Sub-Project Management Office (SMO) level to involve public and private suppliers by inviting them to attend Sub-Project Coordination Committee (SPCC) meetings. It does not appear that, as a result of these meetings, private suppliers adjusted their sales operations to better serve the needs of area farmers.

2.1.3 PIDs and Equity Concerns

Under the CWM Project, the PIDs rehabilitated and lined the canals and remodeled the outlets. While remodeling the outlets, the PIDs were confronted with issues of user equity, as certain outlets were drawing more than their sanctioned discharges. In Sindh and NWFP, the outlets were not reduced to their sanctioned discharge levels due to the effective opposition of water users.

In the Sindh, PID staff remodeled outlets to the existing discharges. In NWFP, remodeling was postponed until a special judicial commission appointed for the purpose could render a verdict in the conflict. In both instances, discussions between PID staff and the project's supervisory engineering consultants increased the awareness of fairness issues in canal policy.

In the Punjab, PID awareness of the equity issue has also been enhanced. The creation of a separate circle within the PID for civil works construction enabled remodeling of outlets with limited interference. This would not have been possible had the remodeling been done by PID operations' staff, who would have been reluctant to ignore the demands of local farmers in the four Punjab sub-projects.

As a consequence of the remodeling of outlets — possibly more than canal lining — the operation of canals has improved. Systems require less water to keep the tail reaches adequately supplied. The superintending engineer in charge of the Hakra canal system, on which the 6R-Hakra sub-project is located, was quick to recognize this advantage. He started a vigorous campaign to rectify irregularities on outlets in neighboring, unimproved systems to achieve similar results. This also helped improve equity.

PIDs constantly monitor flow gauges in the tail reaches. However, measuring for inequities between outlets is not of interest to the PIDs. In instances where there was a need to keep offtake flows as close as possible to sanctioned discharges, PID staff attempted to reduce the size of outlets drawing excess supplies in order to ensure adequate supplies to the tail reaches. This indirectly contributed to improving equity between watercourses.

2.1.4 Commitment to a Future CWM-type Project

Senior line agency personnel of the PIDs, PADs, and SMOs invariably favor a continuation of CWM-type project activities in their provinces. In some quarters, there is genuine interest in the CWM Project concept and related efforts to increase farmers' participation in decision-making and to coordinate line agencies and private-sector activities. However, others support a future project mostly out of enthusiasm for the civil works activities and resources that a second-phase CWM Project would generate. This is especially true for the OFWM staff because, unlike the PID staff, they will not be responsible for operating and maintaining any civil works infrastructure after construction is completed and watercourse improvement activities are discontinued.

The CWM Project sought to reach its objectives for irrigated agriculture by using provincial line agencies without providing them with any resources for institution building at the operational levels. The OFWM staff met their targets by carrying out improvements on watercourses according to their standard blueprint approach. Afterward they were deployed to other jobs outside the sub-project areas. They were given no responsibilities for follow-up activities such as in field-level water management or organization of watercourse maintenance. Similarly, the CWM Project design did not provide any directions for improving PID procedures and staff orientations in interacting with area farmers. More creative interactions could have included, for example, working on water sanctions, charge assessments, and the *warabandi* systems.

The CWM Project, with its emphasis on pilot activities, emphasized process and the potential for institution building. However, the CWM Project design, implementation, and monitoring system did not make any provision for identifying and acting upon novel opportunities in the sub-project. Opportunities were lost, for example, in developing organizational alternatives to the water users association (WUA), in promoting conjunctive use of groundwater and canal water in new farming enterprises, and in testing conveyance and water management technologies below the outlets. The Punjab SMO, to its credit, did experiment to some extent with new types of farmers' organizations, but without considering the potential replicability of these efforts.

Finally, during project implementation, there was no clear consensus among the line agencies, the technical assistance team, and the donors as to what the institution building goals and processes of the project were to be. Much of this deficiency can be attributed to a lack of specifics in the CWM Project design on which institutional indicators to use in monitoring progress. This resulted in institutional development activities that were irrelevant to or contradicted stated project objectives.

2.2 Sub-Project Management Offices

The CWM Project created the SMOs as special management units. These units drew staff from the provincial line agencies in an effort to better coordinate and implement project activities and to monitor and evaluate CWM activities in the field.

In NWFP, the SMO was headed by an officer from the PID, who served as sub-project manager, while continuing to hold his position as superintending engineer for the Peshawar irrigation circle within the PID. The Peshawar circle includes the Warsak Lift Canal sub-project. The Punjab SMO was headed by a sub-project manager from the OFWM, with two liaison officers to handle the four sub-projects. In Sindh, the sub-project manager was from the PAD. And, in Balochistan, the sub-project manager was the PID executive engineer for the Lasbela canal.

2.2.1 Planning, Monitoring, and Evaluation

The SMOs were staffed by one officer each for water management, agronomy, monitoring and evaluation, and support personnel such as field assistants, a computer programmer, and clerical staff. With this staff, the SMOs were to fulfil management functions in planning, financial accounting, monitoring, and evaluation of outputs and impacts.

The SMOs were able to fulfill these functions to varying degrees, but their effectiveness was constrained by high staff turnover and limited staff skills. The planning function of the SMOs was oriented toward developing an annual work plan. For civil works, the SMO received work schedules each year from the PID and OFWM. Since the overall program targets for construction on canals and watercourses were known from the outset, annual plan targets were established commensurate with the capacity of each agency to undertake a certain portion of the total work during the next 12 months.

By contrast, no provincial line agency had formal responsibility for carrying out the non-civil works component of the project. The SMOs, therefore, gradually became responsible for planning and implementing these activities, along with the technical assistance team and water user development specialists (WUADS) hired by USAID. Incorporation of the non-civil works into the annual work plans consisted mostly of reporting on-going activities to help secure additional funding for the coming year.

Once the work plans were consolidated at the SMOs, they were forwarded through the PPCs to the Federal Government Coordination Cell (FCC) for final review and approval. Quarterly

disbursements were then made to the provincial line agencies and the SMOs on the basis of the approved work plans.

Monitoring of sub-project construction activities for canals and watercourses was carried out by two groups of supervisory engineering consultants: the National Engineering Services (Pakistan) Limited/National Development Consultants (NESPAK/NDC), a joint venture organization hired by the World Bank and the GOP to oversee canal civil works; and the Associated Consulting Engineers (Pvt.) Limited (ACE), hired by USAID to oversee watercourse improvements. These consultants were not always clear about whom they reported to, and some viewed the SMOs as the offices to which they were principally responsible.

The SMOs were responsible for informal monitoring of the work of the provincial line agencies through field inspections and feedback from farmers during SCC meetings. They, with the help of the technical assistance team, did develop some capacity to monitor the impact of construction activities and improvements in watercourses. This was done by measuring water conveyance efficiency. However, the SMOs never developed a comparable capacity to efficiently monitor and evaluate CWM's impact.

Input and output monitoring for the non-civil works activities was to have been done by the SMOs, in collaboration with the technical assistance team. But, for the most part, this monitoring and evaluation did not occur. Where monitoring did take place, however, the findings were not entered into any systematic management information system (MIS) within the SMOs themselves.

In retrospect, it was perhaps unreasonable of the CWM Project's designers to have expected the project to produce significant and measurable results from its institutional and agricultural production activities in so short a time. However, objectively verifiable progress indicators could and should have been formulated in the design phase for both components. Although some conventional indicators—such as changes in cropping intensity, cropping patterns, and crop yields per acre—were later suggested to measure increases in agricultural production, no such indicators were developed for the institutional development activities. Indicators should have been developed to quantify the project's institutional development objectives, its annual work plan targets, and implementation.

Some process documentation was prepared by the SMOs and the technical assistance team on the non-civil works activities. These efforts, however, were unsystematic and of varying quality. No external professional help was sought to comment on or assist with either the water management and agronomic trials or with the institutional development activities of the project.

A considerable amount of field data was generated by the SMOs from periodic field surveys, particularly in the Punjab. These data were collected in a largely unsystematic manner and most remain unprocessed and unevaluated. This is so because capacity in the SMOs for data collection, processing, and analysis was largely nonexistent, despite the good intentions of the project's designers and sporadic attempts at training SMO staff.

2.2.2 Agency Decentralization and Management

The organizational structure of SMOs developed during project design was not in keeping with the realities of the provincial line agencies' organizational culture and operations, especially at the field level. Consequently, SMO operations had little, if any, impact in changing the day-to-day operations of the line agencies. PIDs simply carried out the canal remodeling and lining activities as they would have on any other job. OFWM staff, for the most part, did the same with watercourse improvements.

Where the SMO was directed by a sub-project manager from the PAD, both the PID and OFWM staff reported directly to line officers with their own provincial agencies. Where the SMO was directed by a sub-project officer from the PID, there was somewhat more decentralization. In these cases, the PID staff would report to the sub-project manager. However, OFWM staff did not report to these managers and continued to be under the administrative control of their own divisions.

Even in SMOs led by a PID officer, the staffs were unable to either suggest or institute changes in their operations divisions to advance integrated management of irrigated agriculture. Also, some regular PID staff, such as the revenue personnel, were not involved with CWM Project activities. The same was true of SMOs headed by an officer from the PAD. These SMOs did not effectively involve provincial agricultural extension staff in the sub-project ares, nor did they effectively prompt OFWM teams to follow up with farmers on organizing watercourse maintenance or improving field-level water management.

The SMO, therefore, was not an effective model of decentralized management. This is so because, first, provincial staff from the line agencies (PID, OFWM, and Agriculture Extension) working in the sub-project areas were not required to report to the sub-project manager. As a result, such staff did not have primary loyalty to the SMO.

Second, the SMO structure did not permit the sub-project manager to use the operating staff of the canal, watercourse improvement, and agricultural extension in an integrated manner. This precluded a radical reorientation away from compartmentalized line agency thinking, through training in a more holistic and multidisciplinary approach to the development of irrigated agriculture.

As a result of these shortcomings, the SMO model tested under CWM Project must be judged as not feasible for institutional replication.

To expect that the cadres from the District Management Group would have been better accepted by the line agencies than the SMOs were is also unrealistic. Line agencies are unwilling to surrender the jurisdiction of their operating units in the field to any other authority, including the deputy commissioner. And, because their primary responsibilities are in law and order and district administration, deputy commissioners are not appropriate for development activities. In such roles, they might get project activities implemented more quickly, but this managerial style would often be contrary to the purpose of furthering development as a participatory process.

2.3 Water Users Associations

Under the CWM Project, a principal objective was to have farmers participate in the integrated management of irrigated agriculture. Together with the PID, PAD, and input suppliers, farmers, through coordinated project activities, were expected to help increase aggregate agricultural production.

Since all these other groups function as organizations, a project objective was to organize farmers as well. The hope was that, once organized, the farmers would be a resource for construction and maintenance of public works. The purpose also was to give farmers the institutional means of influencing organizations that control farmers' access to needed inputs, principally water.

2.3.1 CWM versus OFWM Approach

During CWM Project design, an accounting was made of previous efforts to organize farmers in irrigated agriculture on the public canal systems in Pakistan. The formal water users associations originated by the OFWM seemed to be a viable starting point. The formation of these WUAs was a legal requirement to initiate watercourse improvements, to insure collective liability to provide unpaid labor for construction, to incur individual liability for cost recovery, and to ensure post-construction maintenance.

Experience has shown that these conditions are generally met, with the exceptions of ensuring maintenance and cost recovery. Under the CWM Project, WUAs could be used to carry out maintenance, but should not be expected to have collective responsibility for individual members in the matter of cost recovery. This may be different under conditions where cost recovery is to be made in advance. Collective group pressures may well be exerted on individual members to pay up to get the watercourse improvements started.

A goal of the CWM Project was that farmers should be organized to benefit from advances in agricultural research and technology. The assumption was that, once organized, it would be easier for farmers to procure and use fertilizers, agro-chemicals, agricultural equipment, and credit.

However, these objectives were not fully realized. One reason was the insufficient training and monitoring of OFWM teams in pursuing these institutional objectives. Another, more important reason was that lining all the watercourses in the sub-project ares was such a large undertaking that OFWM field teams had insufficient time to address the institutional objectives.

In improving all watercourses and lining and rehabilitating all canals, the CWM Project may have served as a pilot test in improving water conveyance efficiencies and the entire canal command. However, the project did not succeed in organizing active WUAs, effective federations, or multipurpose farmers' organizations.

Such organizations would have strengthened the capacity of farmers to do things collectively that they could not accomplish individually. In retrospect, this concept was flawed because it assumed that farmers' interests—beyond water—were the same for all water users on a particular

watercourse. In fact, the evaluation team found no instances where all WUA members were participating in one or more collective activities. To the contrary, common interests emerge only in smaller and more cohesive groups of farmers and, in most cases, these interests are not common to an entire community of water users.

2.3.2 Farmer Interest Groups Emerging from CWM Project Inputs

Farmers perceive themselves sufficient as individuals to manage the irrigation water supplies delivered to their outlets in an orderly manner through *warabandi*, and to maintain their watercourse through collective maintenance. Mechanisms to redress any *warabandi* breeches are available to farmers as individuals under the Canal Act. Yet, there are many different categories of farmers in the irrigation community. They are defined by such factors as the size and tenure arrangements of their land holdings, social and economic status, ethnic and kinship identities, political affiliations, varying access to bureaucracy, and linkages with the national economy. The fact that they share the same watercourse does not mean that they will undertake joint activities, especially if those activities are liable to generate conflicts between different groups.

Farmers do recognize that, as individuals, it is difficult for them to secure access to expensive equipment, supplies from distant points, credit, and specialized education and training. Yet farmers have differing needs and resources. They would rather organize into specific interest groups with other farmers on their own initiative. A WUA is not always the appropriate organization for this because its members do not necessarily have the same needs beyond fulfilling a government legal requirement vis-a-vis construction of civil works. There is evidence in the CWM Project that narrower, specific interest groups did develop in response to resources provided, such as agricultural equipment and seed multiplication.

2.3.3 Participatory Approach

Under the project, it was expected that the technical assistance team, the SMO, and the WUADS would focus on developing certain approaches that could help communities of irrigators organize around a common water source to develop multipurpose organizations.

The project selected a number of WUAs on which to test the participatory approach. Of these, three were documented, one each in NWFP, Sindh, and Balochistan provinces. Each of these was visited by the team. The participatory approach was designed so that all farmers would be visited individually to explain to them the advantages of watercourse improvement. A meeting followed in which the steps necessary for the process were detailed. The formation of a series of subcommittees for various tasks, including quality control of the materials, was a distinctive feature of this approach. Process documentation by the technical assistance team exists in all provinces, except the Punjab, for selected watercourses.

The most significant outcome of the participatory approach in the view of the evaluation team was the insistence of farmers in two instances (NWFP and Balochistan) that pipe be put in certain reaches of their watercourses where they thought conventional lining was not adequate or

appropriate. This deviated from the OFWM's blueprint that requires lining of open watercourses. OFWM, as well as the supervisory consultants and USAID, was persuaded to accept these departures from normal procedures.

This approach, if institutionalized, should make the OFWM program more responsive to the specific needs and wishes of the farmers. The OFWM program must change its methods if water management is to go beyond watercourse lining to include more dynamic, comprehensive, and effective interventions.

The OFWM field teams need to develop into multidisciplinary teams with more flexibility in their procedural approaches to farmers. This will enable them to apply some of the advances made in research on water conveyance technologies, water distribution, and application methods to match particular topography and the spatial and social organization of particular outlet commands. For example, a new procedure could be splitting one channel into two continuously flowing channels in a situation where this is technically and physically possible and where there are two farmer groups that do not cooperate with each other.

The participatory approach on watercourses must also serve to explain the specific maintenance needs of the new interventions and develop the organizational mechanisms to meet them. Farmers need to be aware that the new technology and structures cannot be maintained on traditional lines of collective mobilization for desilting. For instance, it is not feasible for an entire community to mobilize to restore a displaced brick or repair a leaking field outlet. Financial resources, however, could be collected in advance and a local person could be appointed from among the farmers to handle such small maintenance problems.

Thus, the community of water users needs to be organized for the maintenance of new structures through the differentiation of functions or labor. In such a situation, organization moves to a new level. No longer are farmers just organized to act together in a common activity. Instead, through the differentiation of labor, they arrange for someone or something to act on their behalf.

2.3.4 WUADS

The CWM Project approach used social organizers, the WUADS, to serve as a catalyst for making the WUAs into viable multipurpose groups. USAID hired seven WUADS and assigned them to the seven sub-project areas. These men, along with the technical assistance team's farmer organization specialist, were the only resources the project allocated for institutional development at the farm level.

The posting of these specialists met with resistance from the government and the provincial line agencies and, as a consequence, their effectiveness varied and was short-lived. Yet, where these specialists were able to work, they were appreciated by farmers, the SMO, and line agency staff. They also had some success in the organizing process on watercourses improved through the participatory approach.

It is not clear, after the limited involvement of the USAID WUADS in the project, whether or not other WUADS might be appropriately institutionalized in a provincial line agency in the post-

project era. Considering the salary level of the USAID WUADS, which was a major motivating element in their performance, it is difficult to envision their finding permanent places in a government-funded, SMO-type organization, let alone in a provincial line agency.

However, the WUADS' experience has generated some interest among SMO and OFWM staff in finding ways to incorporate a WUADS-type function within their organizational structures. Given the complexity of their tasks and the skill levels they would need to have, it is unlikely that they could work below the officer cadre. Yet, in institution-building terms, the dilemma is that, with their absorption into a government bureaucracy, they would almost certainly lose their motivation to serve as effective catalysts.

2.3.5 Status of Federations

According to USAID officials, "the purpose of organizing water users in the form of WUAs, federations of WUAs, and a council of all federations at the command level was to have a greater participation of farmers in the supply, distribution, and scheduling of water, so that irrigation water could be applied according to crop needs in the right quantity." (Emmert/Eriksen personal communication, 9 December 1992).

This statement suggests that the rationale behind organization of WUA federations was technically deficient. Specifically, project designers apparently never realized that the Indus River irrigation network is a water-scarce system in which cropping patterns must be tailored to the existing water supply, in the absence of extensive use of tubewells. Scheduling of irrigation water to meet the requirements of whatever crops the farmers chose to grow was in fact never technically feasible, with or without WUA federations.

Following the plans of the CWM Project design, the technical assistance team, the SMOs, and the WUADS made attempts in sub-projects to form WUA federations. However, the evaluation team found no evidence that local technicians in the SMOs or the provincial line agencies ever envisioned WUA federations serving the purpose cited by USAID officials in the quote above.

A formal federation was organized at the tail of the Shahkot sub-project area comprising 10 villages and approximately 20 watercourses. However, here and elsewhere in the Punjab, the clear intent of SMO officials in organizing WUA federations was primarily to install local pressure groups to lobby for water user rights. In the past, leading farmers from the area—individually and as a group—had informally approached PID officials about their water delivery problems. However, after being organized into a formal federation under SMO patronage, they appear to be emerging as a stronger collective pressure group influencing the PID. At least on occasions, such as the evaluation team's visit, CWM Project staff managed to ensure the presence of PID officials at federation meetings, where they had to sit and patiently listen to the animated complaints and pleas of farmers. Such federations and PIDs' responsiveness toward them may end after the support of the SMO is withdrawn.

In the Sindh sub-project, a notable landlord and religious leader, who owns land on three different watercourses, claims to be the chairman of a federation that includes a total of seven

watercourses. This appears to be an example of a powerful local leader formalizing his existing authority through an opportunity provided by a government project.

In the Warsak Lift Canal sub-project, a strong farmers' federation has emerged on its own. The farmers on 15 watercourses have organized, without formally calling themselves a federation. They have collectively resisted all attempts by the PID to remodel their outlets. They said this resistance was justified because a traditional source of water for their farms had been diverted elsewhere, entitling them to be compensated for this diversion with water supplied from the Warsak Lift canal.

The farmers, as water users, are collectively and independently contesting their water rights claim against the PID in front of a special judicial commission. In doing so, they have automatically formalized their federation.

Chapter 3

AN ASSESSMENT OF AGRICULTURAL AND WATER MANAGEMENT INTERVENTIONS

The ultimate impact of a project encompassing many interventions—canal rehabilitation, remodeling of outlets, improvement of watercourses, transfer of water management and crop production packages, and institutional development—should be measured using a set of objective, verifiable indicators. These indicators should include impact on the net income of farm households and return per unit of the irrigation water applied.

The CWM Project was expected to produce increases in both cropping intensity and agricultural production per acre. The following sections attempt to assess the impact of CWM's activities in these two areas. The main focus will be on non-water interventions. It should, however, be noted at the outset that, given the paucity of data available and time constraints imposed on the evaluation team, it was difficult to isolate the relative contributions of water and non-water inputs, or even to determine the combined contribution of different crop-related interventions to aggregate production.

3.1 Agricultural and Water Management Interventions Undertaken

Various non-civil works interventions were initiated at various stages of the CWM Project. Early in the project, the technical assistance team developed phased cropping models for testing and implementation. Most of the subsequent interventions implemented by this team were based on these models. After the premature departure of the technical assistance team as a result of Gulf War hostilities, however, most of the interventions were discontinued or scaled back. None of the sub-projects' work plans contained detailed plans for carrying out non-civil works activities.

In the Punjab, however, a few additional interventions were put in place. These included agricultural equipment pools, critical watercourses, Agriculture Forward Organizations, technology demonstration centers, and use of federations of WUAs as protest groups. These interventions were not part of the CWM Project's original design. Instead, they were initiated by the Punjab sub-project manager and OFWM staff, often using non-project funding. The evaluation team felt that, although these interventions might have had some merit, they were a clear departure from the original work plan. The team favored continuation and expansion of previous efforts.

The various crop and water-related interventions, direct and indirect, undertaken in the different sub-projects areas are described below.

3.1.1 Demonstration Plots

The CWM demonstration plots were on farmers' fields. The individual components of the demonstration plots were first tested in more controlled experiments by the technical assistance team, in association with SMO staff, based upon research institute findings and farmers' perceptions of their constraints.

The individual components selected for each type of demonstration were tailored to the individual farmer's financial resources, since in most cases the project did not supply inputs for the demonstrations. The components in the various demonstrations included: improved tillage methods, improved high-yielding crop varieties, better seeds, different sowing methods, better crop cultural practices, balanced use of fertilizers, better timing of fertilizer application, new water application practices, and modifications in the farmer's overall cropping patterns.

These demonstration plots had four fundamental weaknesses in the opinion of the evaluation team. First, although complete technical packages were proposed, farmers with demonstration plots were free to adopt only those practices they could afford. Since some farmers only adopted portions of a technical package, the experimental integrity of the plots was lost. Second, a combination of poor plot identification, i.e., no signboards, and the package approach made it difficult for other farmers to identify the plots or determine the relative contribution of each package component to any yield increases. Third, demonstration plots' results were collected haphazardly, if at all. Results also were never subjected to rigorous financial and economic analysis, particularly after the departure of the technical assistance team. Finally, there were not enough plots set out with exactly the same designs for the same crops in the same seasons to allow for statistical validity in multivariate analyses of the plot results, even if these data had been properly collected and stored.

3.1.2 Precision Land Leveling

Precision land leveling services, using both laser levelers and more traditional methods, were extended to the farmers on a wide scale. It was reported that these services had greater efficiency in water application and permitted cultivation of 10 to 15 percent more land, previously wasted in corners. This intervention was most visible on large farms. Small farmers, who are dominant in all sub-project areas, were generally left out of the program and felt neglected. Nevertheless, this intervention is one of the few non-civil works CWM activities that was visible to farmers throughout the sub-project areas.

3.1.3 Demonstration Centers and Technology Demonstration Centers

These demonstrations, carried out by OFWM staff, were complete packages, where all suggested interventions were implemented on a single plot. These plots were generally four to eight acres in size and were part of the land holdings of large farms. On these plots, precision land leveling was carried out, followed by application of a complete package of recommended technologies.

The results were helpful in demonstrating what could be accomplished with greatly intensified use of crop inputs and access to technical expertise. Nevertheless, the efforts had almost no noticeable demonstration effect—except for the individual farmers on whose fields the centers were located—because for most other farmers, simultaneous adoption of all package components was not possible, given the resource and financial constraints they faced.

3.1.4 Cropping Patterns Adjusted to Water Availability

Based on water availability, especially in water-short watercourse reaches, crops such as barley, sunflowers, millet, forage sorghums, and *kalar grass* (a salt-tolerant forage) were introduced in local cropping systems. These crops have been adopted by a significant number of farmers, some of whom reported replacing crops with higher water requirements, such as wheat, with these alternatives. Farmers also said that income from these crops exceeded what they had been earning from traditional cropping patterns.

3.1.5 Small Basin Irrigation

Another demonstration involved partitioning fields into small basins to improve water application efficiency and promote higher seed germination. During the course of field visits, farmers said this recommendation had been widely accepted. However, actual adoption of this practice on a broad scale could not be verified.

3.1.6 Furrow Ridge and Furrow Bed Irrigation Methods

Furrow ridge and furrow bed irrigation methods for cotton were tested and introduced to farmers. These methods demonstrated substantial savings in labor and, possibly, water requirements. Significant increases in crop yields were also reported.

However, this intervention has not yet been adopted by the many farmers who lack access to tractor-mounted farm implements, either because the equipment is not available or is too expensive.

3.1.7 Introduction and Multiplication of High-Yielding Crop Varieties

Most farmers save and use their own seed or purchase seed from local seed merchants. Seed from these sources is said to be generally of poor quality, with varietal and weed admixtures and seed-borne diseases. Most farmers lack access to quality, improved seed.

In the early phase of the project, concerted efforts were made to replace existing impure seed stocks with pure, high-yielding varietal seed. Seed for improved varieties of wheat, cotton, sorghum, millet, vegetable, and forage were procured from research institutes, public seed corporations, and private seed agencies. These seeds were multiplied on farmers' fields under the supervision of the technical assistance team and other project staff.

Farmers were instructed on field roughing, to remove off-types, and proper harvesting and storage techniques, to maintain seed purity and quality. Some efforts were also devoted to establishing linkages between seed multiplication groups, the government's seed certification department, and private seed companies, such as Pioneer Seeds.

After the departure of the technical assistance team, most of these efforts were not continued in any planned way, except by the Hakra Seed Committee which has fewer than 20 members producing several types of seed on a maximum of 30 to 40 acres of land.

Nevertheless, it was evident that this intervention had created a new awareness among many farmers of the importance of using good quality seed and new high-yielding crop varieties. Demand for good quality seed is now substantial, and farmers are making their own efforts to get the required quantities if they are not available through commercial channels. Continuation and expansion of this activity, a low-cost intervention, on a wide scale would have produced sustainable and significant improvement in overall agricultural productivity in the sub-project areas.

3.1.8 Improved Sowing Methods

Farmers generally sow grains, oilseeds, pulses, and forage seed by broadcasting. The normal practice is to walk several times from one end of a field to the other while throwing the seed. This method leaves gaps as the broadcast seed is not always evenly spread. Cross-wise broadcasting, done while walking both the length and breadth of a field, was recommended by the technical assistance team to ensure even distribution of seed, and higher crop yields. Most farmers quickly understood the efficacy of this low-cost practice, and it has been widely adopted.

3.1.9 Appropriate Levels and Applications of Balanced Fertilizers

In all sub-project areas except Lasbela, fertilizers are commonly used in reasonable quantities. Realizing the need for more balanced use of fertilizer elements—particularly nitrogen and phosphorous—and better timing of applications in split doses, fertilizer trials were laid out. These trials demonstrated to farmers that adoption of these practices would result in increased crop yields and increased income.

In addition to the fertilizer trials, soil-testing services were arranged for farmers, especially in the full watercourse trial areas, to assess the precise fertilizer requirements of fields. These soil testing arrangements, unfortunately, seem to have ended with the departure of the technical assistance team. There may have been a significant effect on individual farmers' thinking about their fertilizer requirements as a result of this testing program. However, any overall impact in the sub-project areas on crop production and factor productivity is difficult to detect.

3.1.10 Agricultural Equipment Pools

In the Punjab, agricultural equipment pools were established in each sub-project area. The tractor-drawn or mounted tillage implements, provided by USAID, were intended for wide-scale farmer demonstrations; instead they were loaned to selected small groups of farmers for five years. Access to the equipment is now limited to members of the agricultural equipment pools on a rental basis. It is anticipated that, over a period of five years, each pool will be able to generate funds from membership and rental fees to procure its own equipment.

The most popular implement provided is the chisel plough, which is used to break hard pans within 18 inches of the soil surface. Farmers and the evaluation team believe that a sub-soiler, which penetrates up to 30 inches, would have been more appropriate had sufficient tractor power been available. Nevertheless, farmers using the implements indicate that crop yields on treated plots have increased and that their increased financial returns justify the equipment rental costs.

The agricultural equipment pool is well thought out as far as it goes. However, it must be pointed out that the restricted access to equipment within the pools effectively violates the original intent of the USAID grant, which stipulated that the equipment be used for demonstrations with large numbers of farmers. In the current program, wider coverage is impossible and cannot be replicated without additional equipment grants. As far as the evaluation team could discern, no attempts have been made to help other WUAs establish similar pools with equipment and machinery purchased on credit from the banks.

3.1.11 Use of Agro-chemicals (Insecticides and Herbicides)

Although a small number of farmers used insecticides and herbicides supplied for testing by sub-project staff, there was little evidence that farmers continued to use such agro-chemicals on their own. Only one handwritten report by the Punjab SMO agronomist cites agro-chemical adoption among a small group of farmers. This report says results were limited and mixed.

3.1.12 Full Watercourse and Coordinated Watercourse Trials

Full watercourse trials were initiated by the technical assistance team—one in each sub-project—to test the replicability and adoption of field-tested, recommended packages of production technologies on an entire watercourse. The trials were to involve all the farmers on a watercourse and integrate institutional development efforts with agricultural interventions to ensure joint organization and delivery of production resources. The intent was to eventually extend the trials in phases to the WUA federation level and, ultimately, to the entire sub-project.

The elements of full watercourse trials included: organization of farmers into viable WUAs; watercourse rehabilitation and maintenance with farmers' participation; joint procurement of non-water inputs; farmer training; arrangements for loans from Agriculture Development Bank of Pakistan; better water management; and improved crop production packages.

In all the sub-project areas, these trial efforts were drastically curtailed after the premature departure of the technical assistance team and the withdrawal of USAID-funded WUADS. In the Punjab, however, some efforts continued on either the original full watercourse trials or on other watercourses, redesignated as coordinated watercourse trials. On the full watercourse trials, farmers participated at each stage of watercourse improvement and in crop-related activities. Detailed farm plans were developed for all the farmers on the watercourse. Soil testing for the watercourse command was carried out to determine fertilizer requirements.

3.1.13 Irrigation Scheduling

Irrigation scheduling calendars were developed and tested in the farmers' fields as a component of full watercourse trials. These calendars were designed to indicate the crop water requirements of farmers' cropping patterns. They were to be compatible with the constraints of a supply-oriented irrigation system with fixed rotational schedules for individual farmers. Finally, the schedules also took into account specific weather conditions, soil types, precipitation patterns, and other factors in the designated area.

The technical assistance team was able to use these irrigation schedules for wheat crops during the 1990/91 *rabi* season in the full watercourse trials in the Lasbela, Warsak Lift Canal, and Shahkot sub-project areas. The calendars were not followed after the team's departure in early 1991.

In the Lasbela sub-project, schedules were developed and tested for other crops, including forages and vegetables. During the evaluation team's field visit, farmers indicated that on plots where the irrigation schedules were followed, there were significant increases in crop yields.

In the Punjab sub-projects, and especially the Shahkot sub-project, irrigation scheduling based on use of gypsum blocks was introduced in cooperation with the PAD agricultural extension staff. Although the experiment had encouraging results, its replicability is questionable due to farmers' illiteracy and problems with calibrating gypsum blocks.

3.1.14 Linkages with Input and Credit Suppliers

Although linkages with public and private sector seed, fertilizer, and pesticide suppliers proceeded on an ad hoc basis in some of the sub-projects, there is no evidence that any new or sustained arrangements were established between farmers and suppliers as a result of CWM Project activities.

3.1.15 Training of Farmers

Training was provided for farmers, especially those who participated in full watercourse trials, in Balochistan and Sindh. This training was done in association with SMOs, provincial research institutes, related line agencies, and public and private suppliers. The training included sessions on watercourse maintenance; conveyance efficiency; irrigation scheduling; water application practices; improved seed, seed-bed preparation, and tillage; sowing methods; pest management; and fertilizer applications.

3.2 Changes in Agricultural Production

The aggregate increase in agricultural production due to CWM interventions was to have come mainly from increases in cropping intensities, changes in cropping patterns, and increases in per-acre yields. An assessment of the project's impact on these three performance indicators is set forth below.

3.2.1 Cropping Intensity

The watercourse improvements and the canal rehabilitation and lining were expected to improve water delivery efficiency, leading to increases in cropping intensities. In addition, better field application efficiency was expected to result from precision land leveling and improved water management practices

The canal systems were originally designed to achieve equal delivery efficiency in all reaches. Over time, however, deferred maintenance and tampering with outlets, mostly in the head reaches, produced disparities in delivery efficiency.

