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AGENCY FOR INTERNATIONAL DEVELOPMENT

DEPARTMENT OF STATE

WASHINGTON, D.C. 20523

PROJECT PAPER AMENDMENT

PAKISTAN - IRRIGATION SYSTEMS MANAGEMENT

(COMMAND WATER MANAGEMENT)

391-0467

JANUARY 1985

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PROJECT AUTHORIZATION AMENDMENT

NAME OF COUNTRY: Pakistan
TITLE OF PROJECT: Irrigation Systems Management
NUMBER OF PROJECT: 391-0467

1. Pursuant to Section 531 of the Foreign Assistance Act of 1961, as amended (the Act), I hereby authorize this Amendment to the Irrigation Systems Management Project, which was originally authorized on May 5, 1983, to provide for the Islamic Republic of Pakistan an additional amount of not to exceed United States Dollars Twenty-Five Million ($25,000,000) in grant funds over a five (5) year period from the date of this Authorization Amendment, subject to the availability of funds in accordance with the A.I.D./OYB allotment process, to help in financing foreign exchange and local currency costs for the Project. The total Project Authorization shall not exceed United States Dollars Ninety Million ($90,000,000).

2. This Project Amendment is designed to provide technical assistance, commodities, training, and financing for civil works to implement a Command Water Management (CWM) Program in seven sub-project areas in all four provinces of Pakistan. This Program is expected to be co-financed by the World Bank (IBRD) through its affiliate, the International Development Association (IDA) under the IBRD/IDA Command Water Management Project. A.I.D. will, among other things, finance rehabilitation of watercourses and other down-stream physical improvements and assist the Cooperating Country to examine the feasibility and replicability of the CWM approach to, among other things: (a) substantially increase agricultural production in selected pilot areas through improved water management; (b) develop water management techniques and programs replicable over a wide range of agro-climatic zones and land and water environments; (c) reduce inequities in actual water deliveries in the tail reach of canals at all levels; and, (d) build within the provincial agencies a continuing capability for planning, implementing, and operating integrated programs for irrigated agriculture.

3. The Project Agreement(s) which may be negotiated and executed by the officer(s) to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following additional essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

Covenant as to Cost Recovery Program

Except as A.I.D. may otherwise agree in writing, the Grantee shall cause each Province to recover from beneficiaries the cost of materials provided to them for renovation of watercourses and other farm-level works at the following approximate levels:

a. Punjab: 20 percent of such costs.

b. Sind and Baluchistan: 25 percent of such costs.

c. NWFP: Not later than August, 31, 1985, or such other date as the parties may agree to in writing, the NWFP shall submit to A.I.D. a written proposal for effecting cost recovery in that Province and agrees, thereafter, to implement a cost-recovery program in a manner and within a time frame mutually acceptable to A.I.D. and the Province.

4. The original authorization shall remain in full force and effect except as hereby amended.

M. Peter McPherson
Administrator

Date

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number 1

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: PAKISTAN

3. PROJECT NUMBER: 391-0467

4. BUREAU/OFFICE: ASIA — 04

5. PROJECT TITLE (maximum 40 characters): Irrigation Systems Management

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 90

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 83 B. Quarter 3 C. Final FY 87

8. COSTS ($000 OR EQUIVALENT $1 = Rs 14.50)

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	19,963	14,037	34,000	40,022	49,978	90,000
(Grant)	(19,963)	(14,037)	(34,000)	(40,022)	(49,978)	(90,000)
(Loan)	(–)	(–)	(–)	(–)	(–)	(–)
Other U.S. 1.						
Other U.S. 2.						
Host Country	–	4,200	4,200	–	37,130	37,130
Other Donor(s) IBRD/IDA	–	11,220	11,220	1,500	85,000	86,500
TOTALS	19,963	29,457	49,420	41,522	172,108	213,630

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	AUTHORIZATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ESF	184	064	–	65,000	–	25,000	–	90,000	–
(2)									
(3)									
(4)									
TOTALS				65,000	–	25,000	–	90,000	–

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 019 022 032 09

11. SECONDARY PURPOSE CODE: 134

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BF	R/AG	EQTY	LAB	TECH	TNG
B. Amount						

13. PROJECT PURPOSE (maximum 480 characters)

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.

14. SCHEDULED EVALUATIONS
Interim MM 07 YY 88 MM YY
Final MM 07 YY 90

15. SOURCE/ORIGIN OF GOODS AND SERVICES
[X] 000 [ ] 941 [X] Local [ ] Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page iv of a 106 page PP Amendment plus annexes.)

A.I.D. plans to add $25 million in ESF grant funds to the existing project to implement a Command Water Management (CWM) Program which will be co-financed by the IBRD through its IDA affiliate.

Methods of Implementation & Financing Approval
A. Dean Pratt, Controller

17. APPROVED BY
Signature: Donor M. Lion
Title: Director, USAID/Pakistan
Date Signed: MM 01 DD 03 YY 85

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MM DD YY

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LIST OF ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ADBP	Agricultural Development Bank of Pakistan
AED	Academy for Educational Development
AID	Agency for International Development
AO	Agricultural Officer
BALAD	Baluchistan Area Development (Project)
CDSS	Country Development Strategy Statement
CMS	Cotton Maximization Scheme
CWM	Command Water Management
CY	Calendar Year
DST	Development Support Training (Project)
EOPS	End of Project Status
FA	Field Assistant
FAR	Fixed Amount Reimbursement
GOP	Government of Pakistan
GOProv.	Government of Province
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
ISM	Irrigation Systems Management (Project)
Khan	A tribal leader of a small community in the NWFP
MART	Management of Agricultural Research and Technology (Project)
mogha	Canal outlet
mt/ac	Metric ton per acre
nakka	Turnout to ditches or farmer's watercourses
NARC	National Agricultural Research Center
NFC	National Fertilizer Corporation
NWFP	Northwest Frontier Province
O&M	Operation and Maintenance
O/ARD	Office of Agriculture and Rural Development (USAID/Pakistan)
OFWM	On-Farm Water Management
OYB	Operational Yearly Budget
P&D	Planning and Development (Department)
PARC	Pakistan Agricultural Research Council
PFY	Pakistan Fiscal Year
PID	Provincial Irrigation Department
PME	Planning, Monitoring, and Evaluation (Unit in SMO)
PP	Project Paper
PPC	Provincial Policy Committee
PRC	Planning Research Corporation (ISM Contractor)
RAP	Revised Action Program
SAR	Staff Appraisal Report
SCARP	Salinity Control and Reclamation Project
SCC	Sub-Project Coordinating Committee
SMO	Sub-Project Management Office
T&V	Training and Visitation

T.A.	Technical Assistance
tehsil	An administrative sub-division of a district (usually four or five tehsils constitute a district)
TIPAN	Transformation and Integration of the Provincial Agricultural Network (Project)
U of I	University of Idaho
UK	United Kingdom
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WAPDA	Water and Power Development Authority
WM	Water Management (Unit in SMO)
WMS II	Water Management Synthesis II (Project)
WUA	Water Users Association
warabandi	Fixed schedule of water delivery

I. SUMMARY AND RECOMMENDATIONS

A. Recommendations

USAID/Pakistan recommends the approval of an authorization amendment to the Irrigation Systems Management (ISM) Project to increase total life of project funding by $25 million to a new total of $90 million to finance a Command Water Management (CWM) Program. Except as A.I.D. may otherwise agree in writing, source and origin of goods and services and ocean shipping requirements under the CWM Program shall remain the same as in the existing authorization. The statutory checklists and Mission Director's 611(e) and 612(b) certifications contained in the original Project Paper remain valid. A country checklist for FY 1985 is included as Annex E.