Theoretically, in the changed situation, if the canal withdrawals remain constant, then overall cropping intensities at the canal command level should stay the same. Similarly, restoration of equity should have no effect on the cropping intensity at the canal command level. Cropping intensity would, however, improve if the conveyance losses in the canals were reduced, and the savings or additional water generated was diverted to the same canal command. Cropping intensity would also increase if significant conveyance losses were reduced at the watercourse level.

In the Punjab, according to the SMO, the water outlets (*moghas*) have been remodeled to restore their authorized discharges and remove inequities. Consequently, the savings from the canal linings are being diverted out of the sub-project areas. This implies that canal lining should have an adverse effect on cropping intensities in the sub-project areas.

Due to equity problems, especially in the tail reaches, the PID was diverting more water into the canal than was authorized by the design. PID did so to pacify the tail-end farmers prior to the lining of the canals. With the canal lining and rehabilitation complete, if the same quantities of water are diverted, they will flood the tail reaches. As a result of the remodeling of watercourses according to their authorized discharges and the canal diversions as per designed discharge of the canal, the cropping intensities at the head reaches should go down, while they should increase at the tail ends. Therefore, overall, the cropping intensity should be less than before canal lining.

The SMO data for the Punjab indicate that, due to canal lining, water losses have been reduced to less than one percent in the lined sections. In the rehabilitated sections, the losses vary between 5 and 9 percent. The SMO data also indicate that water losses in watercourses have been reduced to about 23 percent from about 46 percent. Hence, some increase in cropping intensity should have resulted from watercourse lining.

As per the World Bank Staff Appraisal Report (SAR), the cropping intensities were targeted to increase as follows: from 170 to 185 percent in the Niazbeg sub-project; from 143 to 158 percent in Shahkot; from 135 to 154 percent in Pakpattan; and from 127 to 151 percent for 6R-Hakra.

The baseline survey, carried out by the Punjab Economic Research Institute (PERI) in 1987/88, reported that the actual cropping intensities were 144.9, 128.2, 145, and 129.2 percent, respectively, for the four sub-project areas.

Table 2 presents estimates of cropping intensities in the four sub-projects observed over time, as compared with the SAR targets.

Table 2
Cropping Intensities in the Punjab Sub-Projects

Sub-Project	Pre-Project	Baseline Survey	SMO Data 1990/91	SAR Targets
Niazbeg	170.0	144.9	152.0	185.0
Shahkot	143.0	128.2	139.3	158.0
Pakpattan	135.0	145.0	168.0	154.0
6R-Hakra	127.0	129.2	127.0	150.0

The above table shows that, except for Pakpattan, SAR targets were not achieved in the sub-project areas. For the other three sub-project areas, the present cropping intensities are better than the PERI baseline cropping intensities, but are not significantly different than pre-project bench marks.

Most farmers, particularly those in tail areas, acknowledged that their on-farm cropping intensities have increased substantially. Some farmers, however, complained about a decline in cropping intensities, apparently due to improper location of remodeled outlets and reduced flows in the canals.

The data presented in Table 3 show that in the Kandiaro sub-project the SAR target for cropping intensity has been achieved. In the Warsak Lift Canal sub-project, it has remained constant. In Lasbela, although still behind the target, cropping intensity has increased significantly over the benchmark.

In the Warsak Lift Canal sub-project, the canal system is still not supplying the allocated quantities of water due to operational problems in the pump house. The cropping intensities will hopefully increase significantly when full canal supplies are made available after replacement of the pumps and motors.

In the Lasbela sub-project, there has been a significant improvement in the cropping intensity. This area has the potential to attain the targeted cropping intensity when all cultivable land is brought under the plow. In this sub-project, cropping intensity has increased not only due to improvements in delivery efficiencies, but also due to reductions in seepage, which have mitigated the waterlogging problem in the tail areas.

In Kandiaro, as explained by the secretary of the PID, the outlet remodeling has been carried out in line with existing discharges. He indicated, however, that in no watercourse was the increase more than 10 percent above its sanctioned discharge. The purpose of sustaining prevailing discharges after remodeling was to avoid angering farmers who had been drawing more water than their sanctioned share. Therefore, tail-enders were to get their water shares largely from savings in the system generated from canal lining. The savings in Kandiaro, unlike the Punjab, were internalized within the same command areas.

Table 3
Cropping Intensities in the Lasbela, Warsak Lift Canal, and Kandiaro Sub-Projects

Sub-Project	Pre-Project Benchmark	Baseline Survey	SMO Data 1990/91	SAR Targets
Lasbela	15.0	35.1	86.0	110.0
Warsak Lift	87.0	89.0	87.4	110.0
Kandiaro	113.0	111.0	140.0	130.0

However, farmers in all the above-mentioned sub-projects reported during the field visits that their cropping intensities had generally increased. This was true everywhere but in the tail reaches.

3.2.2 Cropping Patterns

In a fully developed area under irrigation, the cropping pattern would be expected to change in the short-term primarily in response to changes in the relative profitability of individual crops; in the long-term it should change in response to changes in crop technologies. In the sub-project areas, because they are still under development, other determinants affecting cropping patterns are changing water availability, waterlogging, and soil salinity conditions.

In most sub-project areas, the cropping patterns generally remained the same. The CWM Project introduced barley and sunflowers as crops in areas where water shortages were acute. These crops were adopted by some farmers. However, there was no major shift in overall area cropping patterns.

In the Shahkot sub-project, some farmers over time have reduced their plantings of sugar cane and rice in response to declining water availability. These changes might have proceeded at a faster pace if farmers had had access to cotton ginneries close to their farms.

In the 6R-Hakra sub-project, farmers appear to be replacing sugar cane with cotton and wheat. The proportion of maize in the cropping pattern has decreased considerably, while the area sown with forage crops has increased.

In the Pakpattan sub-project, sugar cane acreage has been reduced considerably in favor of wheat and cotton. The relative shares of maize and rice have declined significantly, but it is difficult to determine if this is due to changes in the relative profitability of the individual crops or to other factors, like changes in water availability, due to civil works improvements.

In the Warsak Lift Canal sub-project, the relative share of sugar cane has reportedly fallen as a direct consequence of the interruptions in water supplies from the canal.

In the Lasbela sub-project, the shift in cropping patterns has been in response to the demand for agricultural commodities in the Karachi market. The share of grain crops—wheat, maize, and sorghum—has decreased as farmers have increased production of vegetables and forages.

In Kandiaro sub-project, the cropping pattern has remained more or less stable. There have been, however, some shifts towards rice—a crop that is theoretically banned in the area—and to orchard fruit.

3.2.3 Crop Yields

It is common in most agriculture development projects to stress achieving higher per-acre crop yields, rather than aiming for higher aggregate farm production measured in higher net farm income. The following discussion assesses the performance of the project in achieving higher productivity per unit of land, rather than returns per unit of the scarce resource, which in this case was water.

Different interventions were initially tested on demonstration plots. Later they were more widely demonstrated in full watercourse trials. Among these interventions were introductions of high yielding crop varieties, improved water management practices, more balanced use of fertilizers, and other improved tillage and cultural operations.

With the departure of the technical assistance team, most of the transfer-of-technology activities were diluted and slowed down. In fact, in most cases, no new interventions were initiated after the team left in early 1991. However, in the Punjab, the SMO staff maintained some activities, which had limited impact on small groups of farmers. Unfortunately, insufficient data has been collected and analyzed at these or other sub-project sites to provide any meaningful assessment of improved crop yields. The interview data reported by farmers and discussed in the sub-project site reports (see Annex A) should be noted with caution, as the estimates may be exaggerated and not representative of yields obtained by the majority of farmers.

Farmers have reported that yields of most crops have increased significantly due to adoption of recommended packages of crop technology. Given the absence of cross-sectional and time-series data, however, it was very difficult for the evaluation team to determine the statistical validity of reports from a very small number of respondents about their own actual yield increases or the relative contribution of individual factors to any yield increases that did occur.

Comparing the available data with yield levels estimated in the project feasibility study, the various sub-project baseline studies, SMO reports, and the World Bank SAR targets suggest that farmers who were exposed to the project activities may have achieved higher crop yields on their farms, sometimes even surpassing the SAR targets. However, SMO data from the Punjab indicates that average yields in the sub-project areas are generally below SAR targets. The same is probably true for other sub-project areas. What information is available on crop yields is summarized in Table 4 below.

Table 4
Estimated Crop Yields for the CWM Sub-Project Areas
(Kilograms/Acre)

Crop	Feasibility Study	Baseline Study	Reports by the SMO 1991/92	Mission Interview Data	SAR Yield Targets
Niazbeg Sub-Project					
Wheat	939	896	1,012	1,600	1,390
Cotton	112	452	267	1,000	NA
Rice	653	544	853	NA	860
Sugar cane	11,526	17,132	13,804	48,000	NA
Maize	NA	468	NA	NA	NA
Shahkot Sub-Project					
Wheat	1,029	876	893	1,240	1,310
Cotton	124	268	139	NA	NA
Rice	856	860	1,067	NA	1,080
Sugar cane	15,642	13,920	11,054	26,000	18,375
Maize	NA	456	NA	1,800	480
Pakpattan Sub-Project					
Wheat	935	916	736	1,040	1,120
Cotton	360	900	555	1,000	490
Rice	825	888	960	NA	NA
Sugar cane	14,080	14,012	11,760	50,000	17,500
Maize	NA	688	NA	NA	526
6R-Hakra Sub-Project					
Wheat	881	796	736	NA	1,120
Cotton	288	544	555	NA	385
Rice	NA	NA	960	NA	NA
Sugar cane	15,129	11,404	11,760	NA	NA
Maize	600	NA	NA	NA	470
Warsak Lift Canal Sub-Project					
Wheat	NA	1,041	NA	NA	795
Rice	343	NA	NA	NA	NA
Sugar cane	9,289	10,560	NA	NA	12,340
Maize	NA	511	NA	NA	690
Lasbela Sub-Project					NA
Wheat	555	440	NA	2,000	
Kandiaro Sub-Project					
Wheat	837	957	NA	1,200	1,260
Cotton	488	506	NA	200	598
Rice	1,024	1,096	NA	NA	NA
Sugar cane	16,093	NA	NA	8,000	NA
Maize	NA	266	NA	NA	NA

3.3 Impact of Project Interventions on Agricultural Production

As discussed above, in the absence of reliable data from accurate measurements on farmers' fields, quantifying the impact of project interventions on agricultural production is not possible. However, we estimate that aggregate crop production in the sub-project areas may have increased by as much as 15 to 20 percent over the life of the project. In the Lasbela sub-project, the increase in aggregate production may even have been significantly higher, given the increased cropping intensity reported in the sub-project area.

The components of recommended crop production packages which lie within farmers' resource constraints—improved broadcasting techniques, better timing in sowing crops, and use of better seed—have generally been adopted. As a result, net farm incomes of those who adopted these measures may have increased.

One significant impact of demonstrations, most farmers acknowledged, was increased awareness of the benefits and costs of adopting the total crop packages being promoted. This increased awareness, however, must have been communicated from one farmer to another by word of mouth, because none of the SMOs seem to have conducted or disseminated rigorous analysis of the demonstration plots' technical or economic results.

3.4 Factors Determining Project Impact on Agricultural Production

Based on the evaluation team's impressions and informal exchanges, we suggest that the following factors contributed to whatever increases occurred in agricultural production. The factors are ranked below in rough order of their relative contribution:

1. Water savings from canal lining and rehabilitation
2. Watercourse improvements
3. Use of improved high-yielding crop varieties and better quality seed
4. More balanced use and timely applications of fertilizers
5. Land leveling and better tillage operations
6. Improved water management practices

3.5 Project Impact on Equity Among Water Users

The project has inculcated in farmers a heightened awareness of their rights as water users. However, a continuing commitment by PID staff to ensuring equity among the water users is essential if the limited gains made during the project are to be sustained.

3.6 Contribution of Full Watercourse Trials and Demonstration Plots to Meeting Project Objectives

One of the overall objectives of the CWM Project was to develop WUAs, which would have roles beyond the operation and maintenance of watercourses. The WUAs were to have organized themselves into more functional cooperative units for collective procurement of inputs and joint sales of farm produce. In addition, it was envisaged that farm production would be increased through efficient utilization of water savings and adoption of improved technical packages.

The full watercourse trials, where and while they existed, appear to have been successful. Once provided with the necessary training and support, farmers worked to organize themselves into more multipurpose WUAs. These watercourses also served as bases where the components of technical packages could be tested on larger demonstration plots and replicated over the entire watercourse.

This activity probably turned out to be the most effective new model for convincing farmers on farms adjacent to demonstrations to also adopt the new technical packages. In Lasbela and Kandiaro sub-projects, adjacent farmers were reported to have replicated the demonstrations without any external guidance or support.

Chapter 4

AN ASSESSMENT OF CIVIL WORKS INTERVENTIONS

Civil works in the CWM Project were to be simply the means to achieve authorized water delivery at farms. However, civil works would became the engine that drove the project. The Project Paper Amendment budget, **all sources included**, allocated 62 percent to commodities and civil works and 23 percent to technical assistance and training. This left only 15 percent for all other activities at the design stage.

As of 1 November 1992, USAID had actually disbursed a total of $ 22,922,762 for the CWM Project. Of this total, 37.1 percent had been spent for the technical assistance team, 49.8 percent for commodities and civil works, 12.5 percent for training, and 0.6 percent for project evaluation. The World Bank, on the other hand, spent the majority of IDA loan funds on civil works and essentially made no contribution to the non-civil works and institutional development components of the CWM Project.

Given such funding allocation, it is evident that water and non-water management interventions at the farm and command levels had to be done with little or no funds beyond staff salaries. Civil works targets naturally became the focus of project implementors, supervisors, and advisers. In retrospect, the project purpose stated in the USAID Project Paper Amendment became the most important objective—to carry out physical improvements to the system.

4.1 Status of Civil Works Accomplishments

Revised civil works targets and achievements through October 15, 1992 by province are shown below in Table 5. Table 6 presents the same information aggregated for the CWM Project.

The civil works relating to canals, drains, and outlets were funded through a World Bank/IDA loan. The watercourse rehabilitation, reported in these tables, was funded primarily by USAID. The World Bank did, however, fund watercourses under the project's revised targets. These included 17 watercourses in Lasbela, 3 in NWFP, 100 in Sindh, and 135 in Punjab. Reportedly, most of these have been constructed. Punjab and Sindh SMOs report even more watercourses are being completed under the "project." They explain that several watercourses were completed in command areas with funding from other sources—presumably either from the regular OFWM program or other development projects. This is confusing, indeed, since it seems that no one at the SMO or provincial levels can, in all cases, attach specific watercourses to specific project funds.

Table 5
Civil Works Status in the CWM Project
(as of 15 October 1992)

Civil Works Activity	Revised Targets	Work Completed	Percent Completed	Work Remaining
Lasbela Sub-Project in Balochistan Province				
Canal Rehabilitation (miles)	21.28	21.28	100.0	0
Canal Lining (miles)	16.20	16.20	100.0	0
Remodeling of Outlets	77	77	100.0	0
Watercourse Improvements	70	53	75.7	17
Warsak Lift Canal Sub-Project in North West Frontier Province				
Canal Rehabilitation (miles)	0.76	0.66	86.8	0.10
Canal Lining (miles)	32.82	28.82	87.8	4.00
Remodeling of Outlets	151	25	16.6	126
Watercourse Improvement	78	78	100.0	0
Structures	4	4	100.0	0
Kandiaro (Sehra/Naulakhi) Sub-Project In Sindh Province				
Canal Rehabilitation (miles)	119.68	119.68	100.0	0
Canal Lining (miles)	139.99	139.99	100.0	0
Remodeling of Outlets	571	571	100.0	0
Watercourse Improvement	442	420	95.0	22
Total for the Four Sub-Projects in Punjab Province				
Canal Rehabilitation (miles)	173.46	116.25	67.0	57.21
Canal Lining (miles)	305.04	272.31	89.3	32.73
Remodeling of Outlets	1,052	725	68.9	327
Watercourse Improvement	699	674	96.4	79*

*Note: 6-R Hakra and Pakpattan sub-projects report more lined watercourses than are targeted. Evidently the additional watercourses are funded from other sources.

Table 6
Total Civil Works for the CWM Project

Civil Works Activity	Revised Targets	Work Completed	Percent Completed	Work Remaining
Canal Rehabilitation (miles)	315.18	257.87	81.8	57.31
Canal Lining (miles)	494.05	457.32	92.7	31.73
Remodeling of Outlets	1,851	1,398	75.5	453
Watercourse Improvement	1,289	1,225	95.0	64
Surface Drainage (acres)	73,200	72,000	98.4	1,200
Drainage Wells	39	36	92.3	3

Considerable work remains to be done to meet the revised CWM Project targets. However, only minor cleanup activities are currently underway in most sub-projects. USAID has approved all the remaining watercourses in Sindh (22) and Balochistan (11); however, work has not yet started. Project personnel at other sites indicate that the intended civil works are essentially complete. It is not expected that, at termination, civil works accomplishments will significantly exceed those reported herein.

4.2 Impact of Canal and Watercourse Lining on Water Deliveries

To assess the impact of irrigation deliveries in any channel one must consider two aspects—adequacy and reliability—over the length of the system. In the CWM Project, it is dangerous to generalize because there are so many inherent differences between the sub-projects. As a result, the project's impact must be considered separately for each sub-project area.

4.2.1 Canal Lining

The command area of the Niazbeg sub-project in Punjab is at the lower end of the Niazbeg distributary. This means that the flow into the command area is not governed by a regulator. Instead, it receives water some 15 miles below the distributary headworks. As a result, fluctuations in discharge created within the 15 mile upstream reach are passed to the command area. The following observations can be made about data collected from the SMO in Lahore:

- Data collected on August 28, 1991, give an indication of what can happen upstream of the sub-project. The discharge at the headworks of the distributary was 345 cusecs while the authorized discharge is 213 cusecs. At the head of the sub-project area, 15 miles downstream, the discharge was 132 cusecs, whereas the authorized discharge is 167 cusecs. At approximately 30 miles downstream—mid sub-project—there was no measurable flow in the Niazbeg distributary.

- During the two-week period from 24 October to 8 November 1992, data from stage recorders on the Niazbeg distributary indicated that an average of 106 percent of authorized flow was entering the command of the sub-project area. At the middle of the command, the flow was 70 percent of authorized discharge; only 38 percent was reaching the tail areas.

- Data from the same stage recorders give an indication of the fluctuations in flow. During the study period, the fluctuations in discharge at the head of the command were negligible; but, by the time the flow reached the tail end, daily fluctuations averaged 220 percent. Fluctuations mid-way to the tail averaged 35 percent.

- Discharge data were collected in December 1985 for four outlets near the head of the command and six outlets near the tail. The same information was collected in December 1991 on the same set of outlets. In 1985, the average discharge at the head of the command was 156 percent of the authorized amount, while that reaching the tail outlets averaged only 36 percent. By 1991, the situation had deteriorated, with the head receiving 200 percent and the tail only 20 percent.

- Information collected in October 1991 indicated that of 72 outlets inspected, only 46 were intact as remodeled.

These spot checks provide strong evidence that there remain tremendous inequities within the Niazbeg distributary command. It appears that lining distributaries and minors and remodeling outlets have had essentially no effect on the equity or reliability of water deliveries to farms.

The other three sub-projects in Punjab—Shahkot, 6-R Hakra, and Pakpattan—do not have the fluctuating flow problem to the degree that the Niazbeg sub-project does. In general, these other sub-projects are better project site selections and undoubtedly are more representative of canal commands in the Punjab. It is unfortunate that most of the available flow data collected are for the Niazbeg sub-project. The sub-project's proximity to Lahore took valuable personnel time away from the other sub-project sites.

The following conclusions can be drawn from information collected and reports reviewed in the Punjab:

- A study by Mohammed Akhtar Sipra on the Shahkot sub-project during the *rabi* season 1990/91 showed that the command was usually short of full supply. The distributary operated at full supply only for four days of the 182-day study period and it received 90 percent or more of authorized delivery for only 50 percent of the time. The same study showed that the irrigation intensity over some 1,500 acres at the tail of the distributary was only 12 percent.

- The assistant engineer in the Punjab SMO has collected PID records for all of the sub-project areas for the years 1986 through 1991. These records consist of gauge readings at the head and tail reaches. He has converted the data to total water available on a monthly basis over the entire period. This information has been recorded but not yet analyzed.

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A cursory review of these data reveals that there was very little difference from year to year. The data also show that in no year or sub-project was full authorized discharge received. With the exception of Niazbeg, the commands received about 80 percent of authorized deliveries. Niazbeg received about 70 percent.

The differences in flow between the head and tail of each sub-project are revealing. The loss in Niazbeg averaged 38 percent; in Shahkot, nil; in Pakpattan, 10 percent; and in 6-R Hakra, 20 percent. It should be remembered that these data are from PID records whose validity might be challenged; however, nothing seen or learned on the field visits would be in conflict with these statements, with the exception of the 6R-Hakra sub-project (see Section 4.5 below).

- The Warsak Lift Canal presents a completely different picture for two reasons. First, at the start of the CWM Project, there was no more than a 75 percent supply of water at the headworks and this flow declined, due to pump problems, to its current level of no more than 40 percent of supply. Second, part of the command area receives a considerable but unpredictable supply of water from the Bara River.

  There is, therefore, no valid way to assess the impact of the lining on water deliveries. Certainly the structures have facilitated canal operations, and the covering of the canal in the head reach has eliminated closures due to breaches.

- The Lasbela Canal receives water from the Karachi Water Supply Canal a few kilometers below the Hub Dam. Equity and sufficiency are assured because the duty for this system is 10 cusecs for 1,000 acres. This supply is unlike any other sub-project area—or any other system in Pakistan for that matter.

There is evidence and data to conclude that canal lining does significantly reduce seepage. The technical assistance team's report (ARD, Inc., 1989) on performance indicators shows that the water savings are even greater that the 15 percent assumed by project designers. Measurements taken before and after lining by the Alluvial Channels Observation Project (ACOP) in the Shahkot distributary, for example, showed a 20 percent saving.

The Pakpattan command in Punjab has considerable areas of sandy soils. Here, lining has helped greatly in establishing equity in distributions along channels, as well as along the watercourses. More water is being delivered to tail areas of both the distributaries and the watercourses.

The 6-R Hakra sub-project provides another example of water being saved through seepage reduction (see Section 4.5 below). Reportedly the system operates with at least 50 cusecs less flow since lining and achieves the same results in supplying adequate supplies to the tail reaches. This amount is equivalent to an approximate 10 percent savings in water over what was required before installation of civil works.

Civil works have had little effect on reducing fluctuations in canal flows. Seepage losses are diminished—if not eliminated—with canal lining; yet considerable water is still lost along these channels. Operational waste and theft have not been materially diminished, which seems to be

true in all sub-projects. As a result, civil works have had little or no positive effects on equity of water delivery, even though there is some increase in supply at tail-end farms.

A statement in a draft report found in the SMO in Lahore entitled "Monitoring and Evaluation of the Shahkot Distributary," dated 17 September 1989, adequately summarized the situation as follows:

> The study of post-improvement equity graphs reveals that improvement has maintained more or less the pre-improvement status quo.

4.2.2 Remodeled Outlets

Remodeling outlets is a noble project intervention, not that the renowned Adjustable Proportional Module (APM) needed redesign. Repair of outlets would have been a more accurate description of this intervention. Over the years, some outlets have been eroded and/or broken, permitting more water to pass than was authorized, while many other outlets pass less than design flows, having become submerged due to sedimentation and/or lack of adequate maintenance in the canal or watercourse.

The outlet is the heart of the equity issue along the delivery channels. Readjusting or repairing—i.e., making it operate according to design—ensures equity to the watercourse, so long as the main channel itself is operated anywhere near its designed discharge.

The original irrigation system design in the Indus River system was "run of the river"—the system operates on whatever supply is available at the time. Obviously, such systems must be prepared to operate above and below some chosen mean supply value. Over the years, this mean value has increased. Mangla and Tarbela Dams, for example, allowed annual runoff flows to be spread over longer periods of time. Canal systems, therefore, often operate above their design discharges; they operate "on the freeboard." This does not materially affect equity because variations in canal flows pass through outlets in approximately the same proportion as they occur at the design discharge of the canal, thus the term "proportional."

Experience with remodeling outlets has been varied. Remodeling has been virtually impossible in NWFP, where outlets are merely pipes through the canal bank. These have been altered to the point that sub-project implementors were unwilling to risk the anticipated problems associated with reducing flows in so many watercourses. Outlets in the Punjab and Balochistan have been rigidly remodeled to their original designs, while those in Sindh have been remodeled according to existing flows that have evolved over time.

None of these options is ideal. It would appear that, since canals often operate above design supply and have been doing so for some time, remodeling outlets to some chosen size above original design would be appropriate and would ease farmers' concerns that large investments were being made in the irrigation system, without increasing discharges they see at their farm gates.

Farmers' concerns could be exaggerated. However, almost all farmers questioned did recognize that the flow rates at the watercourse outlets had changed. Many thought they were less that before, even though most reported that they had more water at their farm gates due to watercourse improvement.

4.2.3 Watercourse Improvement

Watercourse lining has helped in conveying water to the tail areas in the Sindh sub-project. Unfortunately, the equity of discharges along the distributary is limited because remodeled outlets deliver discharges at pre-remodeling levels, which often are more than double the authorized ones. Therefore, tail areas not only suffer from any fluctuations that occur in the main canal and branches, but also from inequitable deliveries of water.

The soils of the Lasbela Canal command are especially coarse. Unimproved watercourses there are difficult to maintain. It also is difficult to pass the full supply of water through these watercourses. Lining has, therefore, greatly improved equity along the watercourses.

Watercourse improvements do affect deliveries. Tail-end farmers almost always report that they can irrigate one acre in less time after improvement. This is an indication that they are receiving more water than before. Farmers have indicated this even in cases where they also said the remodeled outlets had reduced flow into the watercourse. This is another indication that watercourse renovation favorably influenced delivery along the watercourses.

Data from the baseline survey in the Punjab and post-improvement measurements taken by SMO staff indicate clearly that there is an approximate 20 to 25 percent saving in water created by improving watercourses. Unlike savings from canal lining, this saving is available at the watercourse level.

Although no hard evidence or data are available, the belief that there is much more equity along the watercourse than along the main channel is valid. Certainly, the impression of farmers leads one to this conclusion.

The restrictions put on the amount of lining allowed on watercourses may have caused inequities between farmers because there are obviously smaller losses along a lined watercourse than along an improved earthen one. This is especially true after a season or two of inadequate maintenance.

4.3. Quality of Civil Works

The quality of construction is adequate at all sites. Supervisory consultants, although not able to provide day-to-day supervision, were able to achieve acceptable results.

There is evidence that sedimentation will be a continuing problem on the side slopes of the lined sections of canals. The condition is critical in the Niazbeg distributary, where weeds are flourishing on deposited sediments. The Warsak Lift canal also shows considerable sedimentation, undoubtedly due to discharges being significantly below design.

The remodeled outlet design in use in all provinces, except NWFP, is excellent. It provides quality control and facilitates head measurement on the outlet. It is reportedly less subject to illegal tampering, being somewhat more difficult to break. The pipe outlets in the Warsak Lift canal were nothing new and several have been tampered with. In fact, outlets that had been tampered with were observed in all sub-projects.

The quality of watercourse lining is generally better than that of the canals. Standard designs were used, however, all watercourses seem to be larger and stronger than necessary. They also appear to be placed too deep in the ground. The project could have experimented with single brick lining and with placing the channel higher, to facilitate flow into surrounding fields. There is evidence that watercourse structures are not holding up well, especially where there is considerable slope.

In the Warsak Lift command, the design of these structures can be criticized. Drop structures and turn-outs are not long enough to pass the flow without excessive erosion below the structure. Some structures are providing little or no benefit to the farmers.

4.4 Civil Works and Their Impact on Private Tubewell Development

The lack of water in the Warsak Lift canal has certainly had an impact on tubewell development. Farmers at the lower half of the command are rapidly constructing tubewells, which provide their only current irrigation supply. This development, of course, is not due to project intervention. It does indicate, however, that when sufficiently stressed, farmers will resort to tubewells where fresh water is available.

The project itself has probably had no measurable effect on investment in private tubewells. Apparently more water is reaching farms, but more water is needed to permit crop watering on demand. Only a few enterprising farmers have recognized that private tubewells are viable economic investments.

There are several examples of groups of farmers joining together to operate tubewells to supplement canal supplies. The technical assistance team was assisting several groups in the Pakpattan sub-project, and at least one such group was observed in 6-R Hakra. The early withdrawal of the technical assistance team essentially stopped this important program before it could be thoroughly established. Reportedly, farmers are continuing to work together, but to achieve the full benefits from cooperation they will need expert assistance in the near future. Hopefully, this cooperation will continue and the technology will spread and evolve naturally.

This type of activity is not likely to attract government or donor assistance. Too much time, patience, and funding are required. As a result, a valuable opportunity has been missed to provide needed knowledge and a replicable experiment that could have tremendous impact for the future of irrigation in Pakistan.

4.5 Project Impact on System Operations and Maintenance

Maintenance is easier in the lined minors and distributaries. It was reported in several cases that more sediment is passing through main channels and into watercourses. However, the shallow side slopes of the cast-in-place concrete do retain sediment deposits, especially where flows are less than full supply.

Even though, in some cases, more sediment is reaching the watercourses, the lining makes them easier to clean. Overall, the improvements make watercourses easier to maintain, offering an incentive to keep them in good condition.

There are two models for operation and maintenance that emerged during the life of the project. In the first model, where the PID provides the sub-project manager, as in NWFP and Balochistan, there is no change in operation procedures or staff. In the second model, however, where the PAD is the lead agency, there is a problem with maintenance. The project provides no funds for maintenance per se, so these needs are not taken care of and must await the time when sub-project operations are "turned back" to the operations and maintenance staff of the PIDs. Several maintenance needs are apparent in the channels and drains in the Punjab. Where the PID is the lead agency, maintenance continues as a usual routine.

The 6-R Hakra sub-project in the Punjab provides an example of how civil works can affect system operations. Prior to the sub-project, approximately 135 percent of design discharge was discharged into the head of 6R-Hakra distributary in order to provide sanctioned supplies to the tail end. Even with this excess, it was found that a rotation of distributaries was necessary to adequately feed the tail end. Lining greatly facilitated passage of water through the system. At present, just 115 percent of design discharge is needed at the head to accomplish the same result.

The rotation of channels continues. It was reported that the PID is considering doing away with the rotation of channels as a result of the lining. This is certainly possible if the water gained from lining is allowed to remain in the command area. Currently it is not, however. Area farmers indicated that their highest water priority was to do away with the channel rotation system. When the system is turned back to the operations and maintenance wing of the PID, no one seems to know what practice will be used.

The practice of operating canal systems above the full supply level in order to "feed the tails," without openly admitting it, causes much confusion and misunderstanding among users when outlets are remodeled to the design discharge. This practice has resulted from necessity. Otherwise, tail reaches will not receive an amount approaching their sanctioned supply. Seepage and bad management have led to the practice of operating canals on the freeboard.

Poor management, by far, causes the greatest water losses. Until this problem is openly dealt with, there is no logical reason to assume that lining major arteries of the irrigation system will have any effect whatsoever on equity of delivery along the system. The CWM Project provides sufficient evidence of this in all sub-projects.

4.6 Status of Civil Works Cost Recovery

Beneficiaries are required to contribute 25 percent of the total cost of watercourse materials in the Punjab, Sindh, and Balochistan provinces; in the Northwest Frontier Province, farmers were to contribute only 10 percent. First installments were due two years after completion of a particular watercourse, with the total recovery taking place in five or ten equal installments within a five-year time period. A summary of the cost recovery status in the CWM Project as of 30 June 1992 is presented in Table 7.

In the Punjab and Sindh Provinces, the recovery status is considered to be satisfactory, with special efforts being made to recover according to schedule. In Balochistan, the first installment was due on 31 December 1991. Despite personal visits by OFWM staff and written reminders, no recovery was made during last fiscal year. In NWFP, recovery is slow because farmers are not receiving full supplies of water and some farmers are receiving no water from the canal system. From July 1989, cost recovery was collected in advance of construction.

Advance recovery of the farmers' share of material costs seems to be a viable solution to cost recovery. Certainly, if farmers of NWFP, where less than one-half of the authorized canal supply is being delivered, are willing to pay in advance, others should be more than willing. The Sindh Province has also adopted the system of collecting advances.

4.7 Impact of Civil Works on the Attainment of Non-Civil Works Project Objectives

Project designers assumed water delivery to farms would be enhanced by the improvements made in watercourses and the channels above, that equity would be increased, and that water savings would result. Civil works, coupled with diligent system operations and maintenance, were considered sufficient to permit delivery of a reliable supply of water to farms. The goal of increased agricultural productivity could then be achieved through departmental and institutional coordination to deliver needed non-water inputs, including technical assistance and training to farmers.