B. Summary Project Amendment Description

This Project Paper Amendment describes the activities which will be financed by A.I.D. under the CWM component of the ISM Project. The CWM component is closely related to the rehabilitation works, institutional improvement, and research components of the parent ISM Project. The latter three project components will lay the foundation for the improved delivery of water through the canal system. Efficient and effective operation, maintenance, and management of the irrigation system are essential to implement a strategy aimed at improving the productivity of the land and water resources in Pakistan. The CWM Program will provide the basis for all relevant agencies to cooperate, with the active participation of water users, to match water supplies with crop requirements and to provide other necessary inputs and services in a coordinated and timely manner in order to increase agricultural productivity.

As is the case for the on-going ISM Project, the CWM component constitutes A.I.D.'s contribution to a Program which was collaboratively designed with and will be co-financed by the World Bank (IBRD) through its International Development Association (IDA) affiliate under the IBRD/IDA CWM Project. The specific objectives of the CWM Program are to:

1. 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;

2. 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;

3. 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,

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

The CWM approach will introduce three new elements to the management of the irrigation system in Pakistan: (1) increased farmer participation in the planning and management of the irrigation system; (2) coordinated institutional, physical and operational improvements in specific sections of the command areas; and, (3) the creation of a single entity, the Sub-Project Management Office, to be the focus for the coordinated delivery of water and non-water inputs to increase agricultural production.

CWM Program activities will be carried out in seven sub-project areas in all four provinces. Over 700,000 people live in the sub-project areas, which are very different agro-climatically and socio-culturally. Each 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. Sub-project areas are also referred to as "command areas". IBRD/IDA will finance the rehabilitation and remodelling of the canals that serve the seven command areas as well as improvements to surface and sub-surface drainage in each sub-project area. A.I.D. will finance rehabilitation of watercourses and other down-stream physical improvements and will provide technical assistance and training to examine the feasibility and replicability of the CWM approach for the improved management of water and non-water inputs.

CWM builds on approaches that have already proved effective and popular (i.e. the creation of Water Users Associations to facilitate watercourse improvements, started under the A.I.D.-financed On-Farm Water Management Project) to establish new institutions and strengthen existing organizations. Sub-Project Management Offices (SMOs) will be established to implement CWM activities. They will be supported at the provincial level by Policy Committees and at the local level by Sub-Project Coordinating Committees. SMOs will be further assisted by consultant teams already under contract under the parent ISM project as well as by a CWM Technical Assistance Team of expatriate and Pakistani specialists; a team from the Water Management Synthesis II Project; and, local supervisory consultants. With this assistance, SMOs will work on a section by section basis (each section typically defined as the area served by a given minor), preparing plans and implementing physical and operational improvements. They will also encourage Water Users Associations (WUAs) to adopt new roles and responsibilities and to join in section federations and command-wide councils to provide farmers with organizations through which to express their needs and views. Each SMO will have a Planning, Monitoring and Evaluation Unit, which will gather baseline data and monitor progress for all CWM activities in its

sub-project area. External researchers, drawn from local universities and private groups, will be hired to conduct studies and evaluations on particular issues that arise during implementation.

Farmer beneficiaries include large and small land owners, owners-cum-tenants, and tenants, farming at subsistence level, or producing small marketable surpluses or large cash crops. The Project will involve Government workers at all levels, from the Additional Chief Secretary for Planning and Development and the Secretaries of Irrigation, Agriculture, and Finance in each province, who will comprise the Provincial Policy Committees, to the Field Assistants of the On-Farm Water Management and Extension Directorates, who will be working directly with Water Users Associations. The private sector, i.e. agricultural input suppliers, sources of formal and informal credit, and agricultural commodity buyers, will also play a major role and will be represented on the Sub-Project Coordinating Committees.

CWM activities will be undertaken in two phases. During the Preliminary Phase, which started in October 1984, various training activities will be initiated using advisors already under contract to USAID. About 25 officials, who will staff the SMOs, will attend an intensive 2-week training program. Some of the SMO staff and senior officials from provincial line departments will participate in a study tour to assess how similar projects in other Asian countries can be adapted to Pakistani conditions. Senior officials will also be sent to the U.S. for short-term training in irrigation management. A series of six-week field worker training courses will also be initiated. Additionally, USAID will contract with a multi-disciplinary team from the A.I.D. centrally-funded Water Management Synthesis II Project to begin work on a 12-month diagnostic analysis of the irrigation system of one sub-project area. The analysis will produce an operational plan for that area and a methodology for conducting similar studies of the other six sub-project areas.

During the five-year CWM Implementation Phase, SMOs will undertake an annual cycle of planning, implementation, monitoring and evaluation in three inter-related areas: WUA formation, watercourse physical improvements, and water management improvements. Activities will proceed sequentially, focusing initially on one section of each sub-project area (typically the area served by a minor and its watercourses (average 20) and covering an average of 8000 acres), and adding similar sections each cycle, until the whole sub-project area is covered. CWM is seen as a first step towards the adoption of major institutional and attitudinal changes in the way Pakistan's irrigation systems are operated and managed. At the end of its five-year life, strategies for achieving desired changes that can be replicated beyond the seven sub-project areas will have been developed and tested.

A summary of the A.I.D., IBRD/IDA and GOP contributions to the CWM Program is provided in Table 1.

TABLE 1

SUMMARY OF A.I.D., GOP AND IBRD/IDA CONTRIBUTIONS TO THE CWM PROGRAM
(In US$ 000s)

Expense Category	Life of Project Funding					
	A.I.D. Grant			GOP	IBRD/IDA	Total
	FX	LC	Total a/			
1. Technical Assistance						
a. LT Expatriate Teams	3,256	712	3,968	-	-	3,968
b. Supervisory Consultant	-	1,000	1,000	-	1,800	2,800
c. Local University or Private Researchers	-	500	500	-	-	500
d. 24 PM of ST Expatriate and Local Advisors	466	60	526	-	-	526
e. Local Advisors	-	1,474	1,474	-	-	1,474
2. Training	2,000	500	2,500	-	-	2,500
3. Commodities	1,100	100	1,200	1,200	1,500	3,900
4. Civil Works	-	19,400	19,400	3,200	39,600	62,200
5. Other Costs	-	-	-	4,900	3,600	8,500
6. Contingency	200	1,005	1,205	-	-	1,205
Total	7,022	24,751	31,773	9,300	46,500	87,573

a/ Of the $31.8 million A.I.D. contribution, an additional $25 million is being requested through this PP Amendment to finance the CWM Program, and the remaining $6.8 million has been reprogrammed from existing funds under other components of the ISM Project. (See Section V.E., Financial Analysis.)

C. Project Amendment Issues

1. Is the CWM Program design so complex that it is likely to create an unmanageable burden on the GOP and the Mission?

Several factors must be considered in assessing the complexity of the Program design. Pakistan has the largest contiguous irrigation system in the world. Its population of over 90 million resides in four geographically and administratively distinct provinces, each with its own government. The provinces differ agro-climatically, socio-culturally, ethnically, and in the area of land served by the irrigation system. The CWM concept, by definition, involves a multitude of actors including farmers, informal and formal sources of credit, private suppliers of non-water inputs (fertilizers, pesticides, seeds, farm implements, machinery), and public sector officials at the federal, provincial and local levels of government in four separate ministries (Irrigation, Agriculture, Finance, and Planning and Development). The complexity and magnitude of the irrigation system and the national implications of the CWM Program, therefore, by necessity call for many institutions, many levels of government, and a complex institutional and management structure.

The CWM design provides for a series of checks and balances, places authority in the right quarters, and streamlines the Program into an annual process of planning, implementation, and evaluation in each sub-project area, involving appropriate inputs of all the interested parties. Implementation of the Program will evolve as follows: Provincial Policy Committees will be formed in all four provinces; SMOs will be organized, staffed, and equipped; Sub-Project Coordinating Committees will then be constituted. Water User Association (WUA) development will also proceed in stages, starting from a specific site (typically a minor command) within the sub-project area, targetted for physical improvements in the first year, and expanding to cover the entire sub-project area over the life of the CWM Program. While the Program covers seven sub-project areas, the pace of implementation in each area will be determined by the speed with which the SMOs are staffed and organized, field staff are deployed, WUAs are organized, and annual work plans are developed. Program activities are therefore not anticipated to begin simultaneously in all seven areas but rather will occur in a more phased manner. On the A.I.D. side, one senior USDH project officer, working full-time on the CWM Program, will be assisted by two other USDH water sector project officers and several professional FSN staff as well as other Mission support staff, including four USDH Regional Affairs Officers, one in each province. Finally, the level, mix, and scheduling of technical assistance and training inputs have been programmed to facilitate implementation. In summary, while the Program design may be considered complex, appropriate institutional and staffing arrangements have been planned for, and a feasible implementation schedule has been adopted that will minimize the management burden on the GOP and the Mission.

2. Can CWM Program objectives realistically be accomplished within the proposed five-year time frame?

The Program design calls for all work, both physical and project management, to be completed within five years and for the maximum benefits to be achieved within eight years after the completion of the physical works activities. This five-year life reflects the target in the IBRD/IDA-financed CWM Project, which has already been approved. Although it is useful to maintain the five-year target, it can be anticipated that a longer period may be required. Delays could hamper the civil works program, and technical assistance and project management inputs may have to be extended both because of the physical delays and the need for a longer effort to obtain projected yield and cropping intensity increases. While it will certainly take longer than five years to institutionalize the CWM concept and approach in Pakistan's irrigated agriculture sector, five years should be sufficient to field test hypotheses and approaches and identify those strategies which can be replicated on a wider scale.

3. Have the issues which were raised by the Mission during and subsequent to preparation of the IBRD/IDA's SAR and to the IBRD/GOP negotiations been satisfactorily resolved?

The major issues related to the level and mix of expatriate technical assistance and the use of separate supervisory consultants for IBRD/IDA-financed and USAID-financed civil works activities. These issues have been resolved to the satisfaction of all parties concerned. The technical assistance plan as contained in this PP amendment and the use of separately-financed supervisory consultants have been agreed to by the IBRD/IDA and the GOP. A review of technical assistance inputs will be undertaken by the end of the second year of the Program to determine the possible need for modifications in the level and mix.

4. Given the GOP and USAID's emphasis on development of the "lagging" provinces, why is the Las Bela command area relatively small as compared with the sub-project areas in the other provinces?

The selection of sub-project areas was made by the Federal and Provincial Government Departments in consultation with the Water and Power Development Authority (WAPDA). The Las Bela command area was identified by the Government of Baluchistan; it has a gross command area of 34,000 acres and a cultivable area of 21,000 acres commanded by its nine minors. Las Bela is the largest contiguous irrigation area in Baluchistan. Since the canal system was built only two years ago, cultivation is limited to the areas of minors one through five, which cover a cultivable command area of 12,000 acres. Accordingly, although the WAPDA CWM Feasibility Study covered the entire 21,000 acres, during IBRD/GOP negotiations in Washington in April 1984, it was decided that the CWM Program would focus only on the area commanded by the first five minors. Given the existing limited human resource base and management capability and capacity in the Province, a relatively small sub-project area is warranted during this initial phase of the CWM Program.

5. Given the existing land tenure system in Pakistan, how will the CWM Program benefit tenant farmers?

Land ownership patterns have a profound impact on the benefits of irrigation improvement schemes. This has been demonstrated under the A.I.D.-financed On-Farm Water Management (OFWM) Project in Pakistan and elsewhere where land ownership often affects the distribution of benefits. In Pakistan, while the pattern of land holdings and farm operation varies among the sub-project areas, tenant farmers are found in all the sub-project areas. They are particularly prevalent in the Sind, where about two-thirds of the farms are tenant-operated. The CWM design reflects GOP/A.I.D./IBRD concerns about the equity impacts of attempts to increase production. The question of land ownership is not an issue. The Pakistan Government does not have a policy to go beyond the land reforms already in existence. The issue to be addressed in CWM concerns how tenant farmers will participate in Program activities, including how they will share in expected benefits. The presence of tenants will affect the CWM Program most critically through the WUAs, especially in connection with physical improvement activities. In recognition of the importance of this matter, the CWM Program design provides for special attention to small farmers and tenants as they are affected by CWM through the Program's on-going and extensive monitoring and evaluation activities which are built into the organizational structure of the SMOs. In addition, this issue will receive particular attention during the diagnostic analysis which will be undertaken in the Sind sub-project area during the first 12 months of the Program by the WMS II Project contractor. Small farmer and tenant participation issues will also be examined by the University of Idaho research team under the parent ISM Project as well as by local private researchers and universities contracted under the CWM Program to undertake special studies. The "rolling design" and experimental approach of the CWM Program, with its annual cycle of planning, implementation, and evaluation in each of the sub-project areas, will facilitate the application of lessons learned from these special intensive studies and from the on-going monitoring program to increase the likelihood that tenant farmers will obtain an appropriate share of the expected benefits of the CWM Program.