Many demonstration plots, full watercourse trials, precision land-leveling trials, and participatory and/or coordinated watercourses were placed where there was extra assurance of a reliable and sufficient supply of water. These supplies came from tubewells, minors in the upper reaches of the command, extra water from the Bara River or watercourses that traditionally received "extra" water. However, on any given sub-project command, there were many watercourse commands that had no hope of receiving water deliveries of the size or reliability enjoyed in the test areas. The project should have attempted to demonstrate different packages of practices to match varying degrees of water supply and reliability. These discrepancies must be acknowledged.

Demonstration trials should have been held where there was an incentive for farmers to cooperate. An excellent example is with cooperative tubewells. In these areas, irrigation according to crop demand could have been successfully tested. These areas are the only ones where there is reasonable hope for demand irrigation in the Indus River system.

Table 7
Summary of Cost Recovery in the CWM Sub-Projects
(as of 30 June 1992, in Pakistan Rupees)

Sub-Project Area	Total Amount Due	Total Amount Recovered	Percent Recovered	Remaining Amount Due
Niazbeg	1,444,348	959,536	66.4	484,812
Shahkot	2,759,595	1,609,690	58.3	1,149,905
Pakpattan	3,459,890	2,212,503	63.9	1,247,387
6R-Hakra	6,895,542	4,936,062	71.6	1,959,480
Sehra/Naulakhi	5,084,340	2,395,457	47.1	2,688,883
Sehra/Naulakhi	Advances	87,161		
Lasbela	132,469	0	0.0	132,469
Warsak Lift	128,091	0	0.0	128,091
Warsak Lift	Advances	373,660		
Total Project	19,904,275	12,574,069	63.2	7,330,206

Demand irrigation is not appropriate where water supplies are inadequate. Tubewells provide the only viable solution in augmenting Pakistan's existing irrigation systems.

The technical assistance team initiated a system of irrigation scheduling to fit existing water supplies, but results are inconclusive due to the abrupt termination of their efforts. They recognized that irrigation scheduling was impossible with unreliable and inadequate water supplies, and they experimented only where well water was available. They learned that complicated scheduling models were inappropriate and proposed a calendar method.

One attempt was made to get farmers to reduce cropped acreage to match the short water supply. This, of course, was inappropriate since to maximize production with less than sufficient irrigation water one must expand the area and apply less than the optimum amounts of water. Pakistan's irrigated agriculture should not be judged on a per-acre basis, instead production per unit of water is more appropriate because of the designed shortages in the irrigation system.

Chapter 5

AN ASSESSMENT OF PROJECT IMPLEMENTATION

5.1 Impact of the Project Design on Project Implementation

With the advantage of hindsight, it is apparent that the ultimate direction and outcome of the CWM Project were, in large measure, determined by decisions made in the design process. The impact of many of the key design decisions have already been discussed in previous sections of this report. They are summarized below.

5.1.1 Ambitious Targets and Limited Time

The scope of activities and the targets set out in the design process appear to have been excessively ambitious, particularly when project implementors were expected to deal with the disparate problems and situations in seven widely scattered sub-projects.

This problem was compounded by the fact that the time needed to effect changes in civil works, agricultural systems, and institutional structures is very different. Nevertheless, considerable progress was expected on all fronts within the same five-year period. Only the civil work targets were largely met. Limited—but probably unsustainable—progress was made in changing agricultural systems. There is almost no evidence of progress toward development of new institutional models for irrigation development.

5.1.2 Two-Stage Development and One Inevitable Outcome

The concept of two-stage development proved to be the biggest shortcoming of the project. This two-stage concept, whose exact origin is still unknown to the evaluation team, caught hold early in project implementation and played strongly to the inherent local bias in irrigation projects—that civil works had to be improved to perfection before starting other activities directed at improving agricultural productivity and testing new institutional arrangements.

The evaluation team asserts that this concept of irrigation development is without merit. Even the tentative and limited project interventions carried out in crop and water management demonstrated conclusively that farmers can and do readily recognize the value of certain interventions—e.g., improved quality in seeds, new crop varieties, better broadcasting methods, use of new types of equipment—even in the absence of any significant changes in their irrigation water delivery systems. While it is certainly true that net benefits from these interventions are enhanced where irrigation water deliveries are totally reliable, many farmers in the sub-project areas were receiving adequate and well-timed water deliveries even before the CWM Project was initiated. They could have received substantial benefits from the project's agricultural interventions even in the complete absence of the civil works component.

In institutional development, the evaluation team sees no essential linkage between physical progress on civil works and advancement of new models for improved cooperation and coordination between provincial line agencies. Improved civil works may provide an incentive for establishing certain types of farmers' groups. However, even the team's brief exposure to farmers in the sub-project areas amply confirmed that farmers organize themselves to accomplish many different tasks—sharing labor at certain points in the cropping cycle, jointly operating private tubewells, managing seed multiplication, procuring inputs, marketing outputs, and even protesting against inequities and other problems with water deliveries.

In sum, many more highly desirable interventions could have been undertaken in agriculture and institutional development by project implementors over a longer period of time if the concept of a two-stage evolution in project activities had not developed in the collective thinking of the donors and recipients.

5.1.3 Concrete Targets Versus Fuzzy Objectives

Targets set out for civil works were concrete—both literally and figuratively—whereas detailed targets for the other project components were either fuzzy or nonexistent. This deficiency appears to have had two major effects on implementation.

First, in SMOs largely dominated by engineers, a clear message was passed as to what targets had to be accomplished and where the true financial benefits to the provincial line agencies were.

Second, implementors of the other project components had no similar, phased targets toward which to direct their efforts. As a result, individuals at SMOs and on the technical assistance team essentially "did their own thing." This tendency became even more pronounced after the USAID mid-term evaluation when implementors clearly got the message that they had to produce better results in the non-civil works components.

In this latter period, many new interventions were initiated, particularly in the Punjab sub-projects, in the attempt to show that "something was being done in agriculture and with farmers' groups." In general, the tendency, unfortunately, was to involve small groups of farmers in location-specific activities and provide them with resources at levels greatly superior to those that could realistically be sustained by the provincial line agencies after the end of the project.

5.1.4 Experimental Aspirations and Old Methodologies

The CWM was specifically promoted as an experimental exercise which would develop novel models to mitigate problems evident in previous irrigation development efforts. However, when one carefully analyzes what was done in the project, one finds very little evidence of any such experimentation.

In reality, interventions in civil works did not differ significantly from those already promoted and executed in previous PID and OFWM programs. In most areas, farmers had no more active

participation in the improvement of irrigation infrastructure than they had had under previous programs.

Most field activities in agriculture differ only in intensity from similar interventions being carried out separately by provincial agricultural extension staff, both within and outside the sub-project areas, under the World Bank-financed training and visit system. The only exceptions were interventions for irrigation scheduling, certain on-farm water management techniques, and demonstrations of agricultural equipment—all of which were short-lived, limited in scope, and likely to disappear at the end of the project.

5.2. The Nature and Effectiveness of Relationships Between Project Implementing Agencies

The project experienced periodic operational squabbles between donors, governments, and project implementation personnel, which are inevitable in a project as large and complex as this one. These troubles were relatively minor. However, the evaluation team believes that implementation of the CWM Project was significantly weakened by four fundamental problems that should have been more effectively monitored and dealt with by senior management in Islamabad. These are outline belowed in Sections 5.2.1 to 5.2.4.

5.2.1 Governance of Project Implementation by Multiple Planning Documents

Complex projects, involving more than one international donor agency and an array of national and provincial agencies, are difficult to implement in the best of circumstances. Any project that seeks to simultaneously accomplish major civil works, induce multiple innovations in agriculture, and promote radical changes in institutional relationships between and among established line agencies and their respective clienteles is even more susceptible to implementation failures. And, finally, if such a project is governed in implementation by multiple planning documents—each cited as binding by one or more project participants—then the prospect for successful achievement of a core set of goals and objectives becomes increasing tenuous.

In the case of the CWM Project, implementation has been governed for one participant or the other by the following sets of planning documents:

- The USAID Project Agreement and the World Bank Staff Appraisal Report and subsequent loan documents;
- An initial set of pro forma contracts (PC-1s) drawn up at the federal and provincial levels;
- A revised set of PC-1s drawn up and authorized later in the project;
- Separate sets of legal documents—over 100 Project Implementation Letters (PILs) and the technical assistance contract in the case of USAID—which authorized and funded discrete project activities; and

- Annual work plans for each SMO working in the seven sub-projects and for the technical assistance team.

It was a formidable clerical task for project implementors simply to keep track of all these disparate documents. The more fundamental problem was that this array of planning documents evidently conveyed different messages to different participants as to CWM goals, purposes, and objectives and the relative priority to be assigned to different project activities.

For example, USAID clearly wavered between wishing to have all project activities progress simultaneously and stressing achievement of the civil works targets as tangible proof that something was being accomplished. The World Bank put more consistent emphasis in its funding allocations on the civil works component. The provincial government authorities, having their own development agendas, introduced a new level of interpretation into the drafting and redrafting of their PC-1s. And, finally, at the actual project implementation level, SMO and technical assistance team members tended to prioritize their time and available resources around a combination of dicta from above and their own levels of personal interest in discrete project activities.

In such a situation, it is not surprising in retrospect that all participants in the project did not always have the same overall concept of project objectives, and that priorities in project implementation differed significantly over the life of the project and between project components.

5.2.2 A Long and Complicated Chain of Project Authority

In a project with the stated objective of improving coordination between participants at all levels, the long and complicated chain of authority in project implementation surely did not enhance prospects for clear and rapid transmission of managerial decisions to all participants, nor did it facilitate easy feedback from the seven sub-projects to higher levels when problems arose and new authorities were needed to resolve them.

It is not entirely clear why project planners felt it necessary to adopt a chain of authority and communications which involved so many different administrative levels—i.e., donor, federal, provincial, the SMO, and line agencies—and, within these levels, so many coordinating institutions—i.e., the federal coordinating cell, the four different provincial committees for policy coordination, the seven sub-project coordination committees, the hundreds of WUAs, and the technical assistance team.

Conversely, if the administrative arrangements were dictated by normal GOP procedures for all projects, it is unclear why the planners did not recognize the problems inherent in trying to use such a cumbersome administrative structure to implement disparate development activities in seven different sub-projects scattered throughout a country as large as Pakistan.

Given the situation, project planners should have squarely faced their responsibilities and either opted for a much simpler chain of authority and coordination between the seven sub-projects, or, conversely, cut back significantly on the number of sub-project sites selected, in anticipation of the likely communications problems.

5.2.3 Lack of Flexibility in Implementation of Project Experimentation

At the core of the project was the explicit intent to experiment with novel approaches to area activities and institutional development and coordination. This central goal was reiterated in project documents and in team interviews with participants. And yet, while the project ultimately achieved some significant results, particularly in civil works, it did so largely within a set of parameters and working relationships that existed before the project was initiated.

The civil works were executed by the PIDs and OFWM units pretty much as they had been before initiation of the CWM Project. Most approaches to agricultural extension work with farmers differed from the classic agricultural research/demonstration/training approaches of the national agricultural extension system only in the intensity of their application and their available resources—e.g., one demonstration per watercourse versus one demonstration per 10 to 12 watercourses, better transportation for field staff. And, finally, attempts to better organize farmer participation in management of their own affairs revolved largely around making a single, preconceived model—the WUAs—work better.

While some creative flexibility was demonstrated—e.g., in using buried channels for water conveyance in NWFP and Balochistan and in attempting formation of alternative types of farmer organizations in the Punjab sub-projects—experimentation and flexibility seemed in rather short supply in the CWM Project. This is most curious given the stated experimentation objective and the fact that the sub-project areas were deliberately chosen to differ one from the other, to facilitate development of alternative models in execution of civil works, in increasing agricultural production and factor productivities, and in more democratic organization of farmer participation.

5.2.4 Late Arrival and Early Departure of the CWM Technical Assistance Team

The project obviously suffered from the short tenure of the technical assistance team and its limited participation in project decision-making. However, the major weakness was the late arrival of the team, due to USAID/GOP contract approval problems, not its departure due to the hostilities in the Gulf War. The basic working relationships and real prioritization of project activities—i.e., concentration on civil works, the idea that civil works had to completed before non-civil works activities could begin, the absence of a structured role for agricultural extension agents in the project, etc.—appear to have been solidified early in the implementation phase.

By the time the technical assistance team arrived, it was faced with a fait accompli in which these working relationships and priorities were already set. In some of the sub-projects, this meant that their efforts were marginalized from the outset of their activities. In others, their arrival meant, at a minimum, that they were faced with little time to produce results and essentially justify their existence to USAID, as the contracting agency, and to a whole array of Pakistani officials who were skeptical about the real need for their presence at all.

5.3 Effectiveness of the Technical Assistance Team/SMO Relationships

It was extremely difficult for the evaluation team to judge the effectiveness of the technical assistance team given that their contract was terminated almost two years before the evaluation and that all but a few members of the technical assistance team were unavailable for interviews during the evaluation. This meant that most of the evaluation team's impressions were necessarily drawn from field observations and interviews with SMO and other provincial personnel.

The first observation that must be made is that technical assistance team/SMO relationships varied greatly between provinces and sub-projects. In the four sub-projects in the Punjab, there is little doubt that there was poor cooperation between the sub-project management and the technical assistance team. There seems to have been a deliberate effort to partition SMO and technical assistance team activities—particularly agricultural and institutional development activities—in different sectors of the sub-project areas and to foster an unconstructive attitude of competition between the two groups. This contributed in a major way to a dispersal of resources and a fragmentation of effort among the two groups, the exact opposite of the project's objective.

In the other areas, the coordination between the technical assistance team and the SMOs appears to have been considerably better; but, not unexpectedly, working relationships were stronger and more effective on a one-to-one basis than between the groups as a whole.

One major weakness detected in project implementation was the general failure of the technical assistance team/SMO relationship to generate a coherent management strategy which effectively linked diagnostic and baseline surveys, annual planning activities, periodic progress reporting, and monitoring/evaluation operations into a strong management information system.

In the absence of such a system, project activities at all levels appear to have been driven more by daily exigencies and the wishes of individuals than by any coherent overall implementation strategy. With respect to civil works, the PID and the OFWM personnel were guided by defined construction objectives and, more or less, measured their individual performances against those targets without a great deal of attention to what was happening, or was supposed to happen, with other project elements.

The agricultural activities of the project, as implemented, were mainly a collection of interventions that had already been initiated by various agricultural research and extension agencies. These were "extended" to small groups of farmers largely as intact transfers from those agencies. Actual experimentation—which was one of the main objectives of the project—was not carried on to any great degree. Where new innovations were initiated, mainly by the technical assistance team, most died after one or two crop seasons or were documented so poorly that any tangible results were quickly forgotten and received no further study.

Finally, the precise nature of anticipated institutional innovations were poorly specified in the project planning documents. Beyond specifying the institutions to be created or strengthened by project activities, virtually no guidance was given to project implementors as to the expected results of the institutional development activities or processes by which they might be achieved.

Given a situation where strategic objectives were loosely stated and no effective guidance was given as to the processes, anticipated results, and indicators to use along the way, it is not surprising that project implementation of non-civil works activities became increasingly erratic and uncoordinated.

In sum, if the personnel charged with implementation do not know precisely where they are expected to go, then all roads will lead them there. In this atmosphere of uncertainty, priorities are set primarily by individual initiative and may or may not be fully compatible with the stated objectives of a project.

5.4 Impact of the Mid-Term Evaluation on Subsequent Project Implementation

The evaluation team and SMO staff in each sub-project attempted to determine what had been done to implement recommendations from the USAID mid-term evaluation. Implementation proved to have been unsatisfactory in virtually all cases.

During the project there was continuous turnover of provincial and SMO staff, particularly sub-project managers. More recently, key SMO staff returned to their line agency positions or other activities. As a result, few of the remaining staff had either read or remembered the specific recommendations of the USAID mid-term evaluation.

There was often a general recognition that the project had been criticized rather severely for the lack of progress on non-civil works and institutional development activities. Often there was some confusion in distinguishing the specific recommendations of the USAID evaluation from the parallel recommendations of the annual World Bank supervisory mission reports.

Another factor that muddied the waters with respect to the USAID recommendations was the simple fact that, although the recommendations stressed the need to reorient activities toward agricultural and institutional development interventions over the remainder of the project, when additional funds became available—as a result of Rupee devaluation and for other reasons—both USAID and the World Bank authorized allocations of virtually all the extra funds to expansion of the civil works agenda. This was true in all but one of the sub-projects. Not only were targets for civil works revised within the existing sub-project areas, but, in some instances, new areas outside the original sub-projects were selected to use up the windfall funding.

These allocations by the donors themselves appear to have imparted a much stronger and more direct message to project implementors than did the recommendations of the USAID mid-term evaluation and even the latest (1991) World Bank supervisory mission report.

5.5 Other Factors Impacting Project Implementation

5.5.1 Failure to Install a Strong Management Information System within the Project and Link It with Monitoring and Evaluation Operations

The CWM Project had two structural characteristics. First, it was designed to devise, test, and analyze a wide variety of development interventions over seven diverse and geographically scattered sub-project situations. Second, it was specifically designed to be experimental in orientation.

One of the principal requirements of such a project is that it have a well-articulated internal management information system, strongly linked to an on-going field monitoring and evaluation. Since experimentation is, by definition, a phased process where successes and failures in one period provide the basis for designing and executing work in the next period, a strong system is essential for documenting what was attempted, why it was attempted, and what the results were.

In all sub-projects, the evaluation team found that monitoring and evaluation operations were either neglected or poorly executed. More importantly, the actual operations of the SMOs appeared to be primarily a function of the managerial styles of the various sub-project managers. There was no evidence that any of the sub-project managers recognized the importance of a well-articulated and well-executed management information system in improving their management operations.

Monitoring and evaluation operations, to the extent they existed at all, were focused almost wholly on producing documents to persuade external evaluators from USAID and the World Bank that the project was meeting the precise targets laid out in the various planning documents. No staff member in any sub-project seemed to realize or express the idea that the true value of a strong monitoring and evaluation operation is for the project's own on-going management. There also was no recognition that, if a monitoring and evaluation operation is fulfilling its primary role in management, the data generated would almost always be more than sufficient to give external evaluators an accurate and comprehensive picture of what is actually happening within the project.

5.5.2 Ineffective Training Before and During Project Implementation

USAID project documents placed considerable emphasis on diagnostic analysis and management training and planning that took place early in the project. The product was to be management plans that could be updated annually to become implementation schedules for all concerned agencies.

The diagnostic analysis training took place during a five-week period in July and August 1985.

This was followed by diagnostic analysis studies in sub-project areas for six weeks in November and December 1985. The management training and planning covered about eight weeks in April and May 1986. During this latter period, a management plan was to have been developed for one sub-project area and a methodology was to have been designed for creating similar plans for the other sub-projects.

Published evidence of this training came in the form of two reports in 1986, nine reports in 1987, and two reports in 1988. These reports were all published in the United States and several copies were sent to Pakistan. The evaluation team was unable to retrieve any of these reports for review. This entire activity was accomplished with a considerable amount of short-term expatriate assistance; yet, it apparently had almost no impact on project implementation. There is no current evidence of the effort having lasting results. Apparently, the diagnostic analysis model designed by Colorado State University was judged by implementors to be too cumbersome, detailed, time consuming, and complicated to have practical use in an irrigation rehabilitation project.

Training sub-project staff in monitoring and evaluation operations was also found to have been rather deficient. Where staff members were trained in computer operations in short courses, they apparently had little or no access to computers after they returned to their assignments, and received no follow-up training on the job to maintain and upgrade their skills.

In another case, considerable attention was given to developing a computerized irrigation scheduling model, which was designed to match crop water requirements to actual water deliveries. Unfortunately, sub-project staff, while having some initial exposure to the model when the technical assistance team was in residence, apparently never were trained to use the model. The result was that the sub-projects now have the model on computer diskettes in their offices but none of the staff can use it to develop and disseminate improved irrigation crop schedules to farmers and area agricultural extension personnel.

Chapter 6

LESSONS TO BE LEARNED FROM THE PROJECT

6.1 Institutional Development

- The need for the dialogue between the PID and PAD in each province was based on the expectation that the PID would deliver water to match crop requirements, with relevant data to be provided by the PAD. This assumption was false because the Indus River canal system is, by design, water scarce and cannot function as an on-demand irrigation system.

- The CWM Project, with its emphasis on pilot activities, essentially emphasized the process and potential of institution building. However, the project design, implementation, and monitoring system did not make any provisions for identifying or responding to such opportunities.

- Throughout project implementation, there was no clear understanding or consensus between the line agencies, the technical assistance team, and the donors on what the concrete institution building goals and processes of the project were to be. Much of this deficiency can be attributed to the project design's failure to specify what institutional indicators should to be used in monitoring progress toward goal attainment. This resulted in institutional development activities that often contradicted or were irrelevant to the stated project objectives.

- It was unreasonable of CWM Project's designers to expect significant and measurable impact from the project's institutional and agricultural production activities over the short life of the project. However, objectively verifiable progress indicators should have been formulated in the design phase for both components.

- The SMO was not an effective model of decentralized management. This is so because, first, the SMOs did not have full administrative control over provincial staff from the line agencies (PID, OFWM and PAD). Second, they had only limited control over the allocation and disbursement of project funds. And, third, the SMOs were not structured to allow the sub-project managers within their own authority to use the staff for canal operations, watercourse improvement, and agricultural extension as they saw fit to realize integrated management of water and non-water inputs in the sub-project areas.

  This model could only have worked with a radical reorientation away from compartmentalized line agency thinking, through extensive training in a more holistic, multidisciplinary approach to irrigated agriculture. Since this was not possible, the SMO model as tested under CWM Project must be judged as inappropriate for institutional replication. The SMO model promotes neither stronger line agencies nor strong autonomous irrigation authorities. It, therefore, has none of the benefits of either of these

institutional arrangements and all of the weaknesses of an organization halfway between the two.

- In retrospect, the concept of expanding the WUA model to other activities was flawed because it assumed that farmers' interests—beyond water—were the same for all water users on a particular watercourse. In fact, no cases were found where all WUA members were participating in joint input purchasing or other similar activities. To the contrary, common interests among farmers seemed to emerge only in smaller, more cohesive groups and, for the most part, these interests were not shared with the entire community of water users.

  This is so because there are many different categories of farmers in the irrigation community. They are defined by such factors as: the size and tenure arrangements of their land holdings, social and economic status, ethnic and kinship identities, political affiliations, varying access to bureaucracy, and linkages with the national economy. The mere fact that they share the same watercourse to fulfil their individual needs for water delivery does not mean that they will collectively undertake joint activities, especially if such activities are liable to generate conflicts between different groups.

- The participatory approach, if institutionalized in Pakistan, should not be used primarily to create multipurpose organizations out of WUAs, but instead to make the OFWM program more responsive to the specific needs and wishes of the farmers. It must also serve to define the specific maintenance needs of the new interventions and develop the organizational mechanisms to meet them. Specifically, farmers need to be aware that the new technology and structures cannot be maintained on traditional lines of collective mobilization for desilting.

- Irrelevant, varied, and contradictory institutional activities are liable to result if concrete institutional objectives and processes are not clearly specified in the project design, and if objectively verifiable progress indicators are not defined.

6.2 Agricultural Development

- Many demonstration plots, full watercourse trials, precision land-leveling plots, and coordinated watercourses were situated where there was extra assurance of a reliable and sufficient supply of water. However, on any given sub-project command, there were many watercourse commands that had no hope of such abundant, reliable water supplies as the test areas. The project should have attempted to demonstrate different packages of practices to match varying degrees of water adequacy and reliability.

  Demonstration trials should have been held where there was an incentive for the farmers to cooperate, as was the case with cooperative tubewells. In areas with tubewells, irrigation according to crop demand could have been successfully tested. Tubewells provide the only reasonable hope for on-demand irrigation in the Indus River system. On-

demand irrigation is not technically feasible where water supplies from canals are inadequate.

Attempts to get farmers to reduce their cropped acreage to match short water supplies, as was done in the CWM Project, are inappropriate. To maximize crop production per unit of available water in water scarce situations, farmers must expand their cropped areas and apply less than the optimum amounts of water. In this regard, Pakistan's irrigated agriculture should not be judged on a per-acre basis, instead production per unit of water is more appropriate because of the designed shortages in the irrigation system.

- The full watercourse trials activity turned out to be the most effective new model for convincing farmers on farms adjacent to demonstrations to adopt technical recommendations.
- If provincial agricultural extension staff are involved from the start of a project, there will be better prospects for developing realistic low-cost extension models and ensuring continuity in transferring these models after the project ended.
- Private input suppliers and agricultural credit institutions should be encouraged to monitor and respond to market conditions in irrigated regions. They should not be encouraged to make exceptional efforts to meet the temporary requirements of projects.

6.3. Civil Works

- Civil works should not be used as an incentive or catalyst for accomplishing other more difficult project activities. Civil and non-civil works must proceed in tandem to maximize returns from donor investments in irrigated agriculture.
- Civil works had little success in reducing fluctuations in canal flows. Seepage losses were diminished if not eliminated with canal lining; yet there remain considerable water losses along these channels because operational waste and theft have not been materially diminished. Civil works alone have had little or no positive effect on equity of water delivery, even though there is some increase in supply at tail-end farms.
- The outlet is the heart of the equity issue along the delivery channels. Readjusting or repairing—i.e., making it operate according to design—ensures equity along the watercourse, so long as the main channel itself is operated near its designed discharge.
- The restrictions put on the amount of lining allowed on watercourses may have caused inequities between farmers because there are obviously lower losses along a lined watercourse than along an improved earthen one. This is especially true after a season or two of inadequate maintenance.
- The project had no measurable effect on investment in or operation of private tubewells. An important and valuable opportunity was missed to provide needed knowledge to carry

out a replicable experiment that might have had tremendous impact on the future irrigation in Pakistan.

- The practice of operating canal systems above the full supply level in order to "feed the tails," without openly admitting it, causes much confusion and misunderstanding among water users when outlets are remodeled to designed discharges. At present, poor management causes the greatest losses in Pakistan's irrigation systems. Until this problem is openly dealt with, there is no reason to assume that further lining of the major arteries of irrigation systems will have any effect whatsoever on improving the equity of water delivery.

6.4 Project Design and Implementation

- The project's two-stage design proved to be the biggest mistake of the CWM Project. The concept caught hold and played to the inherent local bias in irrigation projects that civil works had to be improved before activities directed at improving agricultural productivity and testing new institutional arrangements could start.

  This concept of irrigation development is totally without merit. The tentative and limited project interventions in agriculture demonstrated conclusively that farmers can and do readily recognize the value of certain interventions—e.g., improved seed quality new crop varieties, better broadcasting methods, use of new types of equipment—even in the absence of significant changes in their water delivery systems.

  The success of institutional development, the advancement of new models for improved cooperation and coordination between provincial line agencies, also does not depend on physical progress in civil works.

- The CWM Project was governed by multiple planning documents—each claimed by one or more of the project implementors as being binding. It was a formidable clerical task simply to keep track of all these disparate documents. The more fundamental problem was that the array of planning documents evidently conveyed conflicting messages about CWM objectives and the relative priority to be assigned to different project activities.

- In a project with the stated objective of improving coordination between participants at all levels, the long and complicated chain of authority in project implementation prevents clear and rapid transmission of managerial decisions to all participants; it also inhibits conveying feedback from separate sub-project areas when problems arise.

- One major weakness in project implementation was the failure of the technical assistance team/SMO relationship to generate a coherent management strategy that effectively linked diagnostic and baseline surveys, annual planning activities, periodic progress reporting, and monitoring/evaluation operations into a strong management information system. In the absence of such a system, project activities tended to be driven more by daily exigencies and the wishes of individuals than by any coherent overall implementation strategy.

- Where attainment of a project goal and purpose are to be the responsibility of provincial line agencies, a specific operational process, which has clear objectives and targets, must be agreed upon, put in place, and strengthened through appropriate institution building activities.

- Where a project design specifies approaches without making provisions for flexibility during implementation, innovations that develop during implementation tend to be viewed as departures from mainstream project activity. This reduces chances for technical and other resources being made available for innovations even where they might be more realistic than the approaches originally proposed.

- It should not be assumed that monitoring and evaluation functions will be fulfilled simply by designating staff. Without equipment, on-the-job supervision, assistance with developing indicators, data-gathering techniques, and approaches to analysis, monitoring and evaluation activities remain a mere formality and are of little use.

- It is not possible to have effective decentralized management at the field level without devolving the necessary authority to the unit manager at that level for administrative and programmatic controls over the line agency units operating at the same level.

Chapter 7

RECOMMENDATIONS

7.1 Institutional Development

- Any future CWM-type project should operate through decentralized management under an autonomous authority headed by one manager at the command level of a canal. Operating staff of the irrigation department, OFWM teams, and extension agents must be placed under the administrative control of this authority. Project financial resources must flow to and be allocated by this authority. The operational objectives of all the component units of the authority must be delineated at the outset. The manager, his staff, and those of the operational units must be reoriented and trained to meet the objectives, and the entire process must be closely monitored.

- Any project with institutional development objectives must identify specific institutional goals and objectives at the design stage and then develop objectively verifiable indicators to measure progress toward their attainment.

- To ensure proper project management, both donors and the federal government should closely monitor any special management units created, and should respond quickly to fill any gaps in capacity.

- In any future irrigated-agriculture project, any necessary cooperation between provincial line agencies must be carefully defined. The results expected from this cooperation must be based on a realistic understanding of the constraints under which provincial line agencies operate.

- The functions of OFWM teams need to be redefined to go beyond blueprint construction. A program for on-site training for OFWM staff should be developed and carried out to enhance sensitivity to local physical and social-economic conditions.

- Designers of projects need to keep in mind that it is best for farmers to organize themselves, according to their own perceived needs and interests, not an externally-imposed agenda or model. Once farmers have decided on their own agenda under the project, the project should assist farmers in appropriate areas such as establishing procurement procedures, use-sharing arrangements, and simple bookkeeping and accounting methods.

7.2 Agricultural Development

- Design of any irrigated agriculture project on the public canal system in Pakistan must take into account the fact that the system is water scarce by design. In the absence of conjunctive use of tubewell water on a wide scale, cropping patterns in the irrigation perimeters of Pakistan must be tailored to the available water supply.

- Any project with the explicit goal of increasing agricultural production and farmer income must delineate a formal and well-defined role for the provincial agricultural extension department. Any extension models developed in such a project must be replicable by agricultural extension agents within the context of normal provincial budgets and personnel resources.

- To ensure the appropriateness and relevance of improved crop technologies, detailed farm management studies should be carried out early in any project to analyze the farming systems in a command area. Based on study findings, appropriate technical packages should be developed for different groups of farmers, based on their available resources, the constraints they face, and their ability to adopt package components.

  Where irrigation equity cannot be assured, agricultural interventions should be tailored to existing irrigation water availability. Farmers who have an unreliable water supply obviously cannot benefit from packages designed for optimum irrigation.

- If demonstration plots are to be a primary extension method, they should be set out based on the "On Farm Constraints Research Methodology" developed by CIMMYT and IRRI. The trials should be based on a 2^n factorial design to determine the relative contributions of various bio-physical and socioeconomic factors to closing the gap between on-farm yields and potential yields.

- Where improved technical packages or individual component technologies have been tested and found acceptable to farmers, they should be promoted on a wider scale using the full watercourse trial approach. Low-cost extension training materials—e.g., videos of on-farm trials and demonstration plots, wall posters, and radio messages--should also be prepared and used frequently to disseminate technical information to farmers throughout project command areas.

- Introduction, multiplication, and dissemination of high-yielding crop varieties, in association with research institutes and seed certification agencies should be a primary activity of any irrigated agriculture project. Seed multiplication efforts should be organized where a nucleus group of farmers can serve as a seed bank for a command area.

7.3 Civil Works

- Civil works should not be used in further projects as an incentive or catalyst for accomplishing other more difficult project activities. Civil and non-civil works must proceed in tandem to maximize returns from donor investments in irrigated agriculture.

- The outlet is at the heart of the equity issue along the delivery channels. If tampering with outlets cannot be prevented, there is no rationale for remodeling canal outlets. Where remodeling is done, outlets should be remodeled to a design that recognizes that prior use has been greater than authorized. For example, the sizes of remodeled outlets should be 10, 15, or 20 percent more than was authorized at the initial design. This

change in procedure would give farmers the feeling that they are sharing in the benefits accruing from interventions and not suffering a decrease in their proportional allocations of irrigation water.

- Private tubewell user associations should be encouraged. They should be given expert help in understanding tubewell technology and management. Joint ownership and operation of private tubewells, coupled with inadequate but constant canal supply, provides the only real hope of creating irrigation "on demand" in the Indus River irrigation system.