D. Contributors to the Project Paper Amendment

(See Annex F.)

II. BACKGROUND

A. The CWM Program Setting

1. The Irrigation System in Pakistan

Pakistan has the largest contiguous irrigation system in the world. From the Indus River and its tributaries run a network of canals totalling about 40,000 miles, which, in turn, feeds an additional 250,000 miles of public watercourses. (If farmers' watercourses or field ditches are added, the system totals well over a million miles.) The Indus system also includes more than 200,000 tubewells, of which about 13,000 are publicly-owned. The contiguous system serves a total cultivable command area of 34 million acres.

In addition to its size, the Indus basin area is characterized by very low land slope, high sediment loads, salinity of much of its ground water, a semi-arid, semi-monsoon climate, and wide cultural heterogeneity of its users. These features, as well as the history of Pakistan's irrigation strategy, have given rise to the technical and institutional issues that the ISM project in general and the proposed CWM Program in particular are designed to address.

Outside the Indus basin, in Baluchistan, the NWFP and the Federally Administered Tribal Areas, irrigation is fairly common, but on a smaller scale and more widely scattered and closely tailored to the unique geography of these regions.

2. Pakistan's Irrigation Strategy

Since Independence, Pakistan's strategy for the Indus Basin has focused on: (a) conservation of water and redesign of the conveyance system to counter the effects of the division of rivers under the Indus Basin Treaty (the Indus Basin Project); (b) reclamation and control of salinity and waterlogging (the SCARP Projects); and, (c) improvement in the delivery of water to farmers' fields (the On-Farm Water Management Projects). As reflected in its 1979 Revised Action Program for Irrigated Agriculture (RAP), the Government has adopted a strategy of removing technical constraints to water deliveries (addressed, in part, by the ISM project) and managing water resources in the context of the overall package of inputs and services which farmers require to increase their incomes and production (the thrust of the CWM Program).

3. Irrigated Agriculture in Pakistan

Pakistan has a high potential for food production. Suitable soils in the Indus Basin combined with irrigation can permit double and sometimes triple cropping. However, current agricultural production levels fall far short of potential. In PFY 1981/82, production of wheat, one of the country's staples, averaged only 0.66 metric tons per acre (mt/ac) compared to an estimated potential of 1.38 mt/ac. Rice, which is grown for both export and domestic consumption, has an estimated potential yield of 1.5 mt/ac, yet averages only 0.65 mt/ac.

The World Bank Staff Appraisal Report (SAR) for the CWM Project[1/] cites various official and field level surveys that suggest the following would best contribute to increased crop production: (a) providing timely and assured irrigation water supplies; (b) improving the delivery and availability of certified seeds, fertilizer, insecticides, extension services, agricultural credit and machinery; (c) expanding farmers' knowledge; and, (d) improving the rural infrastructure-- particularly farm-to-market roads, rural electrification and communications. The CWM Program is designed to address the first three issues.

4. The CWM Program

a. Introduction

The rehabilitation works, institutional improvement, and research components of the parent ISM Project will lay the foundation for the improved delivery of water through the canal system. The challenge which will remain for managers of the water system, however, will be to address, with the active participation of water users, the complex set of questions related to water delivery and water use in order to manage water deliveries over the 34 million acres of irrigated land in Pakistan with the objective of increasing on-farm productivity of water use. Efficient and effective operation, maintenance, and management of the irrigation system are essential to implement a strategy aimed at improving the productivity of the land and water resources in Pakistan. The CWM Program will provide the basis for all relevant agencies to cooperate to match water supplies with crop requirements and to provide other necessary inputs and services in a coordinated and timely manner in order to increase agricultural productivity.

CWM has become the shibboleth of irrigated agriculture in Pakistan. Conceptually, it has no detractors, and is a universally accepted goal. In practice, however, particularly within an irrigation system which has never been organizationally connected to agricultural production, the implementation of such a concept requires major breakthroughs in technology and institutional change. The concept was proposed by WAPDA as an outgrowth of the 1979 major study of the irrigated agriculture sector (the RAP). Since that time, the CWM concept has been endorsed by the GOP as a policy goal. Within Pakistan, CWM is defined as the integration of specialized agencies, water and agriculture, at the canal command level, with the expressed objective of increasing agricultural production by combining institutional, administrative, and technical expertise and control over surface and groundwater supplies, agricultural inputs, and extension to deliver the best possible advice and required resources to the farmer in a timely and coordinated manner. The CWM Program is intended to assist the GOP to transform its stated policy goal into an action program.

1/ Staff Appraisal Report, Pakistan, Command Water Management Project, World Bank, April 1984.

A major feasibility study was initiated by WAPDA on July 1, 1982, with a $1 million grant from the UNDP, with the IBRD as the executing agency. A.I.D. also provided technical assistance for this study under the Project Design Fund (391-0470). Under the study, plans for specific sub-projects, each comprising between 20,000 to 150,000 acres in each of the four provinces, were prepared. The sub-project plans included descriptions of the scope of work to be undertaken, details of project implementation, institutional arrangements, and the estimated costs and benefits expected. Provincial Planning and Development, Irrigation, and Agriculture Departments selected the sub-project areas in consultation with WAPDA.

The study, entitled "Feasibility Report, Command Water Management Project," Pakistan Water and Power Development Authority, was completed in August 1983. A World Bank Appraisal Mission arrived in Pakistan in October 1983 to prepare detailed plans to implement the CWM Program, based on the findings of the feasibility study, in each of the seven provincial sub-project areas studied during the feasibility stage. The World Bank's "Staff Appraisal Report, Pakistan, Command Water Management Project," April 1984, describes the Program agreed to by the GOP, the IBRD, and USAID. USAID staff actively participated as members of the IBRD Appraisal Mission in the fall of 1983, attended the April 1984 negotiations in Washington, D.C. between the Bank and the GOP, and assisted in the final preparation of the Bank's SAR. The following section highlights background information contained in the SAR regarding the CWM Program.

b. The CWM Program Area

i. Location and Size

The seven sub-project areas for the CWM Program, selected by the Provincial Governments, are shown in Table 2 and Figure 1. Figure 2 depicts a typical command area which is the focus of the CWM Program. River water diverted into a canal system at a headworks flows through a network of main canal branches, distributaries and minors. The area served by the respective irrigation system is called its command area. Along these networks are moghas or outlets, each diverting surface flow to a public watercourse, whose length typically varies from 1.5 - 3 miles. From the public watercourses, water is diverted, through individually owned nakkas or turnouts, to public ditches or farmers' watercourses that irrigate the fields. An average public watercourse will provide water to about 400 acres of land.

TABLE 2

LOCATION AND SIZE OF SUB-PROJECT AREAS

Sub-Project/ Command Area	Gross Command Area (000 Acres)	Cultivable Command Area (000 Acres)
Punjab		
Pakpattan Canal	119	97
Shahkot Distributary	63	49
6-R Distributary	133	104
Niazbeg Distributary	45	41
Sub-Total	360	291
Sind		
Sehra-Naulakhi Branches	165	164
NWFP		
Warsak Lift Canal	55	43
Baluchistan		
Las Bela Branch	34	12[a]
Total	614	510

a/ Limited to upper 5 minors.

FIGURE 1

COMMAND WATER MANAGEMENT - LOCATION OF SUB-PROJECT AREAS

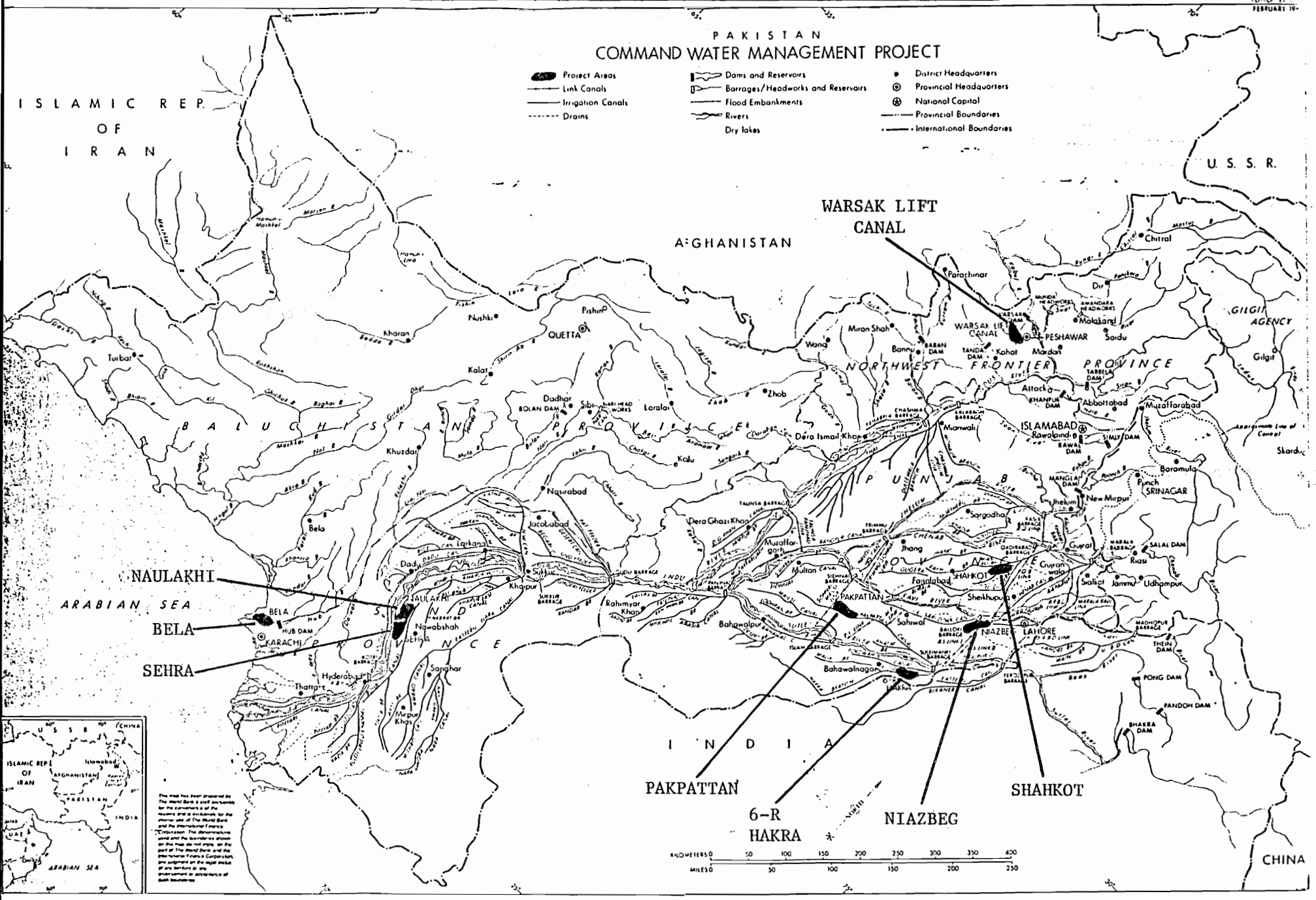

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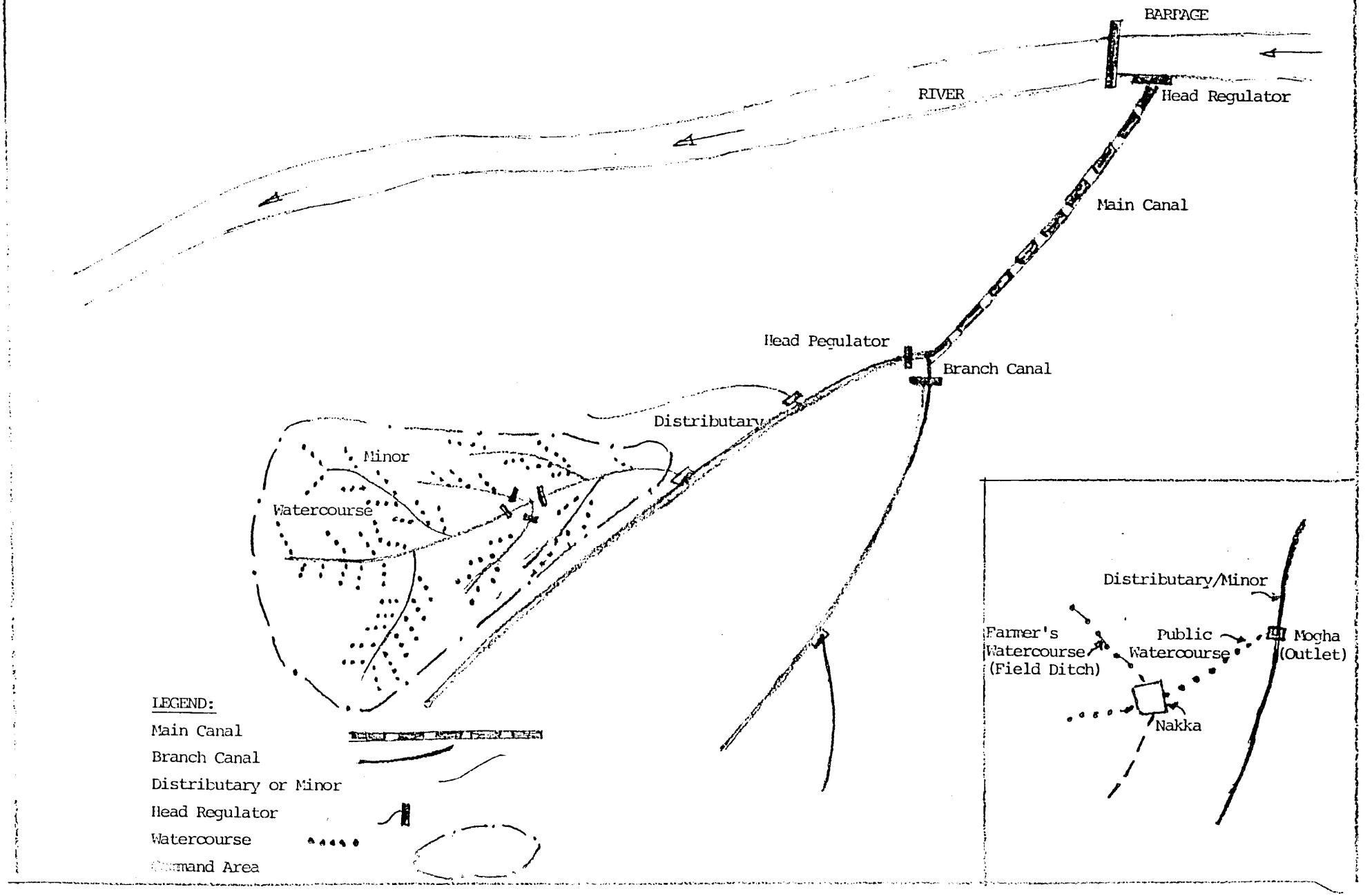
FIGURE 2