- In addition to on-site design and inspection of civil works, supervisory consultants should be given an advisory role in awarding construction contracts and in authorizing payments made to contractors. To accomplish this they need to maintain a presence at all construction sites.

7.4 Project Design and Implementation

- The concept of two-stage development, in which civil works must be essentially complete before other important agricultural or institutional activities are started, should be categorically rejected in future CWM-type projects.

- Any future projects should be governed by a single, internally-consistent set of planning documents, and all project implementors should recognize these documents as the authoritative and legal basis for all project activities.

- In any project with the stated objective of improving coordination between participants at all levels, the chain of authority in project implementation must be short and well defined to facilitate clear and rapid transmission of managerial decisions to all participants and easy feedback from the project areas when problems arise.

  Where attainment of a project goal and purpose are to be the responsibility of provincial line agencies, a specific operational process, which has clear objectives and targets, must be agreed upon, put in place, and strengthened through appropriate institution building activities.

- Any future project must have a coherent management strategy that effectively links diagnostic and baseline surveys, annual planning activities, periodic progress reporting, and monitoring/evaluation operations into a strong management information system. In the absence of such a system, project activities will tend to be driven more by daily exigencies and the wishes of individual participants than by any coherent overall implementation strategy.

- Project design must not so rigidly specify institutional models and approaches that flexibility during project implementation is precluded and there are no opportunities to use project resources to develop innovative approaches not envisioned during the design period.

- It should not be assumed that monitoring and evaluation functions will be fulfilled simply by designating staff for the purpose. Any future project must provide necessary equipment, training, and on-the-job supervision in developing objectively verifiable progress indicators, designing data-gathering exercises, and putting in place appropriate systems for prompt data analyses, report production, and information transfers.

ANNEX A

SUB-PROJECT SITE REPORTS

ANNEX A

SUB-PROJECT SITE REPORTS

I. Punjab Province

A. Niazbeg Sub-Project Site

1. Circumstances of the Visit

The entire evaluation team visited the Niazbeg Sub-Project on 9 November 1992. The team was accompanied by the sub-project manager and staff from the sub-project management office [SMO]. Representatives of the Provincial Agriculture Department [PAD] and Provincial Irrigation Department [PID] also participated in team briefings and site visits.

2. Background

The Niazbeg sub-project area covers a gross area of 86,176 acres and contains 79,136 acres of arable land. The estimated population of the 70 villages in the sub-project zone is 126,000 people [66,000 males and 60,000 females]. The sub-project lies in the Kasur District on both sides of the Lahore/Multan national highway. Since it is close to Lahore, parts of the zone are classified for industrial use. In recent years, the entire sub-project area has been significantly affected by urban penetration for both suburban housing and industrial development.

The irrigation system, within which the sub-project is located, is part of the Upper Bari Doab Canal. The system is 133 years old, having come into operation in 1859. The sub-project area lies between Rohi Nallah and the river Ravi and slopes towards the river. It is, therefore, naturally drained. Topography throughout is essentially level and 83 percent of the area has well-structured soils and drainage characteristics which are suitable for most crops. The water table in five percent of the area ranges between 10 to 15 feet; while, in 95 percent of the area, it lies at more than 15 feet below the surface. Because of these characteristics, there are no serious waterlogging problems in the area. The irrigation water is sweet. The area receives an average annual precipitation of 15.4 inches, with 80 percent falling during the summer months of July and August.

The sub-project lies in the command of the Niazbeg distributary canal, which has a total estimated discharge of 449 cubic feet per second [cusecs] and takes off at the tail of the Lahore Branch Canal. The Niazbeg distributary RD 76,817 to Tail RD 185,240 and its three minor canals -- Kamogil, Jalleke and Thatti Utar, with a combined length of 29 miles -- irrigate the area. The sub-project is served by 85 watercourses. The sanctioned water allowance is 2.84 cusecs per 1,000 acres and the design intensity for irrigation was fixed at 75 percent.

It is estimated that the annual water supply from the canal totals 129,000 acre-feet. This supply is supplemented by an estimated 25,500 acre-feet from 48 public tubewells, having a capacity of 2.5 cusecs each, and 2,000 acre-feet from 50 private tubewells, having a average capacity of one cusec each.. The estimated annual crop water requirement in the zone is 167,000 acre-feet. According to provincial officials, the estimated water savings from sub-project canal and watercourse lining will be 36,250 acre-feet.

The 1987/88 cropping intensity in the area was estimated at 144.9 percent [PERI, 1988]. This cropping intensity was projected to rise to 185 percent by the end of sub-project activities. The principal crops grown and percentages of each in the zone are: forages [20.3], cotton [7.4], rice [6.3], sugarcane [4.3] and maize [1] during the Kharif season; and wheat [45.5], forages [11.5], vegetables [11.6], and sugarcane [4.3] during the Rabi season. Selected crop yields reported in the CWM project baseline survey [PERI, 1988] and current crop yields as reported by the SMO and the PAD are shown below.

Crop	Baseline Yield [1987/88] [kilograms/acre]	1991/92 Average Yield [kilograms/acre]
Wheat	896	1,012
Sugarcane	17,132	13,804
Rice	544	853
Cotton	452	267

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

The physical progress on civil works in the Niazbeg sub-project as of October 1992 is shown below. The physical progress has slowed in the sub-project since the targets were revised. This is especially true with the watercourses. This could be due to the inherent delays in gaining approval for the revised PC-1 which sanctioned the additional civil works.

Irrigation works in Niazbeg involve canal rehabilitation and lining and remodeling of outlets. The canal lining is accomplished by cast-in-situ, non-reinforced concrete. The quality of the concrete and its placement appears to be acceptable; however, it was not possible to observe the bed portions because all channels were operating. The older sections of lining are experiencing silt deposits on the side slopes. This is an indication that the slopes are too shallow to permit passage of silt, as is called for in an alluvial channel. The silt deposit provides a place for weeds and grasses to germinate, with the result that roots are now penetrating the joints. This problem was noted during the mid-term evaluation, yet apparently little has been done to attempt a solution. The problems arises from the fact that in-situ cast concrete cannot be placed on slopes steep enough to eliminate silt deposits on the side slopes.

Two solutions are possible:

- Canal cleaning needs to be accomplished on a regular basis and more frequently than with an unlined channel. The operation is simple enough, however needs to be done on a timely basis or lining failure could result; and

- Canal cross-sections could be lined with bricks in the manner of the older upper reaches of the Niazbeg distributary in the city of Lahore.

No satisfactory rationale was given as to why brick lining was not attempted, even on a trial basis.

The quality of lining on all watercourses visited was excellent. In some instances, the watercourse structures had been chipped or broken allowing leakages to occur. In these cases, evidently the farmers have no program for replacement. The struggle regarding the quantity of lining to be reimbursed on each watercourse reported in the mid-term evaluation continues. OFWM staff pleaded the case with the evaluation team and one group of farmers were not only dissatisfied with the sanctioned length of lining but also its location. When asked if they were not heard during the design stage, they indicated that more influential farmers were able to influence the choice.

Maintenance of the improved watercourses is being accomplished satisfactorily. All farmers interviewed indicated that this was one of the major benefits. The lining itself provided them with more water and the reduced maintenance made it less costly to maintain the proper flows.

There is considerable fluctuation in the flow rate of the Niazbeg distributary. This apparently is a condition that existed prior to the CWM project and was noted during the early diagnostic analysis studies. Apparently, the project has had little or no effect on eliminating or reducing this damaging feature. Equity is not possible when supplies

fluctuate on an apparently random basis.

Status of Niazbeg Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Pevised Target	Work Remaining
Canal Rehabilitation	38.80 miles	11.40 miles	29.4	27.40 miles
Lining of Canals	42.06 miles	39.00 miles	92.7	3.06 miles
Remodeling of Outlets	220 outlets	105 outlets	47.7	115 outlets
Lining and Improvement of Watercourses	130	89	68.5 %	41
Precision Land Leveling	3,9674 acres	4,891 acres	123 %	0 acres

The recording gauge at RD 134 was visited. The flow rate was 75 cusecs against the sanctioned discharge at that point of 90 cusecs. The chart for the previous two week period indicated fluctuations from about 45 to 90 cusecs, with flow at the designed discharge of 90 cusecs occurring only once during a four hour period. Fluctuations were often quite rapid. Fluctuating flows in the distributary, coupled with less than sanctioned discharges, presents a case where equity among watercourse outlets is not possible.

Design project documents call for development of an "operational plan" after diagnosing water delivery problems. This important project feature has evidently never been satisfactorily addressed. In fact, it is not even called for in the CWM project PC-1 for the Punjab.

The operations of the upper reaches of the Niazbeg distributary in the sub-project area have been turned back to the operations division of the PID and the SMO no longer has any influence over its operation.

On all watercourses visited, the farmers -- and especially the tail-enders -- noted that the improved channel had been raised over the previously unlined one. This facilitated irrigation and they are able to irrigate one acre in less time -- an indication of their receiving more water. This raised channel improvement could be the major technical reason for lining minors together with watercourses and thereby remodeling the outlet.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the cropping intensity of the sub-project area was reported to be 170 percent. In the project baseline survey, completed by PERI in 1988, the cropping intensity was estimated at 144.9 percent. And, CWM/SMO sub-project monitoring data for crop year 1990/91 show a cropping intensity in the sub-project area of 152 percent. The available data, therefore, show no clear trend in area cropping intensity. The present cropping

intensity, as reported by the CWM/SMO, is intermediate between the cropping intensities indicated by the pre-project feasibility study and the project baseline survey.

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. Five point observations of cropping patterns are available. They are: the pre-project feasibility report [1981/82]; the project baseline survey [1987/88]; the CWM report [1988/89]; the CWM report [1989/90]; and the CWM report [1990/91]. The data are reported below.

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	Pre-project Feasibility Report	Project Baseline Report	CWM Report 1988/89	CWM Report 1989/90	CWM Report 1990/91
Rabi Crops					
Wheat	67.4	45.5	63.0	63.8	69.2
Forages	14.9	11.5	19.7	21.4	19.5
Sugarcane	8.1	2.1	2.1	8.9	8.2
Others	17.6	11.6	14.7	5.9	1.3
Kharif Crops					
Cotton	14.7	7.4	8.1	10.1	6.4
Sugarcane	8.1	4.3	11.4	17.0	11.8
Rice	18.0	6.3	13.3	12.4	21.6
Maize	2.4	1.0	1.0	5.3	0.3
Forages	48.7	20.3	50.5	52.2	48.1
Others	10.0	1.7	15.9	3.0	6.7

Note: Percentages in some cases total to more than 100 percent reportedly due to inter-cropping and rounding of reported figures.

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c. Observations in the Sub-Project Area

(1) Statements from Farmers

To assess the impacts of the project, in terms of cropping intensity, increases in crop production and factor productivity, and to assess the relative contributions of various factors to changes in the above mentioned performance indicators, and to assess the replicability and sustainability of various interventions, farmers located on various watercourses were interviewed.

The informal interviews on the first watercourse indicated that the cropped area has generally increased by about 25 percent. Per acre yields of different crops have increased as follows: wheat [720 to 1,600 kilograms]; maize [1,400 to 2,400 kilograms]; and sugarcane [14,000 to 48,000 kilograms]. Fertilizer use has increased from two to 4.5 bags per acre; and the ratio of nitrogen to phosphorus has improved. The main source of information for better cultivation practices was identified as CWM/SMO project staff and provincial agricultural extension staff. Sugarcane

is slowly being replaced by cotton. The average yield of cotton was reported as 1,000 kilograms per acre. The farmers indicated that maize is now inter-cropped with sugarcane as advised by CWM/SMO staff. It was also reported that the average farm income has doubled.

Farmers from the neighboring watercourse, however, reported that although yields have increased, there has been no change in the cropped area. The per acre yields of different crops have increased as follows: wheat [800 to 1,400 kilograms]; maize [600 to 800 kilograms]; and sugarcane [10,000 to 20,000 kilograms].

The farmers located on Pattoki distributary, acknowledged significant increases in the cropped area, as well as in crop yields, which led to an increase in income of 100 percent.

(2) Observations

Following impressions are based on limited observations, given the time available in the field, and should be seen only as indicative with respect to the directions of change and the potential impacts of these changes on farm production and/or factor productivity.

Based on the visits to the selected watercourses, informal interviews with beneficiaries, and farmers' perceptions, project interventions can be ranked by importance as:

- **Increased Water Availability**

Most farmers indicated that their cropped areas have increased due to improved water availability. However, a few farmers, especially tail-enders, expressed their feeling that the availability of irrigation water to their farms had actually been reduced.

- **Balanced Use of Fertilizer**

The nitrogen:phosphorus ratio and the level of fertilizer use have generally increased where water availability and high yielding crop varieties have been introduced. There is, however, no evidence of wider adoption of higher levels of fertilizer among farmers not directly contacted by project and line agency staff.

- **Better Tillage Operations**

Farmers who have had access to USAID-supplied farm equipment as members of the agricultural equipment pool reported that their crop yields have increased substantially with the use of deep tillage. The benefits of this intervention, however, have been limited in the sub-project area because the use of USAID-supplied equipment use has been limited to the members of the pool located on one watercourse.

- **Improved Seed**

Most farmers who reported a shift to higher yielding crop varieties indicated substantial yield increases. However, it could not by determined from SMO monitoring and evaluation records how many farmers have actually had improved access to better seed as a direct result of project activities.

In the absence of reliable monitoring and evaluation data [time series and cross-sectional], the cost effectiveness of individual project interventions could not be determined with any accuracy. Moreover, it was impossible to quantify the overall impact on agricultural production or identify the relative contributions of water and other crop-related, non-civil works inputs made available to farmers in the sub-project area. It is a fact, however, that most non-civil works interventions have only been tried on selected watercourses and, within those watercourses, with very limited numbers of farmers. With the completion of project activities in the near term, any wider adoption of the interventions introduced will of necessity be a function of provincial government resources and farmer-to-farmer

communications.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

a. Water User's Associations and Federations

Formally registered WUAs exist on all but nine of the watercourses in the Niazbeg sub-project. The process resulting in the registration of WUAs was led by the OFWM staff responsible for the execution of the watercourse construction. Construction was only procedurally possible after at least 51 percent of the users on each watercourse associated themselves into a formal organization that was legally registered. This approach began and ended with watercourse construction. It ensured both collective responsibility of farmers to provide labor and individual liability to pay back 25 percent of the cost of materials in proportion to land holdings. This approach was not very demanding since informal organization to collectively mobilize for cleaning the watercourses had more or less always existed and only needed formalizing.

The participatory approach proposed by the technical assistance team was not tried in Niazbeg. According to the SMO, by the time the suggestion was made, no "virgin" watercourses on were available in the sub-project area, all having been lined.

Attempts to organize farmers into interest groups around non-water inputs were made on one site in each sub-project -- called the coordinated water course. These were sites where all inputs could be delivered, tried and demonstrated for replication and adoption. These watercourses were later renamed "full watercourse trial" sites. The Niazbeg site was located on the Kamogil minor. However, the trials here were discontinued after two seasons, apparently due to lack of consensus within the project and were not taken up together on one single site elsewhere.

The agricultural equipment pool was started at Bhagiana, a village inhabited by farmers from three different watercourses, by the SMO staff with equipment provided by USAID for general demonstration purposes. The pool is still operational based on organizational, financial and management mechanisms that the SMO staff helped develop and supervise initially. The membership of this pool, including the bank deposit, comprising membership fee and user charges, is said to be growing steadily. The amounts collected will eventually be used by the implements user group to replace the existing machinery, with a new set that will belong to them collectively.

The SMO claims to have tried a few water management interventions -- with OFWM and agriculture extension staff but without the help of the technical assistance team -- on some of the watercourses around Bhagiana. These demonstrations were neither sustained nor documented.

No WUA federations were organized in the Niazbeg area. The WUADS recruited by USAID resigned after 10 months.

c. Line Agency Collaboration and Institutional Change

The Niazbeg distributary, which was handed over to the CWM circle of the PID for the construction of the lined canal at the start of the project, has now been returned to the jurisdication of the PID operations division. Operations division staff did not participate in the CWM project and were impacted by it only indirectly through the temporary suspension of their normal operations and maintenance work. Their responsibilities under the Canal Act -- i.e., water sanctioning, charge assessments, and delivery scheduling beneath the outlet -- continued as usual in isolation from the project.

The OFWM teams responsible for the improvement of the watercourses will leave the sub-project area as soon as they have attained their remaining construction targets.

In the absence of a formally structured role in the project -- and the resources that accompany it -- attempts by the SMO to draw agricultural extension staff into sub-project activities were seen as additional work and resisted. Agriculture extension staff based in the sub-project area appear to have adopted no new interventions generated by the CWM project in their regular work program.

Efforts at developing replicable mechanisms for agriculture input agencies, both public and private, to respond on time to the needs of the farmers were limited to an occasional invitation for monthly SPCC meetings held in Bhaipheru. That these meetings have had no impact is evidenced by the acute shortage of fertilizers currently be experienced by small farmers during the crucial period when they are sowing their wheat crops.

B. Shahkot Sub-Project Site

1. Circumstances of the Visit

The entire evaluation team visited the Shahkot sub-project on 10 November 1992. The team was accompanied by the sub-project manager and staff from the SMO. Representatives of the PAD and PID also participated in team briefings and site visits.

2. Background

The Shahkot sub-project covers a gross area of 133,316 acres and contains 103,774 acres of arable land. The cultivable command area is 48,774 acres according to the PC-1. The estimated population of the 75 villages in the sub-project zone is 199,000 people [104,000 males and 95,000 females]. The sub-project is situated in the Sheikhupura Tehsil of Sheikhupura District and the Jaranwala Tehsil of Faisalabad District.

The sub-project is served by the Shahkot and Khurrianwala distributaries, which have a total discharge of 164 cusecs. The sub-project has 162 watercourses. The sanctioned water allowance is 2.80 cusecs per 1,000 acres.

It is estimated that the annual water supply from the canal totals 105,300 acre-feet and this supply is supplemented by 27,200 acre-feet from 48 public tubewells and 39,000 acre-feet from 350 private tubewells. The estimated annual crop water requirement in the zone is 201,500 acre-feet. According to provincial officials, the estimated water savings from sub-project canal and watercourse lining will be 31,970 acre-feet. The area receives an average annual precipitation of 11 inches, with 80 percent falling during the summer months of July and August.

The sub-project area is underlain with relatively sweet groundwater but suffers from drainage problems. To alleviate these problems, both subsurface and surface drainage works were proposed as World Bank-funded activities under the CWM Project. The surface drainage system consists of drainage canals and the subsurface drainage system consists of 36 public tubewells located at the tail end of the sub-project area.

The 1987/88 cropping intensity in the area was estimated at 128.2 percent [PERI, 1988] and was projected to rise to 158 percent by the end of sub-project activities. The principal crops grown and percentages of each in the zone in 1987/88 were: sugarcane [13.1], forages [11.6], rice [6.7], cotton, maize [2.1], cotton [1.7], and vegetables [3.3] during the kharif season and wheat [51.3], sugarcane [25.1], forages [9.6] and others [0.6] during the rabi season. Estimated 1987/88 crop yields [PERI, 1988] and current crop yields in the sub-project area as estimated by the SMO and PAD are shown below.

Crop	Baseline Yield [1987/88] [kilograms/acre]	1991/92 Average Yield [kilograms/acre]
Wheat	876	893
Sugarcane	13,920	11,,054
Rice	860	1,067
Cotton	208	139

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

This sub-project has a component for drainage works because of high water tables. Therefore, there are elements of surface and sub-surface drainage in the civil works component. The revised sub-project targets and achievements to 30 September 1992 are shown below.

Status of Shahkot Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Canal Rehabilitation	41.70 miles	32.43 miles	77.8	9.27 miles
Lining of Canals	42.79 miles	31.43 miles	73.5	11.36 miles
Remodeling of Outlets	232 outlets	152 outlets	65.5	80 outlets
Surface Drainage	13,200 acres	12,000 acres	90.9	1,200 acres
Public Tube Wells	39 wells	36 wells *	92.3	3 wells
Lining and Improvement of Watercourses	127	89	70.1	38
Precision Land Leveling	4,756 acres	4,720 acres	99.2	36 acres

Note: * Construction is complete; however, only four wells have been commissioned and are pumping.

The field tour included a thorough visit to the surface and sub-surface drainage area at the tail end of the Shahkot distributary. The entire length of the 3-L tertiary of the Madriana drain was observed as weli as a general view of the agricultural area served by the entire drainage scheme.

After discussion with farmers of that area and with several WUAs and the Federation of WUAs, the tour was completed by transversing the entire length of the Shahkot distributary to Lakarmadi. Several watercourses along the distributary were observed. This tour was made with PID, CWM and supervisory consultant personnel.

The construction of the drainage works is essentially complete. Most of the drainage wells have not been commissioned, however connections have been made and apparently all of the wells will soon be operative. During the field visit, only four wells were operating. The effluent from these wells is discharged into the surface drainage network. The effluent by tasting appears to be quite useable for irrigation. Thorough chemical testing should be done to determine if some of this water could not be used to augment canal supplies which are certainly short in this area. Undoubtedly, the drainage effluent will gradually become more saline but, until such time as it does, good use could be made of it.

The open surface drains were constructed more than two years ago and there is ample evidence that little or no maintenance -- i.e., cleaning -- has taken place since then. The 3-L tertiary of the Madriana drain is especially in need of cleaning in its upper reaches. According to the PID officials, there is no provision in the CWM project for maintenance and, until such time as the system is returned to the PID for operation, there is no facility for maintenance.

The general appearance of the area at the time of the visit would indicate that drainage is not a problem. This is undoubtedly evidence that the surface drainage is operative in removing monsoon rainfall which previously would inundate large areas for several weeks. All farmers interviewed indicated that this feature of the CWM project was highly beneficial and they are now able to reclaim salt affected lands by leaching.

The lining of the Shahkot distributary is essentially complete. There are two reaches near Shahkot where work is proceeding to divert the flow from the temporary channel into the newly laid portion. This work will surely be completed in a matter of days.

The quality of canal and watercourse lining is certainly acceptable and according to specification. Silting along the side slopes of the distributary has not yet occurred but there is evidence that it is starting. Care should be taken to keep these slopes clean in order that silting and the resulting weed growth does not occur.

Outlet remodeling has taken place on all watercourses along the distributary. This design feature is innovative an undoubtedly will be adopted as standard procedure for the PID when any channel above outlets is improved.

There is no evidence that the civil works have improved equity along the distributary. Some outlets have clearly been tampered with with the result that the tail reach of the distributary was operating at perhaps less than 75 percent of the sanctioned discharge.

All farmers visited, however, do acknowledge that equity along watercourses has improved. They recognize that some watercourses are not getting their full shares of water because of theft. They appear to be willing to freely discuss the problem among themselves while in the company of an external team of officials. One wonders if these issues are discussed with the WUA federation -- apparently not; yet a reasonable assumption would be that this type of issue should be an important reason for creation of a federation. One cannot help but wonder if the federation is not promoting the inequity, rather than suppressing it. Influential farmers are naturally the officers of the federation and perhaps their stature in the community as big persons in a legal organization provides them with a license to receive extra benefits.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the crop intensity of the sub-project area was reported to be 143 percent. In the project baseline survey, completed by PERI in 1988, the crop intensity was estimated at 128.2 percent. And, CWM/SMO sub-project monitoring data for crop year 1990/91 show a crop intensity in the sub-project area of 139.3 percent. The available data show no clear trend in area cropping intensity over the life of the project. Present cropping intensity, as reported by the CWM/SMO is intermediate between the percentages shown by the pre-project feasibility study and the project baseline survey.

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. Five point observations of cropping patterns are available. They are: the pre-project feasibility report [1981/82]; the project baseline survey [1987/88]; the CWM report [1988/89]; the CWM report [1989/90]; and the CWM report [1990/91]. The data are reported below.

c. Observations in the Sub-Project Area

To assess the impacts of the project, in terms of cropping intensity, increases in crop production and factor

productivities, and to assess the relative contributions of various factors to changes in the above mentioned performance indicators, and to assess the replicability and sustainability of various interventions, farmers located on various watercourses were interviewed.

The farmers on the first watercourse visited had an agricultural equipment pool. The farmers reported that cropped area remained the same [87 percent cropping intensity] even after the canal lining and watercourse improvement, while the yields have increased significantly. The yield of wheat increased from 720 to 1,240 kilograms per acre, sugarcane yields increased from 14,000 to 26,000 kilograms per acre, while maize yield increased from 600 to

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	Pre-project Feasibility Report	Project Baseline Report	CWM Report 1988/89	CWM Report 1989/90	CWM Report 1990/91
Rabi Crops					
Wheat	59.2	51.3	52.0	64.7	63.0
Forages	16.4	9.6	10.0	14.2	13.0
Sugarcane	25.1	13.1	12.0	14.2	20.1
Others	4.7	0.6	1.0	6.8	0.0
Kharif Crops					
Cotton	7.6	1.7	5.0	1.6	3.0
Sugarcane	25.1	13.1	18.0	33.2	31.3
Rice	21.8	6.7	12.0	20.1	30.5
Maize	4.3	2.1	2.0	6.6	0.5
Forages	22.1	11.6	12.0	28.2	32.8
Others	8.3	3.3	1.0	10.3	1.7

Note: Percentages in some case total to more than 100 percent because of intercropping and rounding of reported figures.

1,800 kilograms per acre. The increase in yield was attributed, in order of importance, to improved seed, balanced use of fertilizers, and better tillage. Farmers reported that their income has increased by 40 percent. On this watercourse, canal water is supplemented by tubewell water.

The farmers on second watercourse reported that, as the canal supplies remained the same, cropped area remained the same as it was before canal lining and watercourse improvements. One farmer on this watercourse indicated that, although he used a new high yielding variety for wheat, his yield of wheat per acre had not increased. Moreover, even though the CWM project had laid out a demonstration plot for cotton using a new ridge planting method, he had not adopted the new method because he was not yet convinced that the new method was profitable.

A farmer on the third watercourse visited acknowledged that the cropped area on his farm increased by about 20 percent. His yield of wheat had increased from 720 to 1,000 kilograms per acre, and his sugarcane yield had improved from 8,000 to 14,000 kilograms per acre. The farmer has access to tubewell water. He attributed the increase in yields to new high yielding varieties introduced by the project.

The farmers on a fourth watercourse located on the Pakka Dalla minor reported that water delivery had improved after the improvement of their watercourse, but was significantly reduced after the canal lining and remodeling of the watercourse outlet. They indicated that they had approached all possible quarters for correcting the situation, but the matter has yet to be resolved.

The yields on this watercourse, however, have increased significantly due to better management practices adopted from the experience gained from the full watercourse trials carried out with the assistance of project staff. The wheat yields were said to have increased from 840 to 1,520 kilograms per acre, sugarcane yields have increased from 14,000 to 32,000 kilograms per acre, and rice yields have increased from 640 to 1,480 kilograms per acre. The increases in crop yields were attributed to adoption of better irrigation practices, based on irrigation schedules demonstrated on the watercourse, new high yielding varieties, and balanced use of fertilizers.

Unfortunately, this evidence of project success in increasing crop yields and farmer incomes, the full watercourse trial in Shahkot was discontinued and shifted to another watercourse as a coordinated watercourse trial by the sub-project manager.

In this area, farmers indicated that they regularly supplement water supplied from the gravity canals with groundwater pumped from private tubewells. The farmers who do not own their own tubewells generally purchase water from the tubewell owners.

In the absence of reliable cost accounting data, the financial viability of individual interventions and factor use on farms in the sub-project could not be determined. Moreover, because of inadequate monitoring and evaluation by the SMO, it is presently impossible to quantify the aggregate impacts on agricultural production and/or factor productivities; or to identify the relative contributions of irrigation water and the various improved cultivation-related, non-civil works interventions tried in the sub-project area.

What can be said is that sub-project interventions have only been tried on selected watercourses with very small numbers of farmers. Wider adoption of these interventions may proceed in the future, largely through the farmers' own communication network, but this is by no means guaranteed.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

There is evidence of extensive innovative work on farmer organization by the SMO at the tail of the Shahkot distributary. The area comprises ten villages and approximately 20 watercourses. The work was done with the help of a group of school and college students called the Agriculture Forward Organization [AFO]. The AFO was organized by the SMO under the personal leadership of the sub-project manager to serve as a communications group that could act as a catalyst to organize the farmers into interest groups on the watercourses and as a federation with an executive committee of ten members on the level of the distributary.

a. WUA Federation

While driving to the Shahkot sub-project area, the evaluation team was told that the WUA federation met on the 10th of every month at 1000 hours, and as luck might have it, it was the 10th of the month and approaching 1000 hours! The team was guided to a village where the executive committee and a number of farmers and students from the AFO were waiting to meet them in the courtyard of the president's home. This man is a large and prosperous farmer, with property not only in the Shahkot sub-project area but also in Sindh. The team witnessed an elaborate ritual of the convening of the meeting that included a roll call of the members and speeches by the secretary, the president and a member of the AFO.

The tail reach of the distributary has historically been water short, the team was informed while talking to individual members of the executive committee. Leading farmers from the watercourses located in the area have often,

individually but also as a group, approached irrigation officials in Faisalabad to try and get regular supplies in the past. However, after being organized into a formal federation under SMO patronage, they appear to be emerging as a collective pressure group vis-a-vis the PID.

At least on occasions such as the evaluation team's visit, CWM project personnel manage to ensure the presence of PID officials, who have to sit and patiently listen to animated complaints and pleas. Unfortunately, these officials are from the PID/CWM circle and not the regular operations division to whom the canal will be handed over once the construction is complete. One wonders about the fate of the WUA federation and the posture of the PID towards it after the support of the SMO is withdrawn.

In the absence of independent case studies on the internal and informal dynamics, very little can be said about how inequities between the various member watercourses of the federation are handled. There is evidence by looking at the flows in some outlets that they are drawing way too much. For the moment, the leaders of the federation are demanding at the minimum, that the aggregate sanctioned discharge for their command area be delivered in the distributary at the point above where their constituent outlets begin. However, they discourage any discussion on irregularities on these outlets, which they consider their internal matter. The PID staff are not too impressed by these arguments and, in reasserting their jurisdiction over canal operations, have registered reports of tampered outlets with the local police for prosecution.

b. Farmer's Interest Groups

It is difficult to assess the degree of success of the SMO in organizing the farmers in the area, through the students' "communication group", into functioning interest groups in the absence of documentation and independent studies or evaluations. As a matter of fact, it is doubtful that, with the resources and time available to the SMO, any interest groups were organized in the sub-project area, beyond the agricultural equipment pool built around the use of equipment provided by USAID.

c. The Students' Group

The students' group has operated on stipends contributed by various private sources. A private seed supplier offered seed, which the students could multiply on their own and sell to their contact farmers. The students spoken to expressed a concern about the continuation of their activities in the absence of motivation through stipends, transportation and other incentives, such as reserved seats at the Agricultural University in Faisalabad. They saw themselves as a viable alternative to the extension agents of the PAD. The SMO Agronomist provided them with technical guidance. They confessed to being taken lightly by the farmers initially but said they were eventually paid attention to once their initiative was recognized as being sponsored by the sub-project manager. This is more so since it appears that the farmers associate the CWM initiative in the area with the personal efforts of this individual.

d. WUAs and the Participatory Approach

The OFWM field teams have formed and registered WUAs on all of the 89 watercourses completed. The evaluation team was shown a watercourse that supposedly had been improved following the participatory approach. The OFWM staff faced difficulties in getting the farmers to agree to the renovation of their watercourse. The farmers interviewed by the evaluation team told them that they had had reservations about the improvement of the watercourse because they attributed reduced flows in their minor to the lining. The task to make them agree was passed to the WUADS working in the sub-project. With a lot of effort and explanation, he finally convinced the farmers of the benefits of an improved watercourse, with the possibility of demolishing it if the benefits did not materialize. The farmers seem happy with the decision in retrospect.

However, "participatory" in this process only related to getting agreement of the farmers through the WUADS, agreement which was otherwise not forthcoming within the usual time and level of effort that the regular OFWM team would allocate to the process before giving up. OFWM staff, in any case, feel that they have been using the

participatory approach, given the involvement of the farmers in demolishing of old watercourses, the felling of trees, the realignment process, and labor during construction and installation of the structures.

e. The Sub-project Coordination Committee

SPCC meetings have been discontinued in the Shahkot sub-project area, as elsewhere, for well over two years. The SMO feels that the intended function of the SPCC has been partially replaced by the WUA federation organized in the tail reaches of the distributary. However, this is doubtful since the federation has no way of ensuring the attendance of line agency representatives at its meetings and because it excludes from membership all of the farmers at the head of the distributary.

f. The Technical Assistance Team

There appears to have been a clear delineation of the physical areas in which the SMO staff and the technical assistance team worked in Shahkot. The tail reaches were reserved for the SMO and the head reaches were left to the technical assistance team. The evaluation team was told that the local-hire sociologist of the technical assistance team had attempted to organize a WUA federation at the head of the distributary. There was, however, no documentation of this process, nor was the evaluation team exposed to any of the work. According to the sub-project manager, there was an element of competition that he had instilled here between the technical assistance team and the SMO, with the challenge of seeing how each progressed.

g. The WUADS

The WUADS hired for the Shahkot sub-project had a motorcycle for transport. He was mostly working in the tail reaches. His work was essentially related to gathering data on water use and delivery efficiencies on the farms and carrying out other monitoring and special reporting assignments for the SMO. He appears to have more or less functioned as a liaison officer for the SMO. The sub-project manager expressed great satisfaction with his work. Farmers spoken to in the tail reaches seemed to know him by name and from his hard work, monitoring water in their fields late into the evenings.