SCHEMATIC DIAGRAM OF A TYPICAL COMMAND AREA



There are about 50,000 farms in the seven CWM sub-project areas. Table 3 shows the percentage of different sized farms in terms of the total land area and the cultivable command area.

TABLE 3

FARM SIZE IN CWM SUB-PROJECT AREAS

Size of Farm	Percentage of Gross Area	Percentage of Potential Irrigable Land
Less than 12.5 ac	66	40
12.5 - 25 ac	25	33
More than 25 ac	9	27

Of the 50,000 farms, about 57 percent are owner-operated, or farmed by "owners-cum-tenants". The remaining 43 percent of farms are operated by tenants or share-croppers. Farm size and the ratio of tenants to owners vary considerably in the various project sites. Table 4 shows population data for the approximately 700,000 people who live in the sub-project areas. (See Annex B for more details on the population of the sub-project areas.)

TABLE 4

POPULATION IN CWM SUB-PROJECT AREAS

Sub-Project	Total Population (000s)	Number of Villages
Punjab		
Pakpattan	144	80
Shahkot	96	36
6-R	136	90
Niazbeg	63	34
Sub-Total	439	240
Sind		
Sehra-Naulakhi	208	95
NWFP		
Warsak Lift	69	50
Baluchistan		
Las Bela	3	6
Total	719	391

ii. Water and Soil Resources and Crop Yields

WAPDA estimates that in the sub-project areas, water supplies meet between 52 and 85 percent of crop requirements. During peak demand times, the situation may be even worse with as little as 25-35 percent of requirements met. The six sub-project areas located in the Indus irrigation system (i.e., excluding Las Bela in Baluchistan which is fed from the Hub River Dam), suffer from different combinations of high water losses, poor drainage and resulting waterlogging and high salinity. Poor maintenance has exacerbated these difficulties. (For more details, see pages 7-10 of the World Bank SAR and pages III.7-16 of the WAPDA Feasibility Study.)

WAPDA studies also indicate that the quality of most of the soils in the sub-project sites makes them potentially very productive lands for irrigated agriculture. Statistics for PFY 1981/82 indicate, however, that crop yields in the sub-project areas are generally low, with cotton, maize and sugarcane yields below the national averages. Yields of rice and wheat vary, but are generally higher than national averages in most of the sub-project areas.

c. Institutional Features

Many public and private institutions influence agricultural activities in a command area. One of the main purposes of CWM will be to coordinate the activities of these groups, which are briefly described below. The organization and staffing of the public agencies operating in the sub-project areas are described in detail in Annex J.

i. Water Users Associations

In some parts of the country, farmers are organized into Water Users Associations (WUAs). WUAs were first developed as part of the A.I.D.-financed On-Farm Water Management (OFWM) Project. Tehsil-based OFWM teams are responsible for motivating and helping farmers to form WUAs. Once legal requirements have been fulfilled, the WUA is registered under the Provincial Water Users Association Ordinance. Under the Ordinance, WUAs are responsible for a continuing maintenance program following watercourse improvement. Farmers, through their WUAs, provide the unskilled and semi-skilled labor components of this program and are expected to repay a modest percentage of the material costs for watercourse improvements. The OFWM Teams are also responsible for "motivating" the WUA to continue post-improvement watercourse maintenance and to carry on a program of water management extension activities. To accomplish this, OFWM Teams are expected to make periodic visits to the watercourse command area and to meet with WUA executive committee members.

The approach to WUA development has, to date, been heavily "top-down". Emphasis has been placed on the rapid formation of formal, legal WUAs so that watercourse improvement can be quickly effected.

ii. Provincial Irrigation Departments

Provincial Irrigation Departments (PIDs) have major responsibility for the supply of water at the mogha level. They are essentially technical, engineering agencies, whose areas of responsibility and interest do not include the details of the agricultural activities of the end users of their systems. PIDs do, however, determine and control the flow of water throughout the system and approve the fixed schedule of deliveries (called warabandi) to each group of water users. As such, PIDs have considerable influence in CWM areas. A major objective of the CWM Program is to strengthen the institutional relationships among WUAs, the PIDs, Agricultural Extension and OFWM Directorates (see below) in order to more closely match water supply and water demand for agricultural production.

iii. On-Farm Water Management Directorates

In the 1970's, the GOP created a Federal On-Farm Water Management (OFWM) Cell within the Ministry of Food, Agriculture and Cooperatives. In the Punjab, Sind and NWFP, OFWM Directorates were established within the Provincial Agriculture Departments. (In Baluchistan, OFWM activities are currently implemented by the Extension Directorate.) The OFWM Directorates were designed to: (1) assist farmers in the rehabilitation of public watercourses; (2) help individual farmers with precision land leveling; and, (3) provide water management extension services. At the tehsil level, the OFWM Directorates have field teams, whose composition varies among provinces from 6-7 professionals, including Agricultural Officers (AOs), Field Assistants (FAs) and Water Management Officers.

iv. Provincial Extension Services

Each province has an agricultural extension service within its Agriculture Department. Since there is no Federal Extension Cell, the Provincial Directorates operate essentially as four separate systems. Extension field level work is undertaken by Agricultural Officers (AO) and Field Assistants (FA). Each AO supervises five to six FAs, with each FA programmed to service at least 1,000 farm families, who comprise one Union Council.

v. Fertilizer Suppliers

(1) Provincial Distribution Agencies. Each Province has a public distribution agency responsible for agricultural inputs. These agencies deal primarily with fertilizer and seed. They maintain networks of storage depots and dealers, but do not extend credit to dealers or farmers.

(2) National Fertilizer Corporation (NFC)

The NFC is a public company engaged in fertilizer production. Distribution and sales are carried out through an affiliate, the National Fertilizer Marketing Limited. The NFC also operates through

a network of private retail dealers who market its products as well as those of other companies.

(3) Private Companies. Dawood Hercules and EXXON on the one hand and the Fauji Fertilizer Company on the other hand are private and semi-private manufacturers, respectively, of nitrogenous fertilizer. These firms also participate in the distribution of imported phosphatic and other fertilizer through their own dealer networks.

(4) Dealers. Private fertilizer dealers are usually part-time commission agents who generally work also as local traders, money lenders, and farmers. The dealer may sell products for private producers, the NFC, and for one or more of the provincial supply distributors.

vi. Pesticide Suppliers

Almost all pesticides are imported. The large variety of brands available makes it difficult for farmers to determine correct use and dosages. As a result, pesticide use is sparce. Furthermore, adulteration is common. Prior to 1980, the responsibility for pesticide distribution was with the Agricultural Extension Service. In February 1982, it was transferred to the private sector, and government subsidies for pesticides in the Punjab and Sind were abolished. The decision to withdraw the pesticide subsidy in Baluchistan and NWFP is pending.

vii. Seed Suppliers

The use of certified seed is crucial for increasing agricultural production. Provincial Seed Corporations in the past, however, have been able to meet less than 10 percent of farmer requirements. To improve the supply of good quality seeds, the GOP and provincial governments have launched an IDA-assisted Seed Industry Development Project with the goal of meeting about 86 percent of total certified seed requirements by the late 1980's.

viii. Credit Institutions

Farmers can obtain credit from the Agricultural Development Bank of Pakistan (ADBP), the Federal and Provincial Banks for Cooperatives, and Commercial Banks. The total amount of agricultural credit has increased from Rs 307 million in PFY 1972/73 to Rs 5,102 million in PFY 1981/82. However, the distribution of credit is heavily skewed towards large land owners, and many small farmers receive no institutional credit at all. Small farmers can receive interest-free production loans of up to Rs 6,000 in kind for seed, fertilizer and pesticides provided they repay within 2 months after the harvest.

d. Co-Financing Arrangements

The IBRD, through its IDA affiliate, has agreed to provide $46.5 million to finance the CWM Program over the next five years. The IBRD/GOP loan agreement was signed in June 1984, and its effectiveness is

contingent on, inter alia, AID/Washington approval of A.I.D.'s contribution to the Program, which is documented in this PP amendment. The full details of the IBRD's CWM Project are contained in the SAR of April 1984 and are summarized below. Section III. of this PP Amendment describes in detail the activities which A.I.D. proposes to finance under the GOP's CWM Program.

i. Civil Works

The $39.6 million worth of civil works to be financed by the Bank are all upstream of the mogha or outlets. They include canal rehabilitation and sub-surface and surface drainage.

(1) Canal System Rehabilitation and Remodeling

Canal system rehabilitation will primarily include repairs to structures, desilting, and strengthening of embankments to safeguard against breaches and facilitate more equitable distribution. Such rehabilitation is needed in varying degrees in portions of all seven sub-projects. The Warsak sub-project in the NWFP will require repairs to the lined portion of the canal as well as earthen section rehabilitation. Construction of super passages for safe conveyance of flood water and debris from hill torrents across the upper reaches of the canal will also be required.

Certain canals may require remodeling, including improvements to structures and changes of gradient, with consequent changes in location, to enable more efficient service of the command area. Such remodeling may require land acquisition, depending upon the extent and alignment of relocation required. Remodeling will include the installation of water control structures (some of which may be automated) in order to meet water management requirements.

Remodeling of outlets in all of the sub-projects will be necessary to improve their efficiency, including better control of the outlets in the upper reaches to enhance delivery to the tail-end users. It is estimated that about 1,300 outlets will be remodeled. In some cases, gating of outlets will be considered to meet water management needs.

Certain sections of minors and smaller distributaries will require lining to reduce the excessive seepage losses currently being experienced. Recovery of such losses either for irrigation purposes or to prevent waterlogging will require capital investment and costs for pumping facilities. It is estimated that as much as 200 miles of canal sections may be lined. This may be significantly reduced if more detailed investigation during project implementation reveals the need to give priority to other civil works. It is estimated that about 50,000 acre feet of water annually will be saved by this lining.

(2) Sub-Surface and Surface Drainage

The sub-surface drainage problems are acute in the 6-R and Lower Shahkot sub-projects in Punjab Province. Drainage

tubewells and disposal channels will be required in the 6-R and lower Shahkot sub-projects, as well as low lift pumping units and an interceptor drain in 6-R. Lower Shahkot is located within the SCARP I Project, but existing drainage tubewells are operating at sub-optimum levels and many need to be repaired or replaced. Drainage problems in the sub-projects in Sind Province, which are within the North Rohri SCARP Project areas, are not severe.

Surface drains will be provided to serve as outlets for saline sub-surface drainage effluent from Shahkot and 6-R sub-projects, and for disposal of excess storm water for most sub-projects, with Shahkot, 6-R, Warsak, and Las Bela having the greatest need. Investigations during project implementation will determine whether there is a need to extend drains to watercourse command areas where improvements are made. The need to use more advanced procedures for surface drain design, as opposed to those currently used by the PIDs, will also be investigated. The IBRD has allocated $1.1 million for investigations and surveys.

ii. Other Costs

Approximately $1.5 million has been programmed by the IBRD for vehicles, including motorcycles, for Sub-Project Management Office (SMO) and field staff and for communications and tubewell equipment, office supplies and survey equipment. The IBRD will also finance up to $2.5 million of the recurrent costs of the Program. Finally, $1.8 million has been allocated to finance a host country contract with locally-hired supervisory consultants.

B. Lessons Learned

The ISM Project Paper dated May 1983 details A.I.D.'s 30-year involvement in water programs in Pakistan. During this period, A.I.D. provided almost $1 billion, primarily to improve the basic Indus Basin irrigation system. Over time, emphasis shifted gradually away from the construction of large new civil works to the improvement of existing works, with a major effort initiated in the 1970's to focus on On-Farm Water Management. The lessons learned from A.I.D.'s OFWM project, summarized in the A.I.D. Impact Evaluation conducted in 1982 [2/] and presented below are particularly relevant to the institutional development and agricultural production focus of CWM.

1. Lessons Learned from OFWM

a. Design Flexibility

"The designs for projects -- particularly pilot projects -- which are to be implemented in a variety of physical and cultural settings, need to allow greater flexibility to adapt to local conditions than did the OFWM project. As already noted, permitting flexibility in terms of financial participation would have permitted adaptation to the

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[2/] A.I.D. Project Impact Evaluation Report No.35, "The On-Farm Water Management Project in Pakistan", 1982.

growing popularity of the OFWM project, once it caught on, permitting better use of funds available. Greater design flexibility would have permitted better adaptation to local needs, such as the need in Sind for more watercourse lining or the need in NWFP for different channel design -- perhaps funded through sliding-scale cost sharing arrangements."