C. 6R/Hakra Sub-Project Site

1. Circumstances of the Visit

Three members of the evaluation team [J. Eriksen, G. Corey and J. Tirmizi] visited the 6R-Hakra Sub-Project on 11-12 November 1992. The team was accompanied by the sub-project manager and staff from the SMO. Representatives of the PAD and PID also participated in team briefings and site visits.

2. Background

The 6R-Hakra sub-project area covers a gross area of 197,566 acres and contains 153,800 acres of arable land. The estimated population of the 150 villages in the sub-project zone is 217,000 people [112,000 males and 105,000 females]. The sub-project is situated in the tehsils of Haroonabad and Fortabbas in the Bahawalnagar District. The zone has been supplied with irrigation water from canals since the early 1900s. The water table had been slowing rising for 70 years, but waterlogging and salinity problems have only been severe since about 1980.

Under the CWM project, the civil works directed at mitigating these problems included construction of a series of interlinked drainage channels, canal rehabilitation, canal lining, remodelling of canal outlets, and lining of watercourses. The sub-project is served by 351 watercourses. The sanctioned water allowance is 3.60 cusecs per 1,000 acres.

It is estimated that the annual water supply from the canal system totals 250,000 acre-feet and this supply is supplemented by 16,000 acre-feet from 55 private tubewells. There are no public tubewells in this area. The estimated annual crop water requirement in the zone is estimated at 426,000 acre-feet. According to provincial officials, the estimated water savings from sub-project canal and watercourse lining will be 84,080 acre-feet. The area receives an average annual precipitation of only 7.7 inches, with 80 percent falling during the summer months of July and August.

The 1987/88 cropping intensity in the area was estimated at 129.2 percent [PERI, 1988] and was projected to rise to 151 percent by the end of sub-project activities. The principal crops grown and their percentages of total cropped area in the zone are: cotton [33.6], forages [8.2], sugarcane [6.2], maize [0.1], and others [1.1] during the Kharif season and wheat [41], forages [8.1], sugarcane [6.1], and others [1.7] during the Rabi season. The 1987/88 crop yields [PERI, 1988] and current crop yields in the sub-project area as estimated by the SMO and PAD are shown below.

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

Team members were accompanied by the CWM project manager, the PID Superintending Engineer, the Executive Engineer, the Sub-Project Engineer, and a member of the supervisory consulting firm, NESPAK/NDC. Long reaches of the 6R distributary were visited including lined and rehabilitated portions. Many outlets were inspected along the 6R distributary and 1L minor, along with the watercourses. All drains were inspected in several locations.

Crop	Baseline Yield [1987/88] [kilograms/acre]	1990/91 Average Yield [kilograms/acre]
Wheat	796	736
Sugarcane	11,404	11,760
Rice	N.A.	960
Cotton	544	555

The tail end of the 6R distributary was visited where several farmers were stationed to receive us. The "technology transfer" center was also visited and practices were explained. Detailed discussions were held with PID officials regarding the construction of civil works and the operations of the canal system before, during and after the construction phase.

The status of civil works against the revised targets is shown below.

Status of 6R-Hakra Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Canal Rehabilitation	37.65 miles	17.76 miles	47.2	19.98 miles
Lining of Canals	118.63 miles	105.32 miles	88.8	13.31 miles
Remodeling of Outlets	352 outlets	270 outlets	76.7	82 outlets
Surface Drainage	60,000 acres	60,000 acres	100	0
Watercourse Lining	228	252	110.5	0
Precision Land Leveling	10,554 acres	10,327 acres	97.9	227 acres

All open drains and related structures have been completed with the exception of some excavations near structures. In reaches where longitudinal slope is minimal, there is a great deal of weed growth and standing water. In other areas, the drains are relatively clean. Project personnel indicate that drain maintenance -- i.e., cleaning -- cannot take place until the project is turned back to the PID. Obviously, cleaning of the 6R-Hakra drainage system will be a major budget item from now on. The system apparently operated well during the past monsoon season when rainfall was above normal and there was no evidence of inundation due to surface flow. The construction problem noticed during the mid-term evaluation was eliminated.

Most of the distributary and minor lining is of adequate quality. There are some sections where the by-pass channel is yet to be closed. The reduction of seepage caused by lining is especially evident in the upper reaches of the sub-project area, where soils are sandy and the distributary is in fill. It is reported that from 200 to 500 feet on each side of the channel was waterlogged prior to lining; while presently crops are being grown up to the channel right-of-way.

The rehabilitated but unlined section of 6R-Hakra distributary is an excellent example of an alluvial channel in regime. The works provided here are especially well done.

Remodeling of outlets was done throughout the command. The same design was used in lined sections as in other Punjab sub-project areas. The outlets were also remodeled in the rehabilitated sections, although here there was no need to provide the same pipe, stilling well and APM as in the lined sections. Remodeling of outlets is a difficult process because prior to the project many were drawing more than their sanctioned shares. Naturally, there are many complaints after remodeling and canal operations must deal with them.

The operation of the 6R-Hakra system has changed due to the project. An explanation of the operation of one distributary [6R] will suffice to indicate the procedure. The sanctioned design discharge at the head of 6R is 460 cusecs. Prior to the CWM project, the PID found that, in order to provide water to the tails, as much as 600 cusecs was needed at the head. Since the amount was not always available, the main Hakra command was placed on a rotational operation. This rotation among the various distributaries results in a 15 day on and 7 day off running of the 6R distributary when flows are inadequate. This is most of the time. The reason even excess flow at the head is insufficient to provide the proper discharge to the tail end of the distributary and its minors is due to losses through both seepage and, perhaps, even greater operational losses.

After lining the distributary and minors, it is now possible to provide adequate flow at the tail ends with 550 cusecs. Therefore, there is an apparent 50 cusec saving in the main system due to lining. The system still operates on rotation; however, due to the saving, it is anticipated that rotation of channels can be eliminated. Plans are being made to do so. This would be especially appreciated by farmers. Almost all farmers indicated that removal of the rotational system was their first water management priority. If the rotational system is finally removed under the CWM project, there is no guarantee that it will be continued once the system is turned back to the Operations and Maintenance Division of the PID.

A visit was made to the technology transfer center operating at the middle reach of the minor of the 6R-Hakra distributary. Here cotton was being grown and several interventions has been installed including: field ditches, precision land leveling, pukka nukkas, irrigation scheduling, and increased agricultural extension. The concerned farmers had installed two tubewells near the head of the watercourse with their own resources. The pumps were operated by farmers on an individual basis during their warabundi turns. If a farmer desired or needed more than the canal supply during his turn, he would operate one or both pumps with his own or a rented tractor. It was reported that not uncommonly both pumps operated most of the time. This system of conjunctive water use is the only way in which irrigation by demand can be approached.

The area looked prosperous with good cotton being grown over at least ten acres. The system has been operating for at least three years. The spokesman farmer for the group indicated that he owned ten acres in the 25 acre experiment.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the crop intensity of the sub-project area was reported to be 127 percent. In the project baseline survey, completed by PERI in 1988, the crop intensity was estimated at 129.2 percent. And, CWM/SMO sub-project monitoring data for crop year 1990/91 show a crop intensity in the sub-project area of 127 percent. The available data indicate no significant changes in cropping intensity over the life of the project.

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. Five point observations of cropping patterns are available. They are: the pre-project feasibility report [1981/82]; the project baseline survey [1987/88]; the CWM report [1988/89]; the CWM report [1989/90]; and the CWM report [1990/91]. The data are reported below.

c. Sub-Project Agricultural Activities

The SMO, in collaboration with technical assistance team specialists, carried out a variety of agricultural activities in the 6R-Hakra sub-project. A brief review of these activities is presented below.

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	Pre-project Feasibility Report	Project Baseline Report	CWM Report 1988/89	CWM Report 1989/90	CWM Report 1990/91
Rabi Crops					
Wheat	56.3	41.0	68.5	67.1	70.0
Forages	7.6	8.1	11.2	10.0	10.3
Sugarcane	12.4	6.1	9.8	8.6	6.8
Others	24.4	1.7	8.9	14.3	4.2
Kharif Crops					
Cotton	46.7	33.6	53.6	50.3	58.0
Sugarcane	12.4	6.2	12.3	8.8	7.1
Rice	1.6	0.0	12.4	8.8	4.0
Maize	20.0	0.1	0.1	1.4	0.4
Forages	11.8	11.9	11.9	17.4	19.4
Others	9.1	0.1	0.1	13.4	1.1

Note: Percentages in some case total to more than 100 percent because of intercropping and rounding of reported figures.

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(1) Introduction of New Crop Varieties

One of the major activities of the sub-project has been introduction of new high yielding crop varieties to selected groups of farmers. The new crop varieties were obtained from two sources: Pioneer Seed Company and the Agricultural University in Faisalabad. One or more new varieties of the following crops have been provided for testing: maize, millet, cotton, barley, wheat, pulses, sugarcane, sesame, rapeseed, mustard, forage sorghum and berseem. It is reported that small quantities of vegetable seeds were also provided to selected farmers.

Unfortunately, there is no evidence that the seed introduction program has been systematic in nature -- one small seed multiplication group excepted -- or that there have been any structured follow-up activities with the farmers receiving new varieties to determine in quantitative terms the performance of these varieties versus control plots. The assumption among SMO personnel appears to be that, since the varieties were developed and tested on research plots elsewhere in Pakistan, they must be superior to varieties used by farmers in 6R-Hakra.

(2) Area Specific Crop Varieties

In saline and tail end areas of the sub-project command, efforts have been made to introduce new crop varieties tailored to specific conditions. Salt-tolerant varieties of barley, cotton and wheat have been introduced in areas affected by poor drainage and surface salt crusts. In tail end areas, drought-resistant crop varieties -- millet, cotton and barley -- have been introduced into crop rotations.

These introduction cases suffer from the same deficiencies with respect to follow-up quantitative performance analyses. Interviews with farmers, however, indicated near universal agreement that the new varieties of barley and cotton are particularly appreciated. Among tail end farmers, the introduction of barley was deemed to be very

effective in significantly reducing water requirements compared with wheat and in providing a crop which obtains higher prices in local grain markets than wheat. Use of barley in crop rotations in water-deficient areas has apparently spread quickly among farmers and a specialized local market for this grain has developed, with buyers coming from as far away as Karachi.

(3) Introduction of New Cultural Techniques

New cultural techniques for crops have been demonstrated in the sub-project zone. These new techniques include:

- Paired row plantings of maize, sugarcane and cotton;
- Pit planting of sugarcane;
- Zero tillage with early sown wheat in standing cotton;
- Furrow irrigation of cotton and maize; and
- Intercropping of wheat/pulses, sugarcane/garlic, sugarcane/cauliflower, sugarcane/ turnips, sugarcane/berseem, sugarcane/potatoes, sugarcane/pulses, sugarcane/direct sown forage maize, and cotton/pulses.

As with the other trials and demonstrations, these interesting combinations were laid out without resort to any systematic process of either technical, financial and economic analyses which would have preserved the demonstration findings and determined which interventions were superior to existing practices in improving factor productivities and farm incomes.

(4) Seed Multiplication

Farmer access to improved and quality seeds is indicated as a major problem in increasing aggregate crop production and factor productivities. Considerable effort, therefore, has been devoted to assisting a small group of farmers in forming the Hakra Seed Committee.

During the first year, 24 farmers were provided with basic cotton seed -- Niab 78 -- procured from the Punjab Seed Corporation. A total of 39 acres were sown to this new variety, with individuals planting between one and three acres. The farmers received assistance in the proper use of fertilizers, cultural techniques, and plant protection through regular field inspections and a series of training sessions on plant rouging, pest control, picking, cotton ginning and seed storage.

Farmers' fields were inspected by a representative of the Federal Seed Certification program in Sahiwal. Out of the 39 acres sown, 6.5 acres were rejected on the basis of mixtures of other cotton varieties and 32.5 acres were initially approved for seed production. A total of 3,420 kilograms was produced from this area.

After picking and ginning, seed samples from these farms were collected and analyzed by the Federal Seed Certification Department in Sahiwal. Analysis showed that the cotton seed produced met or exceeded government standards.

During the second year of the program, 2,500 kilograms of cotton seed was produced from 40 acres. In 1991/92, the seed multiplication effort was extended to other crops. The results are summarized below.

Seed produced by this group is sold directly to local farmers. Farmer participants said that they have developed an active seed sales program and buyers are now signing up in advance to receive the available seeds.

Results of the Hakra Seed Committee Program in 1991/92

Name of Member	Crop	Variety	Total Production
Khadam Hussain	Wheat	Fais-85	2,000 kilograms
Mohammed Sharif	Wheat	Pas-90	1,600 kilograms
	Maize	Golden	800 kilograms
	Sesame	Punjab-90	400 kilograms
	Barley	B-87	2,400 kilograms
	Pulse	M-85	320 kilograms
Mohammed Saleem	Wheat	Pas-90	2,400 kilograms
Manzoor Ahmed	Wheat	Punjab-85	1,600 kilograms
Naseer Ahmed	Gram	Noor-91	400 kilograms
	Barley	B-87	2,400 kilograms

Although the present scope of this activity is limited, the operation appears to be well organized. Evidence indicates that farmers are well satisfied with their accomplishments to date. They plan to hire their own seed specialist in the near future and to gradually increase their operations in the future.

(5) Irrigation Scheduling Trials

No activity in this area was observed. SMO personnel described trials they had conducted attempting to better match cropping patterns to water availabilities by substituting barley for wheat in tail end areas. They also discussed trials in scheduling irrigation applications on wheat to the plant's growth cycle.

The impression received was that all of this work was initiated by the technical assistance team and trials were conducted until the team departed in 1991. The SMO personnel admitted to having been introduced to the computer model, which is the basis for these trials, but said that no one had ever given them the hands-on training they needed to actually utilize this tool. As a consequence, the SMO personnel have the model on diskettes in the office but have no capacity to use it for field operations.

(6) Agricultural Equipment Pool

By instruction of the sub-project manager, the agricultural equipment supplied to the sub-project by USAID was withdrawn from the "full watercourse trial" areas in the four Punjab sub-projects. General demonstrations of this equipment for farmers were discontinued and all of the equipment was given to four groups of farmers -- one in each sub-project. These four groups have a total membership of 202 farmers cultivating a total of 1,748 acres. The groups control use of the equipment within the membership with each member paying for an initial entry share and, thereafter, paying a rental charge for each piece of equipment used. It was reported that the four groups have, in the aggregate, generated a capital fund of 202,000 rupees.

These groups seemed to have generated considerable enthusiasm among their privileged membership but, by monopolizing the equipment, they have deprived other, equally deserving farmers of the intended demonstration effect throughout the sub-project area. This is yet another example -- possibly the worst -- in the CWM project of allowing benefits of agricultural interventions to accrue to the few at the expense of the many.

(7) Herbicide Testing

According to information supplied by the SMO, herbicides trials were carried out on 16 farmers' fields -- total of 9.5 acres. Four different herbicides were used in these trials, singularly and in combination. The trials had mixed results, ranging from complete weed control to very poor coverage. The majority of the farmer participants stated after the demonstrations that they intended to use more herbicides on the fields in the future.

(8) Soil Testing and Balanced Fertilizer Trials

The sub-project introduced soil testing for farmers' fields on a limited basis. Testing was performed with soil test kits and by sending soil samples to the Agricultural University in Faisalabad. According the records provided, testing by soil kit was done on a total of 94 acres in 1990. Testing by soil sample was accomplished on a total of 39 acres in 1990 and 93 acres in 1991.

(9) Agricultural Information Communication Group

This group was organized by the SMO in late 1989 as a response to the criticisms in the mid-term evaluation on the slow progress being made in non-civil works. The group in the sub-project area is based on training students as communicators of agricultural information to farmers. A total of 30 students participate in the program -- three on each of ten watercourses. Each student is assigned ten farmers to work with within a village. The students play a lead role in: selling seed of improved varieties and introducing deep tillage practices, herbicides, tree planting, and soil testing. The students also perform basic data collection activities for the SMO.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

a. Farmers' Interest Groups

In the 6R-Hakra sub-project, the SMO replicated an agricultural equipment pool, similar to those in the other Punjab sub-projects, in a village serving four watercourses, including the full watercourse trial. The implements appear to be in great demand. When asked to chose between a project which would ensure a regular supply of high quality seed delivered to the farmgate and a project that would loan farmers agricultural equipments -- which they would buy in installments -- the preference of the majority of the farmers was for the latter activity.

Interestingly the committee jointly managing the agricultural equipment pool comprises individuals with different political affiliations, who do not belong to the same section of the village and who farm on separate watercourses. There is little reason not to believe that the users of the equipment also come from as varied groups as the committee that manages the pool.

A similar interest group has emerged around the production of quality seed for cotton, wheat, barley and oilseeds. This group, originating from a few core farmers on the coordinated water course, has developed into the Hakra Seed Committee. It produces high quality seed and sells it to fellow farmers. The process and know how for growing quality seed seems to have been institutionalized in the area and has every possibility of being replicated by other interested farmer groups as a result of initial efforts of the CWM project to get it going. However, like almost all other institutional activities of the project, the seed committee should have been studied in depth for its internal dynamics by independent professionals. Such a study should have also looked at mechanisms for large scale replication of these groups.

b. WUAs and Federations

The OFWM teams have improved 252 watercourses with the participation of the farmers. Their participation was formalized in a registered WUA on each watercourse. Attempts to form WUA federations were made at two locations in the sub-project area: at the head of the 1R-6R minor in an area comprising six villages and 14 outlets; and at the tail of 6R minor with 30 outlets and ten villages. However, initial work was not followed up, according to the SMO, due to a shortage of staff.

c. OFWM

The OFWM teams will leave the sub-project area once their watercourse improvement targets are met. In contrast to the agriculture extension staff, they have no organic linkage with the farming communities of the area.

d. Agriculture Extension

Unlike the other Punjab sub-projects, the agriculture extension field staff seemed to have taken a keen interest in the CWM activities in the 6R-Hakra area. This was probably because of the participation of the agriculture officer at Faqirwali in the project diagnostic analysis, which was conducted at the initiation of the CWM project in Niazbeg in late 1985.

However, the involvement of the extension staff, like that of the technical assistance team and the SMO, was limited to agronomic and water management package development on a single watercourse, where the full watercourse trials were conducted. In addition, the agriculture officer was also a leading participant in the SPCC meetings that have now been discontinued for over two years.

Unfortunately, the project was not structured to enable the formal involvement of the PAD agricultural extension staff. As a consequence, the extension agents could not deviate from their assigned routines, which are fairly demanding under the World Bank-funded Training and Visit program. This was a great oversight on part of the CWM project planners. A systematic involvement of agricultural extension staff would have helped replicate the water-related and other recommendations developed on the full watercourse trial sites in a wider area and would have enabled an assessment of adoption rates. Moreover, the project missed the opportunity to develop and test a model for the delivery of extension services in canal commands based on the available resources, actual functioning, and organization of the agricultural extension staff in the field.

e. The Provincial Irrigation Department

There are two Executive Engineers detailed to the 6R-Hakra sub-project area: one for the construction in the canals and the other for construction of drains. The Executive Engineer for the canals is also responsible for similar CWM activities in the Pakpattan sub-project. Both men are based in Bahawalnagar, which is the headquarters of the Superintending Engineer in charge of the operating division for 6R-Hakra. However, the engineers report to the Superintending Engineer for the CWM project in Lahore.

It is obvious in this sub-project that the lining of the canal and the remodeling of the outlets to sanctioned discharges has the tails operating better than ever before. Farmers at the head and the middle reaches, who were probably drawing way above their sanctioned discharges before the remodeling, are now complaining bitterly. The Executive Engineer is apprehensive about the outlets gradually returning back to their pre-lining flows once the canal is handed back to the PID operations division. However, it appears that the CWM project experience in 6R-Hakra might have had something to do with the renewed insistence of the Superintending Engineer of the operations division in Bahawalnagar to vigilantly enforce the sanctity of the outlets on the canal commands under his charge outside of the sub-project area.

Three separate groups of farmers from the middle reaches of the 6-Hakra canal came to see these engineers while evaluation team members were having lunch at the Faqirwali rest house. The evaluation team members opted to go with one group to its outlet site and see what their problem was. The water was flowing for the first time after the lining had been laid and was way below the usual discharge. But this could not have been otherwise since the canal was being test run on very little water. Even though the farmers could see that this was the situation, they wanted to take advantage of the presence of officials in the rest house to ensure that, in case something had gone wrong during the remodeling, the field staff would put it right now that it had the attention of their superiors. It is difficult under such circumstances to claim that the farmers are not organized to deal with the PID on water issues, even without resort to the formally constituted WUAs in their area.

D. Pakpattan Sub-Project Site

1. Circumstances of the Visit

Three members of the evaluation team [A. Jones, A. Bhatti and S.A. Husaini] visited the Pakpattan sub-project on 11-13 November 1992. The team was accompanied by Chaudhary Mohammad Ashraff [OFWM Director], Zahid Saeed Khan [USAID Lahore], Anwar-ul-Haq [SMO Liaison Officer], Allah Ditta [Deputy Director, OFWM], Mian Mohammad Masood [PID CWM Circle] and other staff of the line agencies.

The team visited the civil works completed by the project as well as a number of watercourses including No 3702L on 5-R distributary and No 118948L on 3-R distributary. The team also visited a participatory watercourse, two "critical needs" watercourses, the coordinated watercourse, a tail watercourse, and an unimproved watercourse. At each location, team members met with WUA members and farmers. WUA federation members were also interviewed.

2. Background

The Pakpattan sub-project area covers a gross area of 184,089 acres and contains 149,870 acres of arable land. The cultivable command area at present is 96,870 acres. The estimated population of the 105 villages in the sub-project zone is 187,000 people [97,000 males and 90,000 females]. The sub-project is situated in the Tehsils of Vehari and Burewal in the Vehari District. Pakpattan, at the right tail portion of the main Pakpattan Canal, is supplied with surface water by five distributary canals. Their total discharge is 719 cusecs. The length of the distributaries and minors is 98 miles. There are 250 watercourses in the sub-project area. The system is approximately 75 years old.

It is estimated that the annual water supply from the canal system totals 273,000 acre-feet. This supply is supplemented by 54,300 acre-feet from private tubewells. The estimated annual crop water requirement in the zone is estimated at 420,000 acre-feet. The sub-project is served by 250 watercourses. The sanctioned water allowance is 3.12 cusecs per 1,000 acres. According to provincial officials, the estimated water savings from sub-project canal and watercourse lining will be 42,660 acre-feet. The area receives an average annual precipitation of only 6 inches, with 80 percent falling during the summer months of July and August.

The Pakpattan area was chosen as a sub-project because it has no serious seepage or drainage problems and is said to have very fertile soils. Eighty-five percent of the area is estimated to be appropriate for groundwater exploitation and the area has seen considerable installation of private tubewells for conjunctive use with surface water. Over the life of the project, the number of private tubewells in Pakpattan has risen from 215 to an estimated 688 at present.

The 1987/88 cropping intensity in the area was estimated at 145 percent [PERI, 1988] and was projected to rise to 154 percent by the end of sub-project activities. The principal crops grown in the zone and the percentages of each are: cotton [37.6], forages [8.2], sugarcane [5.5], maize [0.3], rice [0.2], and others [0.6] during the kharif season and wheat [38.9], forages [8.7], and sugarcane [5.5] during the rabi season. The 1987/88 crop yields [PERI, 1988] and current crop yields in the sub-project area as estimated by the SMO and PAD are shown below.

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

a. Distributary and Minors [PID]

As per data presented during the field visit, almost 100 percent of lining and rehabilitation work targets have been achieved by the PID. Some minor works, such as filling and compaction at the banks of a small number of reaches, are still in progress. The PID staff was quite confident that these final works will be completed before the end of the year. Remodeling of 80 percent of the outlets was completed.

Generally speaking, the quality of the lining was found to be satisfactory except for some reaches of the three minors [1R/4R, 1L/6R and 2L/6R] where the quality of lining was not up to the mark. The PID has initiated legal proceedings against the contractor to assess penalties and rectify the poor quality work at his expense.

Crop	Baseline Yield [1987/88] [kilograms/acre]	1990/91 Average Yield [kilograms/acre]
Wheat	916	736
Sugarcane	14,012	11,760
Rice	888	960
Cotton	900	555

The data collected by the monitoring and evaluation staff of the SMO on discharges at the head, middle, and tail of a sample distributary [3R Distributary Head readings, 1R/3R Minor Head and Tail readings] does show that tail is getting its due share of irrigation water. The tail gets relatively more water when the channel is running below its full supply level which is normally the case under the rotation system currently in place.

Lining and rehabilitation of distributaries and minors, coupled with remodelling of outlets, has played a key role in increasing irrigation supplies to tail areas and improving equity along the channels in Pakpattan sub-project area. However, a major constraint -- fluctuations in water at the head -- still remains to be addressed at the system level.

b. Watercourses

As per data received from the PAD, lining, rehabilitation and installation of pukka nukkas has been done for 80 percent of the target watercourses. The quality of lining and rehabilitation was found to be satisfactory. However, it was strongly felt during the visit that more care in terms of regular maintenance and repair would be required for obtaining optimum benefits from the improvement.

Farmers along the channels had mixed feelings about the impacts of lining and rehabilitation work. Nevertheless, tail farmers, both on the channels and watercourses, were satisfied with the impact of lining and rehabilitation in terms of increased irrigation supplies. They reported many examples of increased cropped areas and increased crop yields on their farms.

It was observed that several watercourses have not been connected to the outlets, particularly in tail reaches. These observations were brought to the attention of the concerned project staff who promised to make the connections in the next few days.

The status of civil works in the sub-project area is shown below.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the crop intensity of the sub-project area was reported to be 135 percent. In the project baseline survey, completed by PERI in 1988, the crop intensity was estimated at 145 percent. And, CWM/SMO sub-project monitoring data for crop year 1990/91 show a crop intensity in the sub-project area of 168 percent. The Pakpattan is the only one of the four sub-project areas to show a clear trend toward increased cropping intensity

over the life of the project.

Status of Pakpattan Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Canal Rehabilitation	55.31 miles	55.31 miles	100	0
Lining of Canals	101.56 miles	96.56 miles	95.1	5 miles
Remodeling of Outlets	248 outlets	198 outlets	79.8	50 outlets
Lining and Improvement of Watercourses	214	244	114.0	0

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. Five point observations of cropping patterns are available. They are: the pre-project feasibility report [1981/82]; the project baseline survey [1987/88]; the CWM report [1988/89]; the CWM report [1989/90]; and the CWM report [1990/91]. The data are reported below.

c. Observations in the Sub-Project Area

An agricultural extension officer informed team members that average yields in the Vehari Tehsil, where the sub-project is located, are 960, 760, and 50,000 kilograms per acre for wheat, cotton and sugarcane, respectively. Vehari Tehsil is famous for its cotton production, whereas sugarcane has recently entered the cropping system. The official further indicated that, due to the CWM project, crop yields have gone up by 10 to 15 percent. He attributed these changes to both area and yield effects from project interventions. It was further indicated that changes in yields were due to a combination of the introduction of new high yielding varieties, better water management, and improved cultural practices. He maintained, however, that the input levels have not changed significantly. Finally, it was reported in interviews that the last wheat crop [Rabi 1991/92] was considerably damaged by a hailstorm, while current cotton crop has been heavily damaged by a virus attack, leading to significant yield reductions.

The agricultural extension officer indicated that, except for detailing a field assistant, attending SPCC meetings, chairing a SPCC task force [active until late 1989], and trying to solve farmers' immediate problems, he had not had much time to work with the sub-project. This was due to the need to concentrate his attentions on area Training and Visit activities under the World Bank-funded national project.

The watercourses which were visited included the full watercourse trial initially managed by ARD technical assistance team and later continued as a coordinated watercourse trial. Other types of watercourses visited included: a critical needs watercourse, an atypical improved watercourse, a tail end improved watercourse, an incomplete participatory watercourse, and a unrehabilitated watercourse. In addition to these watercourses, a demonstration center was also visited. The impressions from the visits to the above-mentioned watercourses are as follows.

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	Pre-project Feasibility Report	Project Baseline Report	CWM Report 1988/89	CWM Report 1989/90	CWM Report 1990/91
Rabi Crops					
Wheat	63.7	38.9	78.0	72.8	82.2
Forages	11.5	8.7	14.0	12.9	16.3
Sugarcane	17.9	5.5	0.0	4.6	1.4
Others	8.2	0.0	0.0	9.7	0.0
Kharif Crops					
Cotton	45.1	37.6	68.0	65.6	77.1
Sugarcane	17.9	5.5	14.0	6.4	3.3
Rice	4.2	0.2	1.1	0.0	0.5
Maize	9.4	0.3	0.0	0.0	0.0
Forages	14.5	8.2	0.0	15.7	18.0
Others	8.9	0.6	0.0	9.6	0.0

Note: Percentages in some case total to more than 100 percent because of intercropping and rounding of reported figures.

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(1) Full Trial Watercourse

Farmers, who own a tubewell on the watercourse, reported that there has been no change in their cropped area; while farmers having no access to tubewells reported that their cropped area has generally increased. The farmers having access to tubewell water were of the opinion that their costs in using tubewell water have been reduced due to the increased canal water availability. Both groups of farmers reported significant increases in per acre yields -- i.e., wheat from 800 to 1,040 kilograms per acre, and cotton from 720 to 1,000 kilograms per acre.

The farmers attributed the changes to the following factors in order of magnitudes:

- Better water management practices;
- Better tillage operations;
- Increased and balanced use of fertilizers [about 25 percent increase];
- Better cultivation practices;
- Precision land leveling;
- Increased use of insecticides and herbicides; and
- Better seed.

The farmers generally feel that the CWM project has increased their awareness of better crop production packages and that there have been spillover effects on the neighboring farmers.

(2) Critical Needs Watercourse

The farmers reported that average yields of cotton have increased from 520 to 1,000 kilograms per acre, while wheat yields have increased from 720 to 1,280 kilograms per acre. In the case of sugarcane, yields have increased from about 8,000 to 20,000 kilograms per acre.

The cropping intensity has increased from 84 percent to 150 percent in the area. The farmers attributed this increase to water availability, improved seed, and increased use of balanced fertilizers. Some increases in farm income gains were reported to have been achieved through joint purchase of inputs [mainly fertilizers] and better prices received when produce was marketed jointly.

(3) Atypical Improved Watercourse

One farmer located on the atypical improved watercourse reported that his cropping intensity had improved from 70 percent to 100 percent. This particular farmer has access to tubewell water. Another farmer reported that before watercourse improvement only five acres out of his 25 acres were under cultivation; while after improvement his cropped area has increased to 7 acres. He has no access to tubewell water. Both farmers reported that there have been no changes in their input levels and that their crop yields have remained at same level as before watercourse improvement.

(4) Tail End Improved Watercourse

Out of three improved tail end watercourses visited, one was improved under the regular OFWM program prior to the CWM project. These watercourses have access to tubewell water. Crop yields on these watercourses are reported to have increased over the base period as follows: cotton from 600 to 920 kilograms per acre; wheat from 600 to 1,120 kilograms per acre; rapeseed from 480 to 1,000 kilograms per acre; and maize from 800 to 1,280 kilograms per acre. In addition to this, new crops have recently been introduced in the cropping system. The new crops and their current yields are: paddy [1,800 kilograms per acre] and potatoes [3,200 kilograms per acre]. At the same time, gram cultivation has been discontinued. Finally, reported cropping intensities have changed from 75 percent to 130 percent.

No improved cultivation-related non-civil works interventions were reported at these watercourses. The increase in cropping intensity was attributed to improved water availability, and balanced use of fertilizers. The source of knowledge for these changes was not the CWM project but the regular Training and Visit program being implemented by the PAD. The farmers apparently had never heard of any CWM project demonstration plot in the area.

(5) Incomplete Participatory Watercourse

The WUADS had initiated work on this watercourse based on the participatory approach of involving the beneficiaries. The participatory work was discontinued in its initial stages due to termination of the WUADS' contract by USAID. The civil works on the watercourse were later completed by the CWM staff.

No improved agricultural production interventions were reported on this watercourse. Crop yields have remained the same as they were before lining. The availability of water from the outlet has reduced due to a change in the bed level after the lining of the minor and defective remodelling of the inlet.