The CWM Program allows for control of designs by Sub-Project Management Offices, whose location in the sub-project areas and close coordination with farmers will ensure that designs are appropriate to local conditions.

b. Watercourse Maintenance and Farmer Cooperation

"Watercourse maintenance is critical to sustained benefits from watercourse improvement. Such maintenance, particularly in a cultural setting where community cooperation is not the tradition, is highly dependent on building a formal structure for local cooperation and collective labor. However, promotion of voluntary cooperation -- perhaps through extension agents or through media outreach programs to educate farmers as to its benefits -- seems a more promising route than externally imposed legal sanctions to conform, although such cooperation is likely to be more difficult to achieve in villages with pronounced rivalry."

This concept of voluntary farmer cooperation is key to CWM's development of Water Users Associations, and is the foundation for other cooperative undertakings which CWM will promote.

c. Land Ownership

"Land ownership patterns have a profound impact on the benefits of irrigation improvement schemes such as the OFWM project. Where water is controlled by a landlord, the poorest tenants -- precisely those whom such efforts are intended to benefit most -- may see little or no gain from increased water supply. Similarly, size of land holding largely determines the ability, or at least the willingness, of a farmer to take advantage of PLL (precision land leveling); participants are often only those with sufficient land to permit a portion to lie fallow after leveling and those with their own implements (to cut the cost and thus the perceived risk). Future projects need to give more thought to ways of reaching the small farmer under such conditions."

The CWM design reflects GOP/A.I.D./IBRD concerns about the equity impacts of attempts to increase production. Land ownership often affects the distribution of benefits under OFWM. Thus, the CWM Program's monitoring and evaluation activities will give specific attention to small farmers and tenants as they are affected by CWM. (See Section V.C., Social Soundness Analysis.) The monitoring and evaluation effort will also document lessons learned during the life of the CWM Program to assist in the anticipated future replication of the CWM approach in other command areas of Pakistan.

d. Extension

"Extension services are essential to the full achievement of on-farm water management, since they deal with efficient water usage and better cropping practices once water supply is improved. However, when the extension function is hooked up with on-farm water management, overlapping with an existing extension service is a risk; in these instances, more thought must be given to integration than was the case in this project. Furthermore, training farmers to change age-old cropping and irrigating practices may be much more difficult than reconstructing a watercourse, and require more specialized training than that possessed by most agricultural graduates; much more attention must be paid to the training of extension agents than has so far taken place in Pakistan."

This recommendation is reflected in the design of CWM, which emphasizes SMO and extension staff training and includes a technical assistance component which will help develop and support new and existing institutions at the command level to ensure that provision of water is linked to appropriate agricultural inputs and advice supplied at proper times during the farming year.

e. Baseline Data

"To the extent that the success and replication of a pilot project relies on the establishment of quantitative data on project impact — although replication of the OFWM project seems not to have depended on such data -- it is essential that baseline data be collected. The recently initiated efforts of Pakistan's Water and Power Development Authority need to be accorded high priority in order to provide better information on the impacts of the expanded follow-on project now underway. It will be helpful to have more post-improvement measurements of water losses in the watercourses."

The WAPDA feasibility study, which was completed in 1983, forms the basis for CWM activities in the sub-project areas. That study will be supplemented by more detailed baseline data collection and a diagnostic analysis. In addition, on-going data collection and impact studies will be undertaken as part of the Program's monitoring and evaluation activities.

f. Institutional Focus

"Greater attention should have been paid to developing awareness of, and commitment to, on-farm water management on the part of local government and elected bodies in the implementation of the project."

OFWM Directorates at the Provincial level and WUAs work closely with local councils, and CWM will build on this existing framework to promote the involvement and participation of local government officials and rural leaders in the CWM Program.

g. Importance of Farmer Participation

"Pakistani farmers have demonstrated a willingness to respond to projects when they readily perceive potential benefits. In the OFWM project, farmers responded to direct benefits by contributing about 50 percent of the costs of watercourse improvement and maintenance. Private investment in tubewells is another indicator: in spite of inadequate and unreliable power supplies and import restrictions on small diesel engines, an estimated 185,000 private tubewells have been installed."

The CWM Program will build on the demonstrated willingness of farmers to participate, by promoting the development of Water Users Associations (WUAs) that will channel individual participation into more forceful and organized group initiatives in watercourse O&M, agricultural input purchases, agricultural credit acquisition, and other water management activities.

2. Lessons Learned From Other Countries

A World Bank commissioned study of the management and organization of irrigation projects in Indonesia, India, Pakistan and Taiwan[3/] provides many recommendations that have been taken into account in the CWM design. The study stresses the importance of baseline surveys, containing physical, technical, economic and social data. This should be followed by a performance evaluation, measuring productivity, equity, environmental stability, cost and cost recovery. Equally important is an evaluation of the quality of planning, design and construction and an analysis of project organization and management, to include organizational structure, at national and provincial levels, and the scope, limitations and performance of government agencies. The study details the role of agricultural extension and the farmer's role in management.

The first A.I.D.-sponsored worldwide conference on irrigation was held in May 1983. The conference, reported on in A.I.D. Program Evaluation Report No. 8,[4/] was based on the results of impact evaluations of A.I.D.-assisted irrigation projects in the Philippines (2 projects), Korea, Indonesia, Sudan, Pakistan, Egypt, Bangladesh, Afghanistan, Peru and Somalia. The following recommendations of the conference are reflected in the design of the CWM Program.

a. Increase emphasis on training and community mobilization both for diagnosis of rehabilitation needs and for operations and maintenance.

[3/] Comparative Study of the Management and Organization of Irrigation Projects, A.F. Bottrall, World Bank Research Project No. 671/34, August, 1979.

[4/] "Irrigation and A.I.D.'s Experience: A Consideration Based on Evaluations." A.I.D. Program Evaluation Report No.8, AID/Washington, August, 1983.

b. Build on existing water users associations where appropriate rather than create new forms. At the intermediate level between farmer organizations and state bureaucracies, project design should explicity include a strategy for: (i) institutional linkages; and, (ii) problem identification and resolution at the national level. A.I.D. should collaborate with government institutions to develop strategies for irrigation data collection and analysis at all levels. Project design should include methods to recognize and react to changes in an inter-disciplinary, incremental and integrated manner.

The conclusions and recommendations of the July 1984 FAO/AID Conference on Farmer Participation in Irrigation Management, which were based on 7 Asian case-studies, are reflected in the CWM approach to farmer participation:

a. Development, improvement and operation of irrigation systems are generally most effective when farmers have the opportunity to participate effectively in the process from the initial stages. "Participation" here implies playing a significant role in decision-making. Effective sustained participation generally requires planned interventions to assist farmers to evolve appropriate forms of organizations.

b. Enhanced farmer participation has significant technical, economic and social benefits. These benefits comprise items important to farmers including landless farmers, and include:

(i) increased agricultural production;

(ii) improved irrigation system designs;

(iii) reduced levels of farmer