Current cropping intensity on the watercourse was reported as 90 percent. The per acre yields of wheat was reported as 680 kilograms. The yields per acre reported for other crops were as follows: cotton at 640 kilograms; sugarcane

at 10,000 kilograms; and rice at 800 kilograms. It was reported that crop yields have not changed much over the years.

(6) Unimproved Watercourse

The average crop yields on the unimproved watercourse were reported as: 1,200 kilograms per acre for cotton and about 2,000 kilograms per acre for wheat. The cropping intensity was reported at 169 percent.

On farms without access to tubewell water, the yield of cotton was reported as 800 kilograms per acre, while that for wheat was 880 kilograms per acre. Cropping intensity was reported at 125 percent. In the farmers' perception, water availability and crop yields have increased in the improved watercourses.

(7) Demonstration Center

This center consisted essentially of a series of demonstration plots where precision land leveling was carried out on blocks measuring more than four acres. Pukka nukkas were installed to improve irrigation on these fields. Farmers were guided to adopt a recommended package of cropping technology.

It was claimed that, due to precision land leveling, the corners of irregular plots, which could not be plowed earlier, were brought under cultivation. This was estimated to increase in the available land by about six percent. In the Pakpattan sub-project, it was reported that about 3,000 acres were leveled and therefore about 180 additional acres of land were brought under cultivation.

On one farm, an eight acre plot was leveled using laser technology and cotton was grown. The cotton crop was severely damaged due to a virus attack, therefore sugarcane was inter-cropped. The average yield of the cotton was 320 kilograms per acre on the leveled land, compared to 200 kilograms per acre on the adjacent unleveled plots. Last year, on the same plot, wheat yields were reported to be 1,200 kilograms per acre, compared to 800 kilograms per acre before the field was leveled, although there were no changes in input levels.

d. Overall Impressions from the Pakpattan Sub-Project Field Visit

The following impressions are based on limited observations, given the time available in the field, and are only indicative with respect to the directions of change and impacts of the sub-project on crop production and/or factor productivity. Based on the visits to the selected watercourses, informal interviews with beneficiaries, and farmers' own perceptions, the following interventions can be ranked as under:

- **Increased Water Availability**

  Most farmers have indicated that their cropped areas had increased due to improved water availability. A few farmers, especially tail enders, indicated that their water availability had been reduced.

- **Better Tillage Operations**

  Farmers, who are members of the agricultural equipment pool, reported that their yields had increased substantially with the use of deep tillage. The pool, however, has had only a limited impact in the sub-project area because equipment use was limited only to members.

- **Balanced Use of Fertilizers**

  The nitrogen:phosphorus ratio and the levels of fertilizer use have generally improved where water availability has increased and high yielding crop varieties have been introduced through the sub-project's

limited extension activities. There is, however, no evidence of any widespread adoption of higher levels of fertilizer use in the sub-project area.

- **Precision Land Leveling**

  The use of precision land leveling technology, especially involving use of laser equipment, has been limited to a small number of large farmers and full watercourse trial areas. Evidence of wider adoption of this recommendation was difficult to find.

- **Agro-Chemicals**

  Very few farmers indicated use of insecticides, pesticides and herbicides. The farmers who did report use indicated that significant yield increases had been realized.

- **Improved Seed**

  Most farmers who reported adoption of high yielding crop varieties indicated substantial yield increases. However, it is not clear how many farmers actually have benefitted from improved availability of better seeds. The sub-project appears to have succeeded to some extent in increasing local awareness of new high yielding crop varieties but the actual supplies of these improved seeds are inadequate at present.

- **Water Management Practices**

  Improved water management practices, based on irrigation scheduling, have led to increase in yields. These practices were adopted mostly by farmers located on the full watercourse trial or on a few selected farms on six other watercourses. This intervention was limited in scope and evidence of its wider availability was not observed.

- **Modified Cropping Patterns Based on Water Availability**

  Barley was introduced into the cropping patterns of tail end farmers as a crop to better match the water availability. It was observed that this intervention was adopted by farmers in the sub-project area and barley had replaced crops with higher water requirements. Farmers who adopted this crop believe that their overall farm incomes have increased.

In the absence of reliable data, the cost effectiveness of individual interventions and/or factor use is not very clear. Moreover, it is difficult to quantify the overall impacts of project activities on agricultural production or identify the relative contributions of irrigation water and other cultivation-related, non-civil works in the sub-project area. For the most part, sub-project interventions have only been tried on selected watercourses and with small groups of farmers.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

a. Sub-project Management Office

This office has been without technical supporting staff -- e.g., sub-engineer, statistical officer and part-time computer operator -- for the past two years. The SMO liaison officer appears to have devoted most of his time to monitoring the sub-project's three stage recorders, recording flow data, sharing the data with PID CWM circle staff and forwarding them to the SMO in Lahore. He has given considerably less time to other activities, such as supporting coordinated watercourse activities or coordinating the activities of provincial line agencies.

b. Monitoring and Evaluation

As noted, the principal monitoring the SMO liaison officer does involves the three stage recorders. He mentioned that he had been collecting data on private tubewells, as noted in the mid-term evaluation, and forwarded these data to Lahore but no report has been released containing these data. The team was told that the SMO staff officer charged with monitoring and evaluation visited from Lahore monthly to collect data on crop production.

c. Other Relevant Agencies

The physical isolation of CWM personnel one from the other has apparently persisted over the life of the project. This reflects the view of provincial line agency staff that CWM activities are to be undertaken by their respective agencies as in-house activities. This view is especially prevalent among PID staff.

This problem is accentuated by the fact that, many of provincial government staff detailed to CWM project have already returned to their parent agencies and the remaining PID staff are scheduled to return in December 1992.

d. Inter-Agency Coordination/Cooperation

This aspect of project activity fell off dramatically with the departure of the technical assistance team and the WUADS. A further decline is occurring with the return of line agency staff to their parent departments.

e. Sub-Project Coordinating Committees

No formal SPCC meetings have been held in Pakpattan for two years. However, according to line agency staff, some informal meetings have been held more recently -- e.g., the agricultural extension officer for the area said he chaired a meeting in November 1992 on new seed use with the participation of local farmers.

f. WUA Formation

By November 1992, a total of 281 WUAs had been formed in Pakpattan and a total of 255 watercourses improved. These include all watercourses on the right bank of the canal and some on the left bank which fall in the extended area. The formation of water user associations has generally continued to follow the OFWM pattern of organization, except for the so-called "critical needs" WUAs. SMO staff -- i.e., the former water management specialist -- are conversant with the participatory approach to WUA formation; but this approach was actually attempted on only three watercourses in the sub-project area.

A farmer on one of the watercourses selected for the participatory approach recalled the efforts of the WUADS. But, this WUADS was able to work with the WUA for only three months before he was transferred. His efforts per se, therefore, did not result in the organization of the WUA along participatory lines; although his involvement does seem to have made some difference because a WUA was eventually organized and watercourse improvements were carried out using the OFWM model. This WUA does apparently meet to clean and provide routine maintenance every 15 days but otherwise undertakes no cooperative activities for its members.

Members of other WUAs whose watercourses had been lined early in the project reported largely inactive organizations. The only activity they continue is routine watercourse maintenance and cleaning. Given these findings, it must be concluded that the CWM project's approach to farmer organization in the sub-project area has had limited impact outside the "critical needs" watercourses.

The "critical needs" watercourses WUAs appear to be the most active WUAs. These are WUAs with special problems -- e.g., adverse soil conditions, areas of waterlogging and/or salinity -- that justify additional watercourse lining. Thirty-five such WUAs have been identified in Pakpattan under conditions of the revised PC-1. With such designation, the WUAs are given the opportunity to organize different activities, such as joint seed and pesticide

purchases or joint marketing of produce. If they do so and are found through monitoring to be sustaining these activities, they are eligible to receive additional resources for watercourse lining.

Two such WUAs were visited and, in the case of one, record books and minutes of meetings were consulted indicating compliance. This "critical needs" watercourse effort is a fairly recent innovation in the project and it remains to be seen whether the additional WUA activities will be sustained, especially once the additional lining is completed. To date the project experience is that watercourse lining per se has not been a sufficient incentive for WUA members to maintain an active organization carrying out a variety of activities.

Three members of the WUA federation organized by the WUADS were interviewed. This federation, supported by the WUADS and apparently active during the time when improvements were being made to the minor and watercourses, now meets only very infrequently -- i.e., twice in the past two years. However, the members stated their concern at the prospect of the project's demise because they did not want the federation to end. They felt they had a stronger voice, an identity, and informal recognition by the provincial agencies, especially the PID, because they were a federation and that that would end once the CWM project was over.

These members, representing tail end WUAs, said they were satisfied with the civil works completed by the CWM project. They indicated that farmers at the head reaches were also satisfied but it was not possible to confirm this in direct interviews. As the head reach farmers now probably receiving less water than before the improvements, however, their satisfaction is not necessarily assured which may help explain the federation's inactivity.

E. Punjab Sub-Project Office [SMO]

1. Sub-Project Organization in the Punjab

The main provincial line agencies involved in the CWM project were the PID and the PAD. In as much as the sub-project manager in the Punjab came from the OFWM division of the PAD, the PAD assumed the lead role in sub-project coordination. Demands were also made of the PAD agricultural extension staff located in the sub-project areas to provide support to CWM activities; but, as no CWM project resources were provided to these field staff, the extent of their support varied considerably between sub-projects and was largely a function of individual staff members' personal interests in discrete activities.[1] For administrative and operational purposes, the four sub-project areas in the Punjab were directed from a central SMO located in Lahore and headed by the sub-project manager.

a. The SMO in the Punjab

The structure of the SMO remained largely intact throughout the life of the project but its staff complement was increased. With the full staff complement approved in the 1991 revised PC-1, the SMO core staff included: a deputy manager detailed from the PID, an assistant engineer, an officer charged with monitoring and evaluation operations, an assistant agronomist, and an assistant sociologist. The latter two positions were the most recent staff additions. The assistant agronomist arrived at the end of 1989 and the assistant sociologist was detailed to the SMO in September 1992. The staff included a computer programmer, assisted by four computer operators.

In two of the sub-projects [6R-Hakra and Pakpattan], two liaison officers were posted until this year. They reported to the sub-project manager at the SMO in Lahore. The other two sub-projects [Niazbeg and Shahkot] were supervised directly from Lahore. Staff in the two sub-project liaison offices included, at various times, a sub-engineer and a statistical officer. These staff members were only available on an intermittent basis, which limited the capacity of the liaison offices to perform all of their responsibilities.

The mid-term evaluation describes the SMO as having two units: one for water management and another for monitoring and evaluation. In fact, there were staff assigned to perform functions in these areas but they were so few in number, as indicated in the mid-term evaluation, to constitute a real management unit in either case. The staff that was added in the past two or three years were intended to address these manpower constraints but the overall limitations remained.

This problem was made abundantly clear to the evaluation team as they sought repeatedly to get SMO data and analyses to assist with the evaluation. What became evident was that the SMO had collected significant amounts of field data but did not have the capacity to analyze the data to determine what impacts the project had had and/or what progress had been made toward attaining the CWM project's goal, purpose and objectives in civil works, agricultural production, and institutional development.

What analyses had been done, limited though they were, were most detailed for civil works -- as would be expected -- less detailed for agricultural production, and almost non-existent for institutional development. This implicit prioritization of activities was exemplified by the very late addition to the SMO staff of a sociologist, who arrived too late to make any meaningful contribution.

What the CWM sub-projects in the Punjab really required in this regard -- but which was never spelled out in the

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[1] The listing of line agency staff detailed to the project in the mid-term evaluation [ISPAN, 1989, Vol. II, p. 28] does not apply to the latter phase of the project. The sub-projects in the Punjab, for instance, did not have any agricultural extension staff formally assigned to them. The staff complement indicated for the PID circle, on the other hand, is largely accurate; while the positions for OFWM field staff [water management specialists and below] doubled in the extended phase of the project.

USAID Project Paper Amendment, the World Bank SAR or the provincial PC-1s -- was a detailed management information system [MIS]. Such an MIS would have provided an internal monitoring system for all of the sub-projects and would have enabled project staff to assess where they had come from, where they were, and where they were headed with respect to CWM project components. Such a capability was especially critical when the project was designed with an emphasis on experimentation, institutional development and replicability. It is baffling to the evaluation team that this issue was neither adequately dealt with during project design, nor was this problem given sufficient emphasis by the mid-term evaluation.

(1) Liaison with Sub-Projects

Three WUADS were added to the sub-projects in the Punjab at the time of the mid-term evaluation. However, the WUADS were not all hired at the same time and, in one case, a WUADS needed to be replaced. Experience with these WUADS was, for the most part, positive. Their contribution to the project's institutional development goals -- especially the formation of WUAs -- would undoubtedly have been more substantial had they been available for the life of the project. As it was, they were available for only about two years prior to the departure of the technical assistance team. Two years to advance complex institutional development goals of the project was obviously not sufficient to have significant impacts.

(2) An Institutional Development Model

The mid-term evaluation refers to the SMO in the Punjab as representing a particular model for institutional development. This characterization is perhaps overdrawn. To establish an office charged with the difficult tasks of coordinating the activities of line and private agencies, to equip it with limited numbers of staff -- often inadequately trained for their jobs -- and then fail to provide it with a clear vision of what it needed to accomplish was clearly a deficient approach.

In this respect, the comments of the sub-project manager are enlightening. Up until the mid-term evaluation, he viewed his role as largely one of coordination between provincial line agency staff. However, with the mid-term evaluation's criticisms of neglect of non-civil works, he was motivated to assume a much more active executive role. This resulted in increased support for institutional experimentation and formation of some different types of farmer groups -- i.e., the AFO as a farmers' communication group; and agricultural equipment pools.

b. Provincial Policy Committee

This committee met regularly on a quarterly basis. According to meeting records consulted, these meetings typically discussed annual work plans, civil works targets, the OFWM component, issues of funding, delays in construction, and occasionally the water supply situations in the sub-project areas. Participants included on varying occasions: the secretaries of the provincial line agencies, the chief economist of provincial planning and development department -- or their representatives, director general for agricultural extension in the PAD, the superintending engineers for the CWM sub-projects, and the sub-project manager. This was the highest level forum where policy matters and issues related to provincial line agency collaboration in CWM project activities were discussed.

c. Sub-Project Coordination Committees

These committees were supposed to meet on a monthly basis, chaired by the sub-project manager. They were to be attended by SMO and line agency staff responsible for field operations in the sub-projects. One or more representatives from the technical assistance team and the supervisory engineering consultants were also to attend.

According to the minutes consulted, matters discussed in these meetings included: internal monitoring issues, coordination, publicity, reporting functions, institutional development and water management activities, and non-water inputs and services.

In keeping with his assumption of an executive role after the mid-term evaluation, the sub-project manager, on his own authority, chose to discontinue these committee meetings. The reasons he gave for this decision included: a lack of farmer interest, the substantial time commitment the meetings required, and their duplication of problem solving functions already allocated to local courts. Another reason was the difficulties involved in getting provincial line agency personnel and agricultural input suppliers to participate.

d. Technical Assistance Team

As far as can be determined by the evaluation team, the relationships between the sub-project manager and the technical assistance team did not improve after the mid-term evaluation. Since none of the expatriate technical assistance team members were still in Pakistan to be interviewed, it was not possible for the evaluation team to establish the roots of the frictions or the reasons for the lack of improvement in relationships. In the view of the sub-project manager, however, some individuals, rather than the team as a whole, made contributions to furthering the CWM project's objectives.

f. Interagency Relationships

The pattern of interagency relationships described in the mid-term evaluation appears to have continued throughout the project in the Punjab. There was greater support for the SMO concept at the provincial level than among provincial staff in the field. This pattern was reflected in the comments of provincial agency field staff who indicated universally that, if there was to be any follow-on to the CWM project, they would prefer to see implementation be carried out directly through the relevant line agencies and not through an SMO structure.

II. North West Frontier Province

A. Warsak Lift Canal Sub-Project Site

1. Circumstances of the Visit

Three members of the evaluation team [J. Eriksen, G. Corey and J. Tirmizi] visited the Warsak Lift Canal Sub-Project on 17-19 November 1992. The team was accompanied on visits to provincial government offices and in the field by the sub-project manager and staff from the SMO. Interviews in Peshawar were conducted with officials from the PID, PAD and P & D. Field visits were made to the Warsak Lift Canal pump house, several sites along the lift canal distributary, and selected watercourses -- both improved and unimproved. Farmers from WUAs and other cooperative organizations were interviewed in both tribal and non-tribal areas.

2. Background

The Warsak Lift Canal sub-project area covers a gross area of 54,599 acres, out of which 670 acres [1 percent] fall inside the Tribal Agency. A total of 45,478 acres [83 percent] is in Tehsil Peshawar and 8,451 acres [16 percent] lie in Tehsil Nowshera. The cultivable command area is 43,369 acres, of which the area under the irrigation of direct outlets is 34,818 acres [80 percent]. The balance -- 8,551 acres can be irrigated through four minors branching from the main Warsak Lift Canal.

The estimated population of the sub-project zone on the basis of the 1981 census for Tehsil Peshawar and Nowshera was 121,000 people, out of which the rural population was estimated at 69,000 persons and the urban population was 52,000 persons. The male population was 53 percent of the total or 64,000 persons. The population density in the sub-project area was estimated at 1,418 persons per square mile. Since the 1981 census, the population has grown at the estimated rate of 3.1 percent per year.

The sub-project area is classified as semi-arid. The area receives an average annual rainfall of 12.34 inches. The summer season is hot and dry, with a mean maximum temperature of 40 degrees Centigrade in the month of June. The hot and humid season prevails from July to the end of August. The winter by contrast is cold with a mean minimum temperature of about 4 degrees Centigrade in January.

The sub-project area is classified into three major land-form units: an alluvial plain [15,834 acres], a piedmont plain [20,202 acres], and a loess plain [18,564 acres]. The area gradually slopes from south to north.

The sub-project area receives irrigation water through the Warsak Lift Canal, which was designed for a discharge capacity of 200 cusecs. Since the canal offtake level is higher than the tail end of the feeder channel, a pump station was constructed to pump water to the canal over a total height of 196 feet. The pump station has five pumps [of which only two were functional at the time of the visit], each having a theoretical capacity of 50 cusecs.

The total length of the canal is 45.80 miles. The system consists of the Warsak Lift Canal and four minors -- i.e., the Ragi, Mashogagar, Badaber and Surizai. A total of 34,818 acres are irrigable directly from the main canal, while 8,551 acres are irrigable through the four minors.

The sub-project area has relatively fertile soils. It is capable of producing a wide variety of crops. Landholdings in the area are small and fragmented. The present standard of farming is seen as low and is dependent primarily on hand labor. Cropping patterns respond to both subsistence needs of the local population and opportunities for sales of cash crops in the adjacent Peshawar market. Use of agricultural inputs is generally restricted on the small farms.

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

The physical progress on civil works in the Warsak Lift Canal sub-project as of 30 September 1992 is shown below.

Status of Warsak Lift Canal Sub-Project Civil Works
[as of 30 September 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Skimming Platform	1 platform	1 platform	100	0
Canal Covering	0.76 miles	0.67 miles	88.2	0.09 *
Canal Lining	32.82 miles	28.82 miles	87.8	4.0 miles *
Remodeling of Outlets	151 outlets	25 outlets	16.6	126 outlets
Improvement of Watercourses	84	84	100	0

Note: * SMO and supervisory consultants agree that the remaining work is not required.

Water delivery to the command area of the Warsak Lift Canal is complex in that there is a considerable amount of unmeasured discharge from the Bara River delivered to the area. These deliveries are in the form of watercourses that cross the canal thus feeding areas above the canal as well as in the canal command. Some of these Bara River watercourses remain identifiable after crossing the canal and some are combined with the Warsak Lift water immediately below the canal outlet. There are, therefore, built inequities at the outlet with those farmers having prior rights to Bara River water having access to an abundant supply of water. For example, the "coordinated watercourse" receives fully as much water from the Bara River as it does from the Warsak Lift Canal.

During the project life, the Warsak Lift Canal has never been operated to capacity. Wear on the pump impellers had reduced their efficiencies to the point the 200 cusecs design of the four operating pumps was never more than 150 cusecs during the past five years. Then, during the last project phase, only two pumps have been operable with a combined discharge of 60 to 80 cusecs. The result is that no outlet receives full supply and most of the downstream half of the command area receives no water from the Warsak Lift Canal.

[NOTE: USAID, the GOP and equipment suppliers have been working on the pump renovation problem for several years. New pumps have long since arrived at the pumphouse. The renovation has been delayed by the present need to replace all of the pump motors. As related to team members, complete renovation cannot now take place before mid-1993 -- at the earliest -- because the motors in question must be custom-built and the American supplier cannot complete the job until that time. This apparently will mean an extension of the PACD for the specific purpose of supplying the motors and completing the installation.]

The canal covering in the first mile beyond the pump outlet is undoubtedly a major improvement. Slides and breaches were an every year occurrence and there bas not been any problem since this construction. This is the most beneficial civil works in the sub-project.

The quality of the canal lining is weak at the slab joints and cracks are beginning to develop. Some canal siltation has taken place and this may be due to the fact that the canal is operating at less than one-half capacity. However, at some sites, rainwater has flowed into the canal and some of the obvious erosion above the canal has been

deposited in the canal.

Watercourses in NWFP -- and especially those in the Warsak Lift Canal -- present quite different problems than those of the Indus plain. It is understood that the design criteria for Punjab watercourses were insisted upon in NWFP. This provided built in problems. For example:

- There is no government right-of-way along watercourses in the sub-project area. So, when it comes to realignment or removal of trees, there is always negotiation even for very small changes. The PID has authority to purchase land as a last resort to insure that the watercourse remains intact; however, all of this creates abnormal delays, none of which even exist in the other provinces.

- The topography in much steeper than on the Indus plain with the result that velocities in the watercourses are much higher. This provides some advantages and some disadvantages. Lining per se may not be as important in these watercourses; however, structures are. The structures observed were not functioning well. They are not well designed to meet the sub-project needs. Almost all pukka nukka structures should be longer to handle the drop in slope that almost always occurs at these points. There is much evidence that these watercourse structures have not provided the water control that should be expected.

- Buried pipelines should prove advantageous for the terrain.

The "participatory" watercourse was visited. It is the last downstream outlet that currently receives some water from the Warsak Lift scheme. It does, however, receive Bara River water in greater quantity than is supplied by the canal. On the day of the visit, there was ample water in the watercourse; in fact, it appeared excessive.

There are many tubewells in the sub-project area. Several near the canal are public tubewells, where discharge is placed into neighboring watercourses. Reportedly, there are more than 100 private tubewells in the lower 50 percent of the command which does not currently receive canal water. Evidently, new wells are being constructed at a rapid pace. Reliable data on the number of private tubewells in the command area were not available.

There has reportedly been 25 outlets remodelled out of a target of 151. The issue of remodelling has not been taken seriously because so many outlets have been tampered with and are receiving more flow than is authorized. In fact, the outlet in the lined section of the "participatory" watercourse had been completely broken out on the upstream side.

No irrigation scheduling has been attempted in the sub-project area; even though, with Bara River and tubewell water as supplemental to the canal, it should be possible to successfully accomplish it.

Cost recovery for watercourse improvement has been collected through advance payments since 1 July 1989. Prior to that, no funds were recovered.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area, due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the cropping intensity of the sub-project area was reported to be 87 percent. The target for improved cropping intensity with sub-project interventions in place was 110 percent.

In the project baseline survey, completed by IDS in 1989, the cropping intensity was estimated at an average of 89 percent, with intensities in the head, middle and tail reaches of the canal being 87, 98 and 86 percent, respectively. And, SMO sub-project monitoring data for crop year 1990/91 show a cropping intensity in the sub-project area of

87.4 percent -- i.e., 20,402 cropped acres on the 23,342 acres in the sub-project actually receiving irrigation water.

The available data, therefore, show no increase in cropping intensity in the sub-project area. The present cropping intensity is essentially the same as it was in 1981 and 23 percent lower than target.

b. Changes in Cropping Patterns

The SMO monitoring and evaluation officer reported that there had been no significant change in cropping patterns in the sub-project area over the life of the project. The cropping pattern for crop year 1987/88 was reported in the sub-project baseline survey [Institute of Development Studies, 1989] and is shown below.

c. Crop Yields

The World Bank Staff Appraisal Report [1984, p.65] presents an "illustrative cropping pattern and yield per sub-project" in which crop yields for the Warsak Lift Canal sub-project are shown as: 530 kilograms per acre for maize; 530 kilograms per acre for wheat; and 9,140 kilograms per acre for sugarcane.

Actual crop yields on sample farms in the sub-project area as reported in the baseline survey [IDS, 1989] are shown below. A comparison of the actual and projected yields demonstrates the scope for increasing yields for the three major crops -- i.e., wheat, maize and sugarcane. Unfortunately, due to the continuing problems with the lift pumps, the entire tail end of the sub-project area has never been served with gravity flow irrigation water on a reliable basis during the life of the project. The head and middle reaches of the command area have had been supplied with less than anticipated water.

It is not surprising, therefore, that sub-project activities have had little or no impact on aggregate crop production or crop yields. Demonstration plots recently set out by the SMO staff have demonstrated that yields of wheat and maize can be increased significantly with use of improved crop inputs and reception of adequate irrigation water.

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	High Reach	Middle Reach	Tail Reach	Average for Sub-Project
Kharif				
Maize	66.6	44.9	61.2	55.9
Sorghum	20.1	45.8	9.0	31.6
Sugarcane	13.3	7.1	22.8	11.4
Pigeon Peas	0	2.2	0	1.1
Rabi				
Wheat	83.2	67.7	65.9	72.9
Barley	4.8	2.8	21.5	8.5
Berseem	12.0	23.5	2.1	13.7
Green Peas	0	6.0	0	2.2
Spinach	0	0	18.4	2.7

d. Activities in the Sub-Project Area

This section contains a brief accounting of the sub-project's agricultural activities which have been carried out over

the life of the project. Most activities appear to have been implemented since the mid-term evaluation and are, therefore, worthy of note.

All activities were carried out with individual farmers or very small groups of farmers. It is highly doubtful, therefore, that these scattered and recent attempts to implement the non-civil works component of the sub-project

Crop Yields in Different Reaches of Selected Watercourses
[in kilograms per acre]

Crop	Head Reach	Middle Reach	Tail Reach	Average
Maize	212	162	248	209
Sugarcane	8,783	7,043	5,042	6,373
Pigeon Peas	-	4,947	3,037	4,310
Wheat	374	452	450	425
Barley	238	-	160	185
Green Peas	486	674	647	548

will have much significant impact on either aggregate crop production or factor productivities.

There is also no evidence that the activities under differ significantly in form or substance from the activities which would carried out under the normal agricultural extension program in the province area. Demonstration plots, for example, are not significantly different as to the contents of the technical packages being promoted or in their layouts.

The only major difference over the life of the project has been one of intensity in placement of plots -- i.e., one demonstration plot per watercourse versus one plot per 10 to 12 watercourses under normal circumstances. And, according to officials of the agricultural extension service in PAD, there is little or no possibility that the same levels of plot intensity can be sustained with the current budgetary and material resource constraints in the PAD.

(1) Maize Demonstration Plots

Maize is the major kharif crop in the sub-project area. The annual acreage under maize in 1991 was 9,184 acres. In view of the importance of maize, 34 maize demonstration plots were laid out during kharif 1992 using high yielding varieties -- i.e., Kissan-90 and Swabi White. Results of these plots have not yet been received and analyzed by the SMO field officer in charge.

It should be noted that all 1992 maize demonstration plots were laid out on farms having access to tubewell water because water supplies from the canal could not be guaranteed.

In the period 1998 to 1991, a total of 19 maize demonstration plots had been laid out by the SMO field officer, in collaboration with the technical assistance team. Average yields from these plots ranged from a low of 400 kilograms per acre in 1988 to a high of 720 kilograms per acre in 1989. The weighted average yield of maize from all 19 plots over four years was 619 kilograms per acre. No control plot yields were reported.

No financial, economic or technical factor analyses were reported for these demonstration plots In the absence of such analyses, it is impossible to indicate whether or not the interventions demonstrated were financially remunerative to the individual farmers and/or economically sound to promote. Moreover, it is impossible to assess the relative contributions of the various inputs to the yield increases reported.

It is reported that a large number of farmers participated in the field days held by the SMO at the various demonstration plots. Again, no numbers are available and no follow-up with attending farmers was apparently done

to assess the degree of adoption of techniques demonstrated.

(2) Wheat Demonstration Plots

Wheat is the major rabi crop in the sub-project area. As such, it has been the main focus for demonstration plots in the winter season. In the 1991/92 season, 16 wheat demonstration plots were laid out on different watercourses to test two high yielding varieties -- i.e., Pak-81 and Pir Sabaq 85. The plots also demonstrated balanced use of fertilizers and proper sowing dates.

According to the SMO field data, the average wheat yield from these demonstration plots was 1,683 kilograms per acre -- with a range from 1,880 to 1,480 kilograms per acre. Yields on adjacent control plots averaged 1,182 kilograms per acres -- with a range from 1,480 to 760 kilograms per acre.

In the period 1987/88 to 1990/91, an additional 32 wheat demonstration plots were laid out. Average yield results on these plots ranged from a low of 880 kilograms per acre in 1988/89 to a high of 1,280 kilograms per acre in 1990/91.

No financial, economic or technical factor analyses were reported for these demonstration plots. In the absence of such analyses, it is impossible to indicate whether or not the interventions demonstrated were financially remunerative to the individual farmers and/or economically sound to promote. Moreover, it is impossible to assess the relative contributions of the various inputs to the yield increases reported.

It is reported that a large number of farmers participated in the field days held by the SMO at the various demonstration plots. Again, no numbers are available and no follow-up with attending farmers was apparently done to assess the degree of adoption of techniques demonstrated.

(3) Demonstration of Improved Agricultural Implements

In an effort to introduce better agricultural implements in the sub-project area, the SMO contacted a Swiss project specialized in the design and demonstration of improved light tools for various agricultural operations. Demonstrations of light tools and moldboard ploughs are undertaken for local farmers.

(4) Introduction of Sunflowers and Other Crops

Sunflowers are an oilseed crop that can be grown in the sub-project area as a spring or summer crop. The SMO staff, in collaboration with staff from the oilseed section of the Tarnab Agricultural Research Institute, laid out five demonstration plots. It was reported that these plots produced "encouraging results" and that, as a result, sunflowers are gaining popularity as an alternative area crop.

Similarly, three demonstration plots were laid out for dwarf peas and one plot was laid out for gram. Dwarf pea yields were found to be inferior to those for climbing peas already being used by area farmers. The gram plot yield was reported as "good" but no additional plots were laid out.

(5) Fish Farming

The SMO field staff contacted the local Fisheries Department with the objective of establishing fish ponds in the sub-project area. To date, the assistant director of the department has visited several places in the sub-project where farmers have expressed an interest in fish farming. While no ponds have been established as yet, the intention is to introduce the pond techniques and the following types of fish: bambara [Labeo rohita], tehal [Catla catla], and china carp [Cyprinus carpio].

(6) Training in Beekeeping

The SMO arranged a training program for local farmers in beekeeping at the Tarnab Agricultural Research Institute in 1992. After receiving this training, some farmers are reported to have started beekeeping enterprises in the sub-project area.

(7) Tree Plantation Under the Social Forestry Scheme

Some of the farmers in the tail end of the canal area expressed an interest in planting trees on those parts of their land where crop cultivation was impossible. The SMO field staff, therefore, contacted the Forest Department and secured eucalyptus trees for planting on this land. Such plantings are seen as a means to raise farmers' incomes.

(8) Improved Irrigation Scheduling

It is reported that the SMO staff prepared crop specific information on scheduling of irrigations for use by farmers. But, there is no indication that such information has actually been used or demonstrated in the sub-project area.

(9) Water Measurements

The SMO staff carried out a survey in the sub-project area to determine the impacts of watercourse improvements. For this purpose, six watercourses out of a total of 100 were selected and farmers were interviewed at the head, middle and tail reaches of each watercourse.

The survey found that, before improvement, it took 160, 170 and 195 minutes for farmers in the head, middle and tail reaches, respectively, to irrigate one acre of land. After watercourse improvement, the times were reduced to 90, 110 and 120 minutes, respectively, per acre.

In addition to the time savings, the survey found that each irrigation turn could be accomplished by only one person; whereas two persons were required before improvement.

(10) Precision Land Leveling

To date, the OFWM team working in the sub-project is reported to have carried out 34 demonstrations of precision land leveling. No analysis is available on these plots to demonstrate the benefits of this activity and its financial viability for farmers.

(11) Block Demonstration Plots and Seed Multiplication Program

No block demonstration plots have been carried out to date. The SMO field officer in charge of this activity reported an intention to lay out 10 plots of five acres each in 1992/93 to produce quality seed and obtain additional yield data.

(12) Other Activities

General assistance was provided to farmers by the SMO field officer in procuring better supplies of seeds and fertilizers from Agricultural Development Authority.

Fauji Fertilizer Company, in collaboration with the SMO, established five fertilizer demonstration plots in 1988. The normal fertilizer recommendation for wheat in the area is two bags of DAP and two bags of urea per acre. The Fauji plots added one bag per acre of potassium sulfate.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

a. Organization of Civil Works

Construction was left to the PID operations division in the Warsak sub-project, with the executive engineer of the canal in charge. He was already reporting to the sub-project manager in the latter's capacity as superintending engineer. The lining took place during annual closures and was started from the tail end of the canal. The work was checked by supervisory consultants, who also approved the design.

The OFWM assigned a field team to work in the sub-project area. The assistant director of the SMO was placed in charge in the watercourse work. The OFWM team comprised two water management officers, four sub-engineers and eight rod men. At the end of the project, the field team will leave the sub-project area to be detailed elsewhere. Watercourse design and lining were approved and checked by a different set of supervisory consultants than those assigned to the canal.

Remarking on the difference between a normal project and the CWM experience, the director of OFWM felt that, with PID involvement in CWM, an institutional mechanism to get sanctioned outlet discharge data was automatically created. In other situations, essential data for watercourse design had to be acquired through personal contacts of the OFWM staff.

The sub-project area coincides with the jurisdiction of three agricultural extension officers from the PAD. However, the evaluation team was told that the agriculture extension field staff posted in the sub-project area did not participate in any CWM project activity.

Neither was the PID revenue staff involved with any CWM activities. This would have been administratively possible since the project direction and the SMO lie within the PID operating circle in charge of the Warsak Lift Canal Division. An excellent opportunity for testing different models for water charge assessment was lost by overlooking this important built-in advantage in the Warsak area.

The PPC never met. The sub-project management said that there was no need for them to do so. However, there is evidence from talking to officials in the provincial government that the CWM experience has contributed greatly to the desire for an integrated approach to irrigated agriculture within the traditional line agencies. This is coupled by the willingness for radical organizational and institutional changes on part of those who hold leading positions in the existing structure.

b. WUAs and WUA Federations

The OFWM field team improved 84 watercourses in the sub-project area. They could have not done so without formalizing the participation of the farmers into registered WUAs and collecting 10 percent of the material costs in advance. The practice of collecting in advance is unique to the NWFP but so was the 10 percent recovery. [Note: the evaluation team was told later that this rate has now been revised upwards to 20 percent].

The SMO staff, in collaboration with the farmer organization specialist from the technical assistance team and the WUADS, initiated the watercourse improvement process using the participatory approach on one site in the middle reach of the canal. Unlike the OFWM teams, they approached all the farmers individually and explained to them the advantages of improving their watercourse. A meeting followed in which the steps necessary for the process were detailed. The formation of a series of sub-committees for various tasks, including quality control of the materials, was a distinctive feature of this approach. The entire process has been documented by the farmer organization specialist.

Many interesting issues concerning institutional and individual actors involved cropped up and were eventually

resolved in these meetings. These concerned matters as diverse as the issuance of PILs by USAID, dissatisfaction with materials and eventual rectification by the suppliers, the budgetary and procedural constraints of OFWM, problems concerning the chairman who felt his honor was breached, etc.

The most significant outcome of the participatory approach was the insistence of the farmers to put in a pipe at the head reach of their watercourse. There was no provision for such deviation from the blueprint lining approach that OFWM has conventionally followed while improving watercourses. However, the topography of the head section, where the watercourse lay deep below the surface making it inaccessible and hazardous, justified what the farmers were proposing. Deviating from their routine, the financing, supervisory and implementing agencies accepted the proposal.

Unfortunately, the participatory approach followed does not appear to have had any spillover effects in the post-construction era. The evaluation team visited the site unannounced and managed to talk to a few farmers working in the fields on the specific issue of maintenance. They would still have to get together and collect money on a case-by-case basis whenever any repairs were needed. Farmers indicated they were not willing to trust any committee with money collected by them in advance and kept in a fund.

It is obvious that the participatory approach, by giving the farmers a voice in the decision-making, enabled them to get a technology that was appropriate for their particular circumstances. It did not, however, succeed in building an organization for collective activities of all the users, beyond construction.

The technical assistance team attempted to organize a WUA federation at the tail end of the system with the help of the WUADS. Their effort ended with their departure in 1991.

The farmers on some 15 watercourses in the middle reaches are definitely organized, without formally calling themselves a federation. They collectively resisted all attempts by the PID to remodel their outlets. They base their claims for "adequate flows" from the Warsak Lift Canal on their traditional water rights to the Bara river water, which was diverted for the population upstream. They contend that the understanding was that the commissioning of the lift canal would replace this water. The users from 15 separate watercourses are collectively contesting the PID for their water rights in front of a provincial judicial commission that has been especially constituted with a session judge in charge.

III. Balochistan Province

A. Lasbela Sub-Project Site

1. Circumstances of the Visit

Three members of the evaluation team [A. Jones, A. Bhatti and S.A. Husaini] visited the Lasbela sub-project on 18 November 1992. The team was accompanied by Tariq Mahmood [USAID/Islamabad], and met with the following staff at the SMO in Hub Chowki: M. Naeem Baloch [Project Manager/PID], Qaiser H. Jafri [NESPAK/NDC], Gul Hasan Mari [Assistant Director/OFWM], and other staff of the SMO. The team visited the canal, minors and watercourses to assess the work done. Sites visited included a participatory watercourse [Watercourse 24, Minor 4] and other watercourses on Minors 4 and 3, including an unimproved watercourse and one at the tail reach. At each watercourse, the team met with WUA members and farmers.

2. Background

The sub-project lies about 20 miles west of Karachi in Lasbela district, the southeasternmost district in Balochistan. The sub-project area is estimated to have a present population of about 20,600, based on an annual population growth rate of 4.6 percent. The gross area of the Lasbela sub-project is 34,000 acres, out of which 18,873 acres [51.5 percent] is arable. At the project's outset, the scope of the project was limited to the command area of the upper five minors of the Lasbela canal, which covered an area of 12,000 acres. The scope has now been extended to minors 6,8 and 9, which adds 6,800 acres in the revised sub-project area.

The sub-project area is composed of a flood plain and a piedmont plain. It was formed by sediments brought by the Hub river and many other small streams. These streams caused development of a rudimentary catchment system, known locally as Rod Khoi, as well as construction of numerous weirs across the major streams to divert water through small channels to provide seasonal water supplies for short periods of time.

A maximum of 120 cusecs of irrigation water is supplied through the Lasbela canal. The seepage losses along the main canal and minors 1,2,3 and 5 have been significantly reduced through the rehabilitation of the canal and the lining of minors; but losses of up to 48 percent are estimated along the unlined minors 6,8 and 9, owing to the highly porous soil.

Of the farming units in the area, most [66 percent] are smaller than 12.5 acres; 25 percent range in size from 12.5 to 25 acres; and nine percent are over 25 acres. The cropping intensity in 1984 was 7.3 percent in kharif season and 7.7 percent in rabi season. Cropping intensity was estimated to have increased to over 80 percent by 1990 [Revised PC-1, 1990]. The major crops in the area are forages, fruits and garden vegetables.

As the mid-term evaluation noted, drainage problems exist in the sub-project area. These were apparently overlooked or not anticipated in 1983. Waterlogging and salinity problems continue to pose a challenge and increase local pressures for additional lining activities.

With respect to socio-economic circumstances, the mid-term evaluation identified the potential for corporate farmers buying out the traditional farmers. It suggested that the sub-project develop a strategy for helping the latter in making the transition to irrigated agriculture.

The sub-project efforts in the direction of supporting agricultural development and institutional development can not be said to have amounted to a strategy. They were rather limited and piecemeal in their execution and are not expected to provide sustained benefits for the people of the sub-project area. This outcome is a result in part of the departure of the technical assistance team before the end of the sub-project, as well as the constraints placed upon staff available to the project at various periods throughout its life.

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

The status of civil works against the revised targets is shown below.

Status of Lasbela Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Canal Rehabilitation	21.28 miles	21.28 miles	100	0 miles
Canal Remodeling	21.28 miles	21.28 miles	100	0 miles
Canal Lining	16.20 miles	16.20 miles	100	0 miles
Remodeling of Outlets	77 outlets	77 outlets	100	0 outlets
Improvement of Watercourses	87	66	76	21

Civil works at distributary level involved laying of three inches of concrete in the bed of Lasbela Canal, cement pointing of side walls, raising the lining an additional foot in height, and widening the banks above raised lining. The work was undertaken during two weeks of canal closure. This time constraint impacted negatively on the quality of work, which was found to be marginal. It requires maintenance at several locations. The bed of the Lasbela Canal could not be inspected due to running water in the channel.

Civil works at minor level involved construction of a new embankment along one of the banks and back filling the old minor to construct an inspection road. Seven of nine minors have been lined completely. Minor 7 was excluded because it supplies water only for industrial usage and minor 9 is still unlined. The quality of civil works undertaken on most of the minors was found to be satisfactory. Problems of alignment of sides was observed in a few places in the head reach of the minor 4 and tail reach of the minor 3. Minor 1 has been reconstructed using buried pipe. This was an excellent idea. The minor 1 is functioning without any major problem.

Remodeling of 77 watercourse outlets has been completed. Several outlets were inspected and found to be functioning quite satisfactorily. Very few complaints of tampering with outlets were noted. Civil works at watercourse level involved lining of 50 percent of the length of main watercourse, earthen improvement on the remaining length, and installation of pukka nukkas for diverting water into farm ditches.

About 76 percent of the revised watercourse improvement targets have been achieved to date. USAID PILs have been issued for the remaining watercourses. But, due to some administrative problems at SMO level, the funds are not being released for constructing the remaining channels. USAID may have to get in touch with Balochistan government to resolve this issue.

The quality of civil works on the completed watercourses was found to be satisfactory. However, maintenance on earthen parts of the watercourses is necessary. This work is being neglected. Finally, water leakage was observed from some of the joints and pukka nukkas.

As the Lasbela Canal is being fed by Hub Dam, there are no fluctuations in irrigation supply at its offtake. Considering the nature of the soils in the sub-project area, which are predominantly coarse textured, the civil works have played vital role in saving tremendous amounts of water which otherwise would not have be available for agricultural production. Unfortunately, no data on hydraulic performance or irrigation efficiency were collected by the PID or SMO staff to quantify the exact savings resulting from lining.

The data on cropped areas do indicate that the area has been doubled during the project to date and is still increasing. Very few tubewells are operating in the area because, with the increase in water supply from canal system, farmers see no need for tubewells at the moment.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the crop intensity of the sub-project area was reported to be 15 percent. In the project baseline survey, completed by SRPO in 1988, the crop intensity was estimated at 35.1 percent. The data compiled by the monitoring and evaluation section show that the cropping intensity increased to 86 percent by 1989/90. This is based on data collected from 64 operational watercourses out of 72 sanctioned watercourses.

The data from PID show that in the crop year 1982/83, the cropped area in the sub-project was 1,095 acres. This area increased to 3,099 acres in 1986/87 and to 8,982 by 1991/92. The rapid increase in cropped area is due to:

- Additional water releases in the system;
- Improvements in conveyance structures;
- Reduction in waterlogged areas, especially in the tail reaches;
- Better water management practices adopted by farmers.

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. Only two point observations of cropping patterns are available. They are: the CWM report [1988/89] and the CWM report [1990/91]. The data are reported below. The distinguishing feature of cropping patterns in this sub-project is that orchard fruit and vegetables constitute more than 68 percent of the total cropped area.

c. Observations in the Sub-Project Area

Due to proximity to Karachi city, with an estimated population of over 10 million persons, the sub-project area has become an important supply center for fresh fruits and vegetables and green forages. A sizeable number of farmers are part-time farmers from Karachi, who visit their farms on weekend.

It is estimated that fruits -- i.e., guava and chiku -- fetch Rupees 30 to 40 thousand per acre, while papaya and bananas are sold at Rupees 45 to 50 thousand per acre. The per acre income from vegetables -- e.g., tomatoes, chili peppers, cauliflower -- and forages in each kharif and rabi seasons is about Rupees 12 to 15 thousand per acre.

Reported Cropping Patterns in the Sub-Project Area
[in Percent of Total Cropped Area]

Season and Crop	CWM Report 1988/89	CWM Report 1990/91
Rabi Crops		
Wheat	13.0	16.5
Maize	10.0	3.0
Forages	10.0	8.9
Vegetables	20.0	25.1
Orchards	47.0	46.8
Kharif Crops		
Sorghum	13.0	10.9
Maize	9.0	16.2
Forages	10.0	3.5
Vegetables	22.0	24.9
Orchard	46.0	44.5

Note: Percentages in some case total to more than 100 percent because of inter-cropping and rounding of reported figures.

Due to virgin soils in the sub-project area, fertilizer requirements are not high at present. The average yield of wheat in the area was reported as 1,400 kilograms per acre. With adoption of high yielding varieties and better water management practices, the yields have increased to 2,000 kilograms per acre.

The watercourses visited included: the full watercourse trial, initially managed by technical assistance team; typical improved watercourses; tail end improved watercourses; and unrehabilitated watercourses. The impressions from the visits to the above mentioned watercourses are set forth below:

(1) Increases in Cropping Intensity

Most farmers interviewed were of the opinion that, on their respective watercourses, the cropping intensities have gone up by 75 percent, largely due to the lining of canals and watercourses. Some farmers, however, indicated that better water management practices have also led to marginal increases in the cropped area. Some farmers also reported that the lining of canals has reduced seepages and made it possible to reclaim some land.

(2) Increases in Per Acre Yields

There are indications of increases in wheat yields [1,400 to 2,000 kilograms per acre]. With other crops, however, no significant changes were reported. Since newly established orchards dominant the area [i.e., trees are not yet bearing fruit], it is too early to make any judgements with respect to the contribution of the sub-project to increases in fruit yields.

(3) Adoption of Improved Cultural Practices

It was observed that the watercourses adjacent to the full watercourse trial and other watercourses where

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demonstration plots had been laid out had a favorable demonstration effect. Nevertheless, the farmers located in areas with relatively difficult to access were not aware of the demonstration plots or any improved production packages recommended by sub-project staff.

Some farmers reported that improved seeds for wheat, vegetables and forages procured by the technical assistance team from the local research institute were made available to them. However, most farmers still rely on seed suppliers located in the vegetable market in Karachi.

(4) Water Availability in Tail Reaches

The farmers located at tail ends indicated that increase in cropping intensities in tails is largely due to canal lining, which has reduced seepage in the tails areas. However, they also acknowledged that the water availability and delivery efficiencies have also increased due to watercourses improvements. It is estimated that the cropping intensities have gone up 20 to 30 percent in the tail reaches. Crop yields, however, have not changed significantly.

(5) Water Availability At Unimproved Watercourses

The farmers located on unimproved watercourses reported some increases in water availability and an increase in cropping intensity of 10 to 15 percent. They indicated in some cases marginal increases in yields resulting from the demonstration effects of the sub-project's demonstration plots.

(6) Farmers Perceptions about Factors Contributing to Crop Improvements

The farmers attributed the changes in their farming systems to the following factors, in order of magnitudes:

- Lining of the minors;
- Watercourse improvements;
- Better water management practices;
- Improved seeds;
- Increased use of insecticides.

The farmers generally feel that the CWM project has increased their awareness of better production packages and that there have been spillover effects from demonstration plots to neighboring farmers.

In the absence of reliable data on the cost effectiveness of individual interventions, changes in factor productivities are not very clear. Similarly, it is difficult to quantify the overall impact on production or identify the relative contributions of improved water availability and the other non-civil, crop-related works in the sub-project area.

These interventions have only been tried on only a few selected watercourse. Wider adoption of these interventions will need to be ascertained in the future through a well-designed, ex-post impact evaluation study comparing the current cropping status with the baseline survey results.

5. Sub-Project Institutional Development Activities

a. Sub-project Management Office

This SMO is headed by a sub-project manager from the PID. Over the life of the project, four different persons

have occupied this position. The current incumbent, Mohammad Naeem, has been in office since early 1992. The turnover in this key position of the SMO and the loss of institutional memory available to the sub-project limited the effectiveness of the SMO in project implementation.

At one time the SMO had two assistant engineers posted from PID, as well as a sub-divisional officer and nine sub-engineers. At the time of the evaluation team visit, most of the SMO's PID staff had technically been returned to the PID [as of the end of June 1992]. However, due to on-going activities, the sub-project manager and some of his staff are being extended through the end of December 1992. The present staff from PID now include: one assistant engineer and three sub-engineers.

From the OFWM, the SMO at one time had an assistant SMO manager, an agricultural engineer, an assistant engineer, and an agriculture officer -- the latter two were posted as water management specialists -- eight sub-engineers and two field assistants. Current OFWM staff include: an agricultural engineer, one of the two water management specialists, and eight sub-engineers.

In addition to coordinating the sub-project civil works, the SMO has been responsible for water management, general monitoring and evaluation operations, and input monitoring. Water management has been carried out by OFWM staff, but this has been primarily as part of improving watercourses.

Monitoring and evaluation operations were carried out by two specialists who were available to the sub-project for limited periods -- one for just six months and the other for two years. The monitoring and evaluation unit also had the services of an enumerator to help with data collection. This unit compiled data and drafted reports, sometimes at the direction of the sub-project director, at other times at the direction of the technical assistance team.

The problems cited in the mid-term evaluation with respect to locating and keeping staff at Lasbela appear to have been largely overcome until recent months when attrition took place as the project's end approached. This may help explain why watercourse improvement targets have fallen short.

b. Monitoring and Evaluation

The monitoring and evaluation unit was responsible for preparing reports on the following: quarterly OFWM status; water flow measurements; monthly and yearly weather conditions; and agricultural production by growing season. This unit began a data base on all the farmers in the command area, with respect to their land holdings, tenancy rights, land use, etc. The unit reportedly prepared a report on the experience with organizing seventeen watercourses where the participatory approach was attempted, but this report was not available to the evaluation team. The staff responsible for this unit ended their employment in March 1991, with the result that only sporadic reporting by the SMO has occurred since.

c. Inter-Agency Coordination/Cooperation

This has been a problem area for the sub-project for the reason that provincial line agencies do not coordinate and cooperate with one another. This lack of cooperation early in the sub-project resulted in delayed implementation of project activities. Some improvements were made by sub-project staff in working through some of the difficulties and developing a more streamlined set of procedures. Nonetheless, problems have persisted with the two main provincial agencies -- the PID and OFWM -- not cooperating in such matters as payments or reimbursements.

According to the sub-project manager and other staff interviewed, the SMO has achieved some success as an institution and ought to be given consideration for continuation under a follow-on project. This view was echoed in Quetta by provincial line agency staff. The argument was that, through the CWM experience, the interagency difficulties had been worked out and the SMO arrangement should be continued. However, there is a sense that this may have been more telling the team what it wanted to hear than what the best working arrangement would be. This issue needs to be looked at more closely prior to making a decision for a follow-on project. One suspects one would

find more difficulties encountered with the SMO than the team was able to uncover in the short time available.

e. Sub-Project Coordinating Committees

SPCC meetings have continued, with the most recent being held in October 1992. According to the sub-project manager, meetings are held every few months on an as-needed basis. The last meeting was held to bring together PID staff and farmers to discuss the extension of the canal command in the Minor 4 area and to discuss such issues as land settlement and warabundi. These meetings appear to have a evolved into a useful forum for airing substantive issues of concern to the project and the farmers.

f. WUA Formation

In November 1992, a total of 66 WUAs have been formed in the Lasbela sub-project area. According to project staff, ten WUAs were formed before the attempt was made to organize watercourse 24 on minor 4 using the participatory approach. This approach -- documented in a report by Isles, Mangal and Khawaja -- appears to have achieved some success. This WUA was visited by the evaluation team and the chairman and some members were interviewed. The WUA remains active, with the executive and maintenance committees reportedly meeting three times a month. The WUA has established a revolving fund for the purchase of seeds and fertilizers mostly to benefit its poorer members.

The WUA is not without its difficulties, however, including the issue of land owned by the chairman near the tail. This land, which he supplements with tubewell water, was flooded because of a weakened channel embankment that resulted in major damage to his tubewell. He is trying to recover the damages but the cost -- R 150,000 -- is more than the WUA is prepared to consider. This presents an unusual and difficult problem for the WUA, which appears to be beyond its capacity to solve.

The experience of the WUA on watercourse 24 appears to have had some positive effect on neighboring watercourses, which have tried to emulate the steps followed on this watercourse, including the establishment of a revolving fund. This positive example appears not to have extended beyond the minor 4 area. Minor 3 farmers interviewed have been less successful with their WUAs. One chairman indicated that he was having a difficult time collecting the shares from members to contribute to cost recovery. A factor here may be tribal identity. Baluch Rind dominate in at least some of minor 4 reaches and this factor has contributed to tribal solidarity and support for WUA formation and operation. On minor 3, there are Bizenjo Baluch, who are less prosperous and appear to be having less success with their WUA.

OFWM personnel claim to have adopted participatory methods in all of the WUAs they have organized since the success of watercourse 24. However, interviews with the staff responsible for organizing, suggests that they are following the participatory approach in only a limited fashion. For instance, they are not organizing the various sub-committees outlined and deemed to be important to the success of this approach. OFWM staff do seem to have absorbed the project's emphasis on the importance of organizing the WUAs, particularly imputing them with a sense of ownership and investment in the watercourse, even if they do not now have the staff and resources to do their job as it is meant to be carried out.

Though the experience of the WUA on watercourse suggests some measure of organizational success can be achieved through the participatory approach, the question remains as to whether this is the right approach and whether such an approach will result in an organization that sustains itself over time. What the field visit did establish was that WUA 24 continues to exist and carries out some cooperative activity. The experience here appears to have had some positive spread effect. Despite these signs of success, however, a more thorough investigation of the present status of WUA 24 and its activities is warranted before endorsing this approach for wider application or replication.

IV. Sindh Province

A. Sehra-Naulakhi Sub-Project Site

1. Circumstances of the Visit

Three members of the evaluation team [A. Jones, A. Bhatti and S.A. Husaini] visited the Sehra-Naulakhi Sub-Project on 20-21 November 1992. The team visited the canal, minors and watercourses to assess the work done. Sites visited included a participatory watercourse [2L Abji] and other watercourses on minors Lakhi and Darbello. These included an unimproved watercourse and one in the tail reach. At each watercourse, the team met with WUA members and farmers.

2. Background/Setting

The Sindh sub-project area covers a gross area of 204,450 acres and contains 201,625 acres of arable land. The estimated population of the area is 579,000 persons based on figures from the previous two censuses. The sub-project consists of lands irrigated by the Sehra and Naulakhi branches of the Rohri canal. This canal is one of the three main canals that irrigate the left bank of the Indus River from the Sukkur Barrage, which was completed 60 years ago. Most of the project area is in Nawabshah district. Only a small portion of the Naulakhi sub-project area lies in Khairpur district.

The Sehra and Naulakhi branches were designed for a cropping intensity of 81 percent [27 percent in the kharif season and 54 percent in the rabi season]. Since the improvements have been made to the channels and watercourses under the sub-project, the SMO staff estimates that the cropping intensity has increased to 45 percent in the rabi season and to 63 percent in the kharif season for a total cropping intensity of 108 percent. There are reported to be 254 public SCARP public tubewells [3 to 5 cusecs discharge each] and 200 private tubewells [one cusec each] which operate an average of eight hours each day. Crop water requirements at the time of project appraisal were estimated to be 650,000 acre feet, against an available irrigation supply of 551,000 acre feet.

With respect to socio-economic characteristics, the lawlessness cited in the mid-term evaluation has continued in this area. This resulted in disruptions in the activities of the SMO staff and technical assistance team, although it did not preclude achievement of the civil works targets. The army has been deployed in Sindh for the past six months, which has contributed to increased security in the sub-project area.

3. Assessment of the Progress and Impacts of Sub-Project Civil Works

The status of civil works against the revised targets is shown below.

Originally only two systems -- namely the Naulakhi and Sehra branches of the Rohri canal -- constituted the Sindh sub-project. When revised civil works targets were set, however, three additional systems -- Budhika, Kandiaro and Gohdu -- were included in the sub-project.

Civil works at distributary level involved lining channels having discharges equal to or less than 30 cusecs. The channels with more than 30 cusecs discharge were rehabilitated. The civil works have been completed. These were undertaken during the period when the law and order situation was a major obstacle. Yet, the quality of most of the civil works was found to be satisfactory. However, the floods caused by the heavy rains during the last summer have caused major damages to the tail portions of several of the improved distributaries and minors -- e.g., Sehra Minor, Dali Pota Minor, Sondhar Minor, Let Minor and Abji Minor]. The Sindh PID has already made a survey and is taking necessary steps to repair the damage.

Status of Sindh Sub-Project Civil Works
[as of October 1992]

Civil Work	Revised Target for Sub-Project	Work Completed	Percent of Revised Target	Work Remaining
Canal Rehabilitation	119.68 miles	119.68 miles	100	0 miles
Canal Lining	140.00 miles	140.00 miles	100	0 miles
Remodeling of Outlets	571 outlets	571 outlets	100	0 outlets
Improvement of Watercourses	538	509	95	29

Remodeling of 538 watercourse outlets has been completed. Unfortunately, the criteria used for remodeling of outlets was existing discharges, rather than sanctioned discharges. This has altered the duty of water for these outlets. As a consequence, the remodeling has resulted in further distortion of the equity along the channel, instead of improving it. Detailed discussions were held on this problem both with Sindh PID staff and the supervisory consultants. It appeared that none of these people were considering equity as an objective under this sub-project. As a consequence, complaints on tampering with the outlets were found to be very common.

Civil works at watercourse level involved lining of 15 percent of the length of main watercourse, earthen improvement of the remaining length, and installation of pukka nukkas for diverting water into field ditches. About 95 percent of the revised targets have been achieved so far. PILs have been issued recently for additional 22 watercourses. The actual work has not been started on these 22 watercourses. However, concerned staff of the OFWM was optimistic for their completion before the end of the project.

The quality of civil works on the improved channels was found to be satisfactory. Regular maintenance, especially cleaning for earthen part, seems essential. This was being neglected. Water leakage from joints in the lined portions and pukka nukkas was observed on some of the improved watercourses. This will require some minor maintenance before the end of the project.

Despite the fact that most of the civil works were carried out under adverse security conditions, their quality was found to be satisfactory. Although, there were no data available on hydraulic performance, there was visual evidence and farmers' recognition that lining had helped in increasing irrigation water supplies in tail portions, both quantitatively [more water] and qualitatively [more frequently]. However, fluctuations upstream are still affecting irrigation operations and are found to be a major hindrance to getting optimum benefits from lining. This is particularly true for tail reaches -- e.g., in case of the Let Minor of Sehra branch. Nevertheless, the presence of SCARP public tubewells in this area has helped in overcoming the tail shortages. There are not many private tubewells in the area.

4. Assessment of the Progress and Impacts of Sub-Project Non-Civil Works

a. Changes in Cropping Intensity

One of the major impacts anticipated in the project planning documents was an increase in cropping intensity in the sub-project area due primarily to the increased water availability resulting from canal and watercourse lining. In the pre-project feasibility study, the crop intensity of the sub-project area was reported to be 113 percent. In the project

baseline survey, completed by SRPO in 1988, the crop intensity was estimated at 111 percent. The data compiled by the SMO monitoring and evaluation section show that the cropping intensity increased to 140 percent in 1990/91. The latest report prepared by SMO shows that the cropping intensity before the project commenced was 81 percent and the current intensity is 108 percent.

b. Changes in Cropping Patterns

It is extremely difficult on the basis of the available data to evaluate any impacts or trends in cropping patterns in the sub-project area. The only point observation of the cropping pattern available is the project baseline survey [1987/88]. This shows a rabi season pattern with 79.6 percent wheat, 11.7 percent sugarcane, 6.9 percent forage crops, and less than 2 percent in other crops. The kharif season pattern shows 55.2 percent in cotton, 15.6 percent in sugarcane, 15.3 percent rice, 10.3 percent forage crops, and less than 2 percent in other crops.

c. Observations in the Sub-Project Area

Watercourses which were visited included: a full watercourse trial, initially managed by technical assistance team; a participatory watercourse [also termed a designed package watercourse trial], a typical improved watercourse, tail end improved watercourse, and an unrehabilitated watercourse.

(1) Increases in Cropping Intensity

Most farmers were of the opinion that, on their respective watercourses, the cropping intensities had gone up by 20 to 30 percent. However, some farmers reported no increases in the cropping intensities. Some farmers were also of the opinion that better water management practices also have led to marginal increases in cropped areas. In addition to the canal water, farmers have access to public fresh groundwater tubewells.

(2) Increases In Crop Yields

There are indications of increases in yield, especially for wheat [800 to 1,200 kilograms per acre] and, to a lesser degree, for sugarcane [4,000 to 8,000 kilograms] and cotton [120 to 200 kilograms]. Some of the farmers, located in the tail reaches or on unimproved watercourses, also reported yield increases close to what farmers located on improved watercourses were obtaining. This was attributed to better water management practices and adoption of improved high yielding crop varieties demonstrated in the sub-project area. Some farmers also reported significant increases in forage crop yields resulting from the improved seed multiplied in the sub-project area.

(3) Adoption of Improved Cultural Practices

The most common and widely adopted cultural practice seems to be the crosswise broadcasting method introduced for wheat. The second most adopted intervention were improved water management practices. Some farmers reported using insecticides recommended by the technical assistance team, but its wider acceptability of this intervention could not be ascertained.

It was observed that farmers on watercourses adjacent to the full watercourse trial and watercourses where demonstration plots were laid out were adopting new practices. Nevertheless, the farmers located in areas having relatively difficult access were not aware of the demonstration plots or any improved production packages recommended by sub-project staff.

(4) Water Availability in the Tail Reaches

The farmers located in the tail reaches indicated that the overall water availability and delivery efficiencies in their areas have increased only marginally. It was acknowledged, however, that regularity of water availability in the tail reaches has increased, even though the quantities have not changed significantly. It is estimated that the cropping

intensities have gone up 10 to 15 percent in these areas. Yield levels, however, have not changed significantly.

(5) Water Availability on the Unimproved Watercourses

The farmers located on unimproved watercourses reported some increase in water availability and an increase in cropping intensity of 10 to 15 percent. They indicated, in some cases, marginal increases in crop yields resulting from the demonstration effects of the sub-project demonstration plots.

(6) Farmers Perceptions About Factors Contributing to Improvements in Their Farming Systems

The farmers attributed changes in their farming systems to the following factors, in order of magnitudes:

- Better water management practices;
- Adoption of better seed;
- Better land preparation;
- Lining of the canals; and
- Improvements in watercourses.

The farmers generally feel that the CWM project has increased their awareness of better production packages and that there have been spillover effects on neighboring farms from the sub-project demonstration plots.

In the absence of reliable data, the cost effectiveness of individual interventions on factor productivity cannot be determined. Moreover, it is difficult to quantify the overall impact on aggregate agricultural production or to identify the relative contributions of the water management and other non-civil works, crop-related interventions tried in the sub-project area. Moreover, these interventions have only been tried only on selected watercourses and any wider adoption of interventions will need to be ascertained through a well-designed, full-fledged ex-post impact evaluation study.

5. Assessment of the Progress and Impacts of Sub-Project Institutional Development Activities

a. Sub-project Management Office

This office is headed by a sub-project manager from the OFWM. The incumbent is the third manager the sub-project has had. The first manager's tenure extended into 1991; the next two managers were in office for only eight months each. This turnover has had an adverse effect on the implementation of non-civil works activities. The current sub-project manager, for instance, has little understanding of what the project was trying to accomplish, especially with respect to the monitoring and evaluation unit.

The staff directly attached to the SMO have in the past included: an accounts officer, a progress officer, an assistant sociologist, an assistant economist. a computer programmer, and an administrative officer. At present, the only three of these positions are filled -- i.e, the accounts officer, the assistant economist, and the administrative officer.

Heading the water management and monitoring and evaluation units, the SMO has had a deputy manager position for each unit. During much of the sub-project, however, one or the other of these positions has been vacant. The

deputy manager for water management is a new man and the position of deputy manager for monitoring and evaluation operations is vacant. In addition, the two planning officer positions in the monitoring and evaluation unit are vacant; as are the two assistant agricultural engineer positions in the water management unit. The project has had five OFWM field teams attached to it. Each was headed by an assistant manager, with water management specialists and sub-engineers as staff. Currently, the sub-project has just four field teams in place.

Apparently the SMO has had difficulty keeping staff since the transfer of the first sub-project manager, who reportedly did much to build up the staff numbers and morale. When he left, many of the staff saw little reason to stay or began to look for positions elsewhere. This situation has had a negative impact on the sub-project during its last two years and has affected the sub-project's output, especially with respect to collection, analysis and reporting of field data.

As in other provinces, the sociologist position has been filled for only short periods. At present, the position is vacant in Sindh. This reflects a prevailing view in the government that this position was dispensable. Yet, the failure to fill this position and provide support is seen as one cause of the sub-project's poor performance in meeting its institutional development goals. Furthermore, such a position was particularly important in Sindh where the social order, usually described as feudal, is so entrenched that attempts to change it invariably meet with failure.

The sub-project manager's staff were not cooperating with him during the visit of the evaluation team. In fact, they had scrawled various slogans on the walls of the SMO office in Kandiaro and were, according to the sub-project manager, making unreasonable demands. The evaluation team, therefore, met with the sub-project manager at the rest house in Nausharo Feroze used by the technical assistance team. The manager brought a number of reports with him to provide to the team. These reports were mostly progress/status reports. They did not constitute a complete series and were particularly deficient for events in the recent past. Few reports were available from the technical assistance team and there were none that the evaluation team had not already seen elsewhere.

b. Monitoring and Evaluation

Aside from required quarterly progress/status reports, the SMO monitoring and evaluation unit appears to have done virtually no reporting after the departure of the technical assistance team in 1991. The reporting done before then back to the mid-term evaluation appears to be very sparse from the SMO. The staff had prepared a report for the evaluation team prior to its visit summarizing what reporting the office had carried out. This contained some useful agricultural production data but little on the institutional development achieved in the sub-project.

c. Inter-Agency Coordination/Cooperation

According to SMO staff interviewed, there has been a fairly considerable degree of interagency cooperation and coordination in Sindh. The Secretary of the PID remarked in Karachi that his department was agreeable to the PAD being the lead agency for the sub-project in Sindh and that this was a position they had held from the beginning. During the field visit, the evaluation team did not encounter any complaints in this area and the irrigation and agriculture staff appeared to be on good terms. The mid-term evaluation refers to coordination in supply of inputs and marketing and this appears to be continuing based on field interviews with farmers and WUA members, though only on a limited scale. The sub-project staff is not thought to have provided much support in this area at least in the last year or so on account of its reduced staff.

e. Sub-Project Coordinating Committees

SPCC meetings have not been held during the tenure of the current sub-project manager so he was not able to report on them. The file of minutes of the meetings was not available to the evaluation team so it was not possible to determine when the last meetings were held. As these meetings have apparently not been held with any regularity, they are not thought to have moved beyond the stage of supplication noted in the mid-term evaluation to venues for participatory development. The fact that Sindh was able to complete its civil works a year early may have some

bearing here because, as in the other provinces, the emphasis was on completing civil works so that once this was accomplished there was seen to be little need for the SPCC meetings.

f. WUA Formation

Two of the six participatory watercourses identified for Sehra-Naulakhi were visited. These were 2L Abji, for which process documentation exists, and 9AL Darbello. Both of the WUAs on these watercourses appear to have remained active, according to interviews with farmers and office bearers at each site. Ways in which the association has helped on 2L Abji include: irrigation scheduling, improved seed dissemination, and land leveling. The WUA continues to provide advice on wheat seed, for example, through a seed committee. The committee advises the WUA on availability in the market and bulk purchasing. Activities the WUA is currently engaged in include repair of broken pukka nukkas, for which the WUA is collecting funds from the members on a per acre basis.

The general secretary of the WUA claimed that sub-project interventions had produced more water and higher yields leading to higher social aspirations. These included interest in further education for their children, including their girls. There is a primary school nearby but they desire a middle school for girls. One of the daughters of a current member is studying at the matriculation level and they hope that she will return to be a teacher in the middle school once it is established.

There appears to have been a positive spread effect from watercourse 2L Abji to one neighboring watercourse visited. The WUA along this watercourse -- Tail Mithani -- according to interviews with two member farmers and the chairman, has followed the example of 2L Abji in the several ways: they meet on the 5th of every month for routine cleaning and maintenance of their watercourse; they participate in bulk buying seeds, fertilizers and pesticides for all the farmers; and they also participate in joint marketing of their crops. The members noted the time and money saved by these efforts which are taken as incentives for them to continue with the WUA. Socially, the WUA crosses several caste/tribal boundaries and most are owner-cum-tenants or tenants [66 percent] so they offer an interesting example of cooperation from the perspectives of social identity and tenancy.

The 9AL WUA meets once a month for routine maintenance. Their October meeting organized labor to reinforce the watercourse embankment damaged by recent rains. In September, they selected a new chairman. They wish additional lining as the tail-enders are not yet getting their full supply. There appears to be less joint purchase of inputs in this WUA but for the members who can benefit -- i.e., smaller, poorer farm households -- the WUA does support cooperative activity. They apparently jointly market their cucumbers, an important cash crop in the area, to such cities as Peshawar, Rawalpindi, Quetta and Karachi. They say they will keep their WUA active because it meets their needs and solves their problems. One farmer said that he thought there had been some spread effect as a result of their efforts and that one or two watercourses nearby were following their example.

One unlined watercourse was visited -- 12 AL Darbello -- to see why the farmers had not had their watercourse lined. The apparent reason is that there is a large farmer at the head and all of the other farmers are smallholders. The larger farmer is getting or taking what water he wants and is not interested in cooperating with the others. There would also be a heavy labor requirement from the farmers as the watercourse presently has high embankments. On account of these problems, a WUA has not been formed along this watercourse.

The farmers at 2L Abji and 9AL Darbello were informed before hand of the evaluation team's visit, so they may well have been prompted to put the best face on their WUAs. They appear to be active nonetheless; though whether still along participatory lines that involve most if not all the members would take a longer period of investigation than the team had available to it. The field visit found some positive signs among these WUAs; whether these can be sustained and can lead to the formation of viable, continuing WUAs remains to be seen.

A federation was visited at Kotri in the Naulakhi area. There were apparently two formed in the sub-project area. This one and one on the Sahita minor. The chairman of the federation was interviewed. He said seven WUAs comprised the federation, with the chairman of each [or his designated alternate] serving as the members. The

chairman claimed that the federation had a constitution and office bearers, including a general secretary, and met on an as needed basis.

The latter, who kept the federation's records, was away so the records could not be consulted. He is a Sijadah Nasheen -- or keeper of a religious shrine -- and is a large landlord. He has land on three of the federation's seven watercourses, in addition to land on two other watercourses. He said the main problems the federation was addressing were land leveling and seed supply. Water supply was an interest but problems in this area were not taken up with PID. He further claimed that the federation had been developed as a result of the wishes of the seven WUAs and that the sub-project had little to do with its formation.

This appears to be an organization that is serving mainly the interests of the larger farmers in the area, including the chairman. The sub-project appears to have maintained little contact with or support for the federation, allowing the present situation to develop.

ANNEX B

SCOPE OF WORK

ANNEX B

SCOPE OF WORK

1. MISSION REQUEST

Mission requests USAID/W assistance in obtaining services through a buy-in to the Irrigation Support Project for Asia and the Near East (ISPAN) to conduct subject evaluation, the description of which is provided below:

2. ACTIVITY TO BE EVALUATED

Project Title: Command Water Management (CWM) Component of Irrigation Systems Management (ISM) Project

Project Number: 391-0467

USAID Funding: US $ 33.536 million [prior to Pressler Amendment Budget]

World Bank Funding: US $ 46.500 million

GOP Funding: US $ 9.300 million

LOP Dates: FY 1985 - FY 1993

PACD: June 4,1993

3. PURPOSE AND OBJECTIVES OF THE EVALUATION

The purposes of this final evaluation are:

- To assess project accomplishments and impacts against the goals and objectives for the project; and
- To provide suggestions for formulation of a future CWM project so as to obtain increased accomplishments and greater impact.

The first objective will look on the project in hindsight and will gauge how the project has performed against the goals and objectives set forth in project documents, in particular the USAID Project Paper Amendment to the Irrigation Systems Management Project, January 1985, and also the World Bank SAR, No. 4971 PAK, April 1984.

The second objective deals with foresight. The evaluation will provide information to the Government of Pakistan, USAID, the World Bank, and possibly other donors to determine if the CWM concept is sound and justifies continuation. It will identify those strategies and approaches which can be replicated on a wider scale, and help decide how best to formulate similar CWM type programs in the future, particularly in the light of the World Bank's consideration of carrying out a second phase of CWM.

4. BACKGROUND

Irrigation is essential to agricultural productivity in Pakistan. The canal system, which today commands 35 million acres, was constructed during British rule beginning in the second half of the nineteenth century. The objective was famine avoidance. Orfice-type outlets were installed, and a water supply delivery schedule was instituted such that a large number of farmers could harvest at least one crop per year. Historically, this was a "protective" irrigation

system.

Pakistan's irrigation system has continued to evolve with emphasis on making it a "productive" irrigation system. Both the Government and farmers have contributed to bringing more lands under cultivation and to raising cropping intensities. The link canal system and the large dams at Mangla and Tarbela, a result of the ambitious Indus Basin Plan, have increased water delivery flexibility and supply, leading to an increase in overall production of the principal grains. Independently, farmers have installed nearly 250,000 tubewells which augment canal supplies by approximately one-third. This is an achievement in private-sector irrigation development which is largely unheralded. In certain areas of the country, use of tubewell water has enabled farmers to increase cropping intensity to between 1.2 and 1.4.

Notwithstanding these achievements, Pakistan's irrigation system, and therefore its agricultural economy, performs very poorly. For example:

- About 25 percent of the water is lost before reaching the farm, while at the farm level, irrigation efficiency averages less than 50 percent.

- Waterlogging and associated salinity occurs on an estimated 17 million acres or half the total under command. These factors contribute to keeping yields low.

- Average irrigated yields for rice and wheat are less than 2.0 mt/ha, which places Pakistan near the bottom of the list for countries producing these crops under irrigation.

- While a substantial number of farmers achieve yields of up to 6 mt/ha for rice and wheat, many more poor and disadvantaged farmers harvest considerably less than two tons per hectare. In Pakistan, the difference between the top ten percent of the farmers and the bottom ten percent is very great. Differential access to water (equity/inequity) accounts for much of the observed yield and income disparity.

The CWM Project was designed to address these and other constraints affecting the performance of Pakistan's irrigation system. Through interventions to capture more fully existing irrigation potential, the project sought to raise agricultural productivity in selected areas. CWM follows an integrated approach which brings together civil works improvements (infrastructure) with non-civil works activities in an effort to obtain improvements in agricultural production. CWM was begun by the GOP in July 1985 with the assistance of USAID and the World Bank.

Civil works improvements programmed under CWM include: canal rehabilitation, canal lining, outlet remodeling, surface drainage, sub-surface drainage (tubewells), and watercourse improvement (partial lining).

Project-sponsored non-civil works included:

- Agronomic improvements to increase cropping intensities or crop yields, and sometimes to introduce new crops. Interventions included, but were not limited to, better water management and scheduling, improved equity of water deliveries, and increased use of inputs.

- Institutional change at three levels:

    - o changes in the way the line agencies, the Provincial Agriculture Departments (PADs) and Provincial Irrigation Departments (PIDs), collaborate to achieve the agricultural objectives of CWM;

- o establishment of Sub-Project Management Offices (SMOs) responsible for planning and implementing CWM activities in the sub-project areas. SMOs are public-sector decentralized institutions which draw staff from PADs and PIDs; and

- o fostering establishment and function of water user associations (WUAs) which are grassroots, private organizations at the watercourse levels.

Under the CWM Project, civil and non-civil works have been implemented in seven sub-project areas distributed among Pakistan's four provinces:

Balochistan	Lasbela Canal
North West Frontier Province	Warsak Lift Canal
Punjab	Niazbeg, Pakpattan, Shahkot and 6R/Hakra
Sindh	Sehra/Naulakhi

These sub-project areas have a cultivable command area of 510,000 acres served by over 1,000 public watercourses that vary in length from one and a half to three miles.

USAID support included the funding of a technical assistance team (TAT) of expatriate and local experts that assisted local counterparts in the SMOs in institutional development, engineering, farm-level economics, and agronomy. The TAT was evacuated during the Gulf War and the contract with the consulting firm was terminated. A Pakistani firm is being hired to analyze the data from on-going trials which have continued under SMO direction.

Principal agricultural institutions concerned with CWM implementation are the On-Farm Water Management and the Extension Directorates. In Punjab and Sindh, Agriculture Departments were the lead organizations. In Balochistan and NWFP, project management was with the PIDs. Coordination at the Federal level is being provided by the Ministry of Water and Power.

5. STATEMENT OF WORK

The evaluation team will compile and analyze information about the CWM Project to meet the objectives for the evaluation. The team will discuss the problems and constraints faced during implementation, and the lessons learned. It will provide recommendations regarding replicability and sustainability of the CWM program on a larger scale. Specific questions/subject areas to be addressed will include, but not be limited to, the following:

A. Institutional Development

Line Agencies:

- ♦ Has CWM increased dialogue among line agencies?

- ♦ Is there any evidence within line agencies of increased concern for agricultural production (PADs), and for equity (PIDs), as a result of project interventions?

- ♦ Have PADs been able to work together with private input suppliers to improve agricultural productivity?

- ♦ Have PIDs indicated any willingness to monitor flows themselves to assess equity concerns?

- ♦ Assess the degree of commitment of line agency leadership toward implementation of a future CWM Project.

- Could a future CWM Project be implemented with line agency cooperation but with leadership provided by the District Commissioner's (DC) office?

Sub-Project Management Offices (SMOs):

- Assess the effectiveness of SMOs in terms of stated project objectives of planning, input monitoring, and M&E of outputs and impacts.
- Is the SMO model a valid concept for agency decentralization and management?
- How does establishment of SMOs affect WUAs?
- Is the SMO model cost effective? Estimate recurrent costs.
- Is the SMO model institutionally feasible to replicate? What is the line agency response to SMO formation?
- What resources are requested to keep the SMOs or some similarly functioning unit in place after project termination and what is the interest in the Government for doing so?

Water User Associations (WUAs):

- Report on the existence, operation, and performance of WUAs in project areas.
- Are there WUA experiences which can be adapted and replicated?
- What have been the roles of WUAs in helping meet CWM objectives?
- On the basis of CWM experience (as contrasted with OFWM experience), is there reason to believe that the interest and existence of the WUAs can be maintained beyond watercourse lining?
- What are the recommended water and non-water roles for WUAs?
- How effective is the participatory approach in organizing viable WUAs?
- Review the status of federation of the WUAs.
- Make an overall assessment of the impact of Water User Association Development Specialists (WUADS) on:
    - o WUA formation;
    - o farmers' awareness of improved technologies; and
    - o implementation of those technologies.
- What were the benefits and problems in having WUADs work directly with farmers? Are they a required part of the program?
- Should the OFWM Project use WUADs in support of their program?
- How should the salaries of WUADs be paid?

- What are the opportunities for and interest in institutionalizing the positions within the Government?
- How do the WUA experiences of CWM and OFWM compare?
- What are the prospects for WUAs as vehicles for user cost recovery?

B. Agricultural Interventions

- Catalog the agricultural (including on-farm water management) interventions advocated by the project and assess their relative contribution to meeting CWM objectives.
- On the basis of information documented by others, report on changes in agricultural production (yield, cropping density) in CWM sub-project areas in comparison to adjacent non-CWM areas. If data are not available, make recommendations as to how data may be obtained.
- Are there changes in agricultural production and incomes that can be directly attributed to CWM interventions? If not, why not?
- If increased production is found to be a result of CWM activities, was the increase due to additional water, better equity in water delivery, improved access to inputs, new technologies, better marketing, etc.?
- Has the CWM Project made any difference regarding tail-end farmer access to water?
- To what extent have farmers adopted improved water management techniques and crop cultivation practices? What, if any, are the constraints to farmer adoption of the techniques?
- Have precision land leveling and irrigation scheduling improved application efficiencies?
- Have the programs of Full Watercourse Trials and Demonstration Plots contributed to meeting CWM objectives?

C. Civil Works

- Update the status of civil works accomplishments against physical targets established in the Project Paper.
- What has been the impact of watercourse lining on water deliveries?
- What has been the impact of canal lining on water deliveries?
- What is the status of watercourse material cost recovery? What have been the difficulties in recovering costs from farmers? How can cost collection be improved? Potential role of WUAs?
- Assess the quality of construction of civil works?
- Has provision of CWM-funded civil works helped or hindered private investment in tubewell irrigation?
- Has the project had any impacts upon system operations and maintenance (O&M)? Are there any differences between O&M as practiced in CWM sub-project areas and in non-CWM areas?
- Given that funding for civil works in often cited as the incentive for participation by line agencies and by farmers, how can a future CWM Project be structured so that attainment of civil works targets does not hamper non-civil works? Could a future CWM Project be established with incremental funding based on

non-civil works?

D. **Project Implementation Assessment**

- Review the effectiveness of training programs and workshops in terms of advancing overall project objectives.

- Assess the effectiveness of the technical assistance team in providing guidance to SMOs in the implementation of project objectives.

- Assess the nature and effectiveness of the relationships among major entities involved (USAID, GOP, World Bank, TA team, other donors) in implementation of the project.

- Review the major recommendations of the mid-term evaluation of CWM and determine responsiveness by implementors and involved agencies to those recommendations.

6. TEAM COMPOSITION

The evaluation team shall consist of six members to be provided by ISPAN under a buy-in arrangement. Since this is a final evaluation of the CWM component, the team will be composed of individuals with no previous involvement with the CWM component.

Expatriate members of the team will consist of an irrigation/agricultural engineer, an institutional specialist, and an agricultural economist. It is desirable for these team members to have experience in Pakistan or South Asia. In consultation with USAID, one of these individuals will be designated as team leader with full responsibility for coordinating the evaluation and drafting and presenting the final evaluation report.

Three locally hired professionals will also be hired by ISPAN. These will be an irrigation/ agricultural engineer, an institutional specialist, and an agricultural economist.

All team members should have disciplinary skills stemming from at least 15 years in agriculture-related institutional building projects. Prior experience conducting evaluations is desirable. Strong writing skills, computer abilities in drafting written reports, and successful interpersonal skills are also required.

7. METHODS AND PROCEDURES

Agronomic impact data will be collected and compiled by a local contractor prior to fielding the evaluation team. The data are expected to be ready by October. The data will be reviewed by ISPAN for completeness and adequacy before fielding the evaluation team. ISPAN may ask a local member of the evaluation team, preferably the agricultural economist, to make this review before initiation of the full evaluation.

Prior to arrival of the expatriate team, a Pakistani member of the team will assemble key documents for use of the evaluation team. These will include copies of the Project Paper Amendment, the SAR, the World Bank's Aide Memoire covering the "Rapid Appraisal" of the CWM Project (November 3-27, 1991), and other documents pertaining to the project that are available in Pakistan. This team member will also compile data on civil works accomplishments. ISPAN will provide copies of the mid-term CWM evaluation (May 1989).

Steps in the evaluation will include:

- A team planning meeting for expatriate team members at the ISPAN offices prior to departure.

- Review of assembled impact data and civil work accomplishments.

- On arrival, a second team planning meeting of the full team with the concerned USAID Project Officer to obtain further orientation, to make travel plans, and to fine-tune reporting requirements.

- Since this is a final evaluation of a large and important project, field visits should be made to all CWM sub-project areas. However, all members of the team should not visit all project areas. Following visits by the entire team to the most important sites, members will form small groups to make visits to the others. Site selections will be made by the team with USAID and Government agencies.

- At the provincial level, meetings will be held with representatives of the line agencies, SMOs, and DC Offices. Meetings will also be held with the Federal Coordinator's Office and with various concerned donor groups in Islamabad. Site visits will include interviews with WUAs and area farmers.

- A draft will be submitted to the USAID Mission at least one week before the departure of the expatriate members of the evaluation team.

- Comments on the draft report will be made verbally and in writing at the final meeting to be held in Islamabad by USAID, the World Bank, the Federal Coordinator, and Provincial Representatives. Based on these comments, the draft will be revised and left in-country.

- Within three weeks of his/her return to the USA, the team leader will prepare a final draft report, for submission to ISPAN.

- The final report will be edited, printed, and distributed by ISPAN within two weeks of the submission of the final draft report by the team leader.

8. PERIOD OF SERVICES

The services of the specialists are required during a period of six weeks commencing o/a October 1, 1992 through November 15, 1992. A six-day work week will be required. Each member of the expatriate team is expected to spend: 2 days in a team planning meeting at ISPAN offices; 3 days in travel; and 36 work days in Pakistan.

The team leader will be authorized an additional 5 days for report completion in the USA.

For the local team, 36 work days in Pakistan are anticipated. One member of the local team will spend up to five additional days in data review and compilation prior to the arrival of the full team.

9. REPORTING REQUIREMENTS

The final report shall contain at a minimum the following sections:

- Basic Project Identification Sheet

- Executive Summary of not more than five single spaced pages. It will review major findings, conclusions and recommendations.

- The main text that will review and analyze the questions and issues set forth in the Scope of Work. This will be limited to not more than 50 pages.

- A set of annexes to include:

    - Site reports giving a final update/status of the project by each of the sub-project areas, using the ISPAN mid-term evaluation report as a baseline. A suggested format is contained in that report;

- o Compiled agronomic and civil works data;
- o The Scope of Work;
- o A list of individuals and literature consulted; and
- o Other materials as appropriate.

ANNEX C

LIST OF PERSONS CONTACTED AND TEAM SCHEDULE

ANNEX C

LIST OF PERSONS CONTACTED AND TEAM SCHEDULE

I. USAID Mission

John S. Blackton	Mission Director
Nancy M. Tumavick	Deputy Mission Director
Arnold J. Radi	Chief, Office of Agriculture and Rural Development
Virgil D. Miedema	Chief, Mission Program Office
Richard Steelman	Chief, Mission Project Design Office
Michael E. Hauben	Deputy Chief, Mission Project Design Office
John B. Swanson	Deputy Chief, Office of Agriculture and Rural Development
Jan P. Emmert	Chief, Water Resources Division, Office of Agriculture and Rural Development
Judy Schumacher	Mission Evaluation Officer
Muzammil H. Qureshi	Chief Water Resources Engineer/Irrigation Systems Management Project Officer
Zahid S. Khan	Project Engineer
S. Asif Mahmood	Project Officer
Jalil U. Ahmad	Irrigation Systems Rehabilitation Project Officer
Tariq Mahmood	Senior Program Assistant

II. Government of Pakistan

A. Federal Government

Syed Shahid Hussain	Additional Secretary, Federal Ministry of Water and Power
S. Inayat Ali	Deputy Secretary [Water]/Additional Federal Coordinator for CWM, Ministry of Water and Power
Bashir Ahmad	Joint Secretary [Water] and Federal Coordinator for the CWM Project, Federal Ministry of Water and Power

B. Provincial Government and CWM Project Personnel

1. Balochistan Province

Mohammad Amin	Secretary, PID, Quetta
Salam Khan	Chief Engineer, PID
Nur Ahmed	Superintending Engineer, Kacat Irrigation Circle, PID
Mohammed Naim	Project Manager [ex-Engineer (Analysis Division), PID
Raees Iqbal	Chief [Agriculture], P&D, Quetta
Anwar-ul-Haq Badar	Chief [Water], P&D, Quetta
Fazal Durrani	Secretary, Department of Agriculture, Quetta
Chaudari Zulfiqar Ali	Director General [Agriculture Extension]
Riaz Ahmed	OFWM Agronomist
Mohammed Tariq Janjua	Secretary [Finance], Finance Department, Quetta
Mohammad Naeem Baloch	Sub-Project Manager, SMO
Asif Javed	SDO [Irrigation]
Abdul Aziz	SDO/CWM Project
Amin Qumbrani	Divisional Head Draftsman

Abdul Qadir	Agriculture Officer
Gul Hassan Mari	Assistant Director [OFWM]
Zahid Saeed Qureshi	Ex-Project-funded Monitoring and Evaluation Specialist, SMO
Mohammed Siddique	Chairman, WUA, Watercourse 24, Minor 4
Qaiser H. Jafri	Engineer, NESPAK-NDC
Saif-ur-Rehman Mengal	Ex-Project-funded WUADS

2. Sindh Province

Ghulam Haider Abbasi	Director General, Sind Regional Planning Organization
Ghulam Mustapha Soomro	Economist, Sind Regional Planning Organization
Mohammad Idris Rajput	Secretary, PID [Karachi]
Nassar Ali Rajput	Additional Secretary, PID
Shuja Ahmed Junejo	Superintending Engineer, Rohri Canal Circle, PID
Fazalullah Qureshi	Additional Chief Secretary, P&D
Ghulam Mustafa Abro	Chief [Water and Power], P&D
Munir Ahmad Qazi	Chief [Agriculture], P&D
Azizullah Tunio	Deputy Secretary, PAD
Ayub Qazi	Additional Secretary, PAD
Aftab Ahmad Khan	Director General [OFWM], PAD
J. Nazar M. Shah	Deputy Director [Agriculture], L.B.O.D
Shahzado Sheikh	Secretary, Department of Agriculture & Wildlife
Ghulam Nabi Mughal	Executive Engineer, Moro Division
Bhatti Amir Bux	Sub-Project Manager
Mannan Memon	Director, SRPO

3. Punjab Province

Shams Ul Mulk	Member and Managing Director [Water], Pakistan Water and Power Development Authority [WAPDA]
M. Sadiq Cheema	Secretary, Department of Agriculture
Mushtaq Ahmad Gill	Director General Agriculture [Water Management] Punjab
Dr. Shaheen Khan	Chief Economist, Planning and Development
M. Afzal Shah	Chief [Agriculture]. Planning and Development
Ch. Khadim Hussain	Assistant Chief [Foreign Aid], Planning and Development
Abdul Hafiz	Assistant Chief [Crops], Planning and Development
Imtiaz Ahmad	Assistant [Research Officer], Planning and Development
Zaka Uddin	Chief [Water], Planning and Development
Tahir Saleem Khakwani	Director General Extension, PAD
Iftikhar Cheema	Director Headquarters, Agricultural Extension, PAD
Maqbool Ahmed	Director, Extension, PAD
A.H. Zaidi	Additional Secretary, Provincial Irrigation Department [PID]
M. Akahtar Rana	Chief Engineer, P&R, and Deputy Secretary, PID
Qazi Anwar Ali	Deputy Secretary [Development], PID
Ch. Irshad-ul-Haq	Personal Assistant to the Additional Secretary, PID
Hafiz Mohammad Gulzar	Superintending Engineer, CWMP Circle
Mohammad Siddique	Executive Engineer, Lahore
Abdul Majid Bhatti	Executive Engineer, Pakpattan
Mohammad Ashraf	Director Headquarters, OFWM
Mohammad Saleem Arshad	Director, CWMP

4. North West Frontier Province

Faqir Ahmed Paracha	Secretary, Irrigation and Public Health
Inamullah Khan	Additional Secretary, P&D
Adnan Bashir Khan	Chief [Agriculture] P&D
Abdul Qayyum Khan	Chief [Irrigation], P&D
Nawab Khan Masud	Chief Engineer [WSIPC], P&D
Amjad Shahid Afridi	Chief of Section [Water and Power], P&D
Hashmat Ullah	Assistant Director [WSIPU], P&D
Manzoor Ahmad Sethi	Additional Secretary [Agriculture], PAD
Haq Dad Than	Deputy Director [Planning], PAD
Shaukat Ali	Economist representing Director General [Extension], PAD
Yousaf Khattak	Director, OFWM, PAD
Sher Afzal	Deputy Director, OFWM, PAD
Sahib Zada Alamgir	Assistant Director, Water Management
Ijaz Khattak	Assistant Director, CWM
Amir Haider Khan	Chief Engineer, PID
Allah B Bakhsh Baluch	Superintending Engineer [PID]/Sub-Project Manager, CWM/SMO
Mian Mehboob Gul	Deputy Sub-Project Manager, CWM
Khanzado	Agricultural Economist/Monitoring and Evaluation Officer, CWM/SMO
Kalim Afzal	Former Deputy Project Director, CWM/SMO
Arshad Aziz	Irrigation Engineer, formerly with ARD, Inc.

III. Donor Representatives and International Agencies

S.H. Thavaraj	Senior Irrigation Engineer, Agriculture Operations, Country Department 3, South Asia Region, World Bank, Washington, D.C.
Masood Ahmad	Irrigation Engineer, Agriculture Operations, Country Department 3, South Asia Region, World Bank
Usman Qamar	Project Advisor, World Bank/Islamabad
Jacob W. Kijne	Director, International Irrigation Management Institute/Lahore

IV. Contract Personnel

Tariq Husain	Managing Director, Enterprise & Development Consulting (Pvt) Limited
Mohammad Tufail Bhatt	Enterprise & Development Consulting (Pvt) Limited
Abdul Razzaq Saleemi	Enterprise & Development Consulting (Pvt) Limited
I.R. Mufti	Enterprise & Development Consulting (Pvt) Limited
Nasir-Ud-Din	Enterprise & Development Consulting (Pvt) Limited
Jan M. Saaita	Enterprise & Development Consulting (Pvt) Limited
M. Asghar Khan	Agronomist, Enterprise & Development Consulting (Pvt) Limited
Faizul Hassan	Project Manager, Associated Consulting Engineers [ACE] (Pvt.) Limited
Col. S. Hasnain Ahmed	NESPAK/NDC
Mohammad Jameel Khan	Director, Pakistan Economic Research Institute [PERI]
Robert A. Mohammed	Senior Associate and Agricultural/Irrigation Engineer, ARD, Inc., Burlington, Vermont

EVALUATION TEAM SCHEDULE

30 October 1992	Expatriate team members arrive at Marriott Hotel, Islamabad Meeting with Jan Emmert and Asif Mahmood, USAID Informal meetings between team members
31 October 1992	Team planning meeting Air line arrangements at American Express
1 November 1992	
0830	Meeting with Asif Mahmood, USAID Project Officer, and Jan Emmert with focus on evaluation logistics
1000	Meeting with USAID/ARD office members: Arnold Radi, John Swanson, Jan Emmert, Asif Mahmood, Jallil Ahmad, Muzammil Qureshi, and Tariq Mahmood
1430	Meeting with Bashir Ahmad, GOP Federal Coordinator for the CWM Project
2 November 1992	
	Review of available literature on the CWM Project
1430	Meeting with EDC team compiling data on final watercourse trials and former Pakistani CWM project technical assistance team members
3 November 1992	
	Finalization of team itinerary Review of available literature on the CWM Project
4 November 1992	
0900	Shahid Hussain, Additional Secretary in the Federal Ministry of Water and Power
1100	Meeting with John Blackton, USAID Mission Director, and Nancy Tumavick, USAID Deputy Mission Director
1415	Meeting with Usman Qamar, World Bank
5 November 1992	
	Review of available literature on the CWM Project
6 November 1992	
	Team departure for Lahore Team arrives at Avari Hotel, Lahore
7 November 1992	
0900	Secretary, Provincial Agriculture Department [PAD]
0930	Chief Economist and staff, Provincial Planning and Development Department
1045	Director General, On-Farm Water Management [OFWM]
1345	Director General, Agricultural Extension
1500	Member and Managing Director [Water], WAPDA

1600	Director, Water Management Evaluation Department [WMED]
8 November 1992	
0900	Secretary, Provincial Irrigation Department [PID]
1000	Chief Engineer, PID and staff
1115	Consultants from ACE and NDC/NESPAK
1400	Director and staff, Punjab Economic Research Institute [PERI]
1500	Director, International Irrigation Management Institute [IIMI]
9 November 1992	
	Team visit to Niazbeg Sub-Project site
10 November 1992	
	Team visit to Shahkot Sub-Project site
11-13 November 1992	
	Group A [Jones, Husaini and Bhatti] visits Pakpattan Sub-Project site Group B [Eriksen, Corey and Tirmizi] visits 6 R Hakra Sub-Project site
14 November 1992	
	Team meetings at CWM/Punjab SMO
15 November 1992	
	Final wrap-up meetings and interviews in Lahore
16 November 1992	
	Group A travels to Quetta Group B returns to Islamabad
17 November 1992	
	Group A interviews Provincial Government officials in Quetta and then travels to Karachi Group B travels to Peshawar
18 November 1992	
	Group A visits Lasbela Sub-Project site
19 November 1992	
	Group A interviews Provincial Government officials in Karachi

20-21 November 1992	
	Group A visits Sukkar and Kandiaro Sub-Project site
22 November 1992	
	Group A returns to Islamabad
18-19 November 1992	
	Group B interviews Provincial Government officials and visits the Warsak Lift Canal Sub-Project site Group B returns to Islamabad
20-21 November 1992	
	Group B drafting site reports and other annexes
22-29 November 1992	
	Team drafting of report
30 November 1992	
	Team debriefing(s) and presentation of the preliminary draft report to USAID Mission
2 December 1992	
	USAID debriefing and comments to the team on preliminary draft report
3 December 1992	
	Team revises preliminary draft evaluation report to incorporate USAID Mission comments
4 December 1992	
	American team members depart Pakistan
7-19 December 1992	
	Preparation of final draft evaluation report by Eriksen in Ithaca, New York
17 December 1992	
	Evaluation debriefing at AID/Washington

ANNEX D

REPORT BIBLIOGRAPHY

ANNEX D

REPORT BIBLIOGRAPHY

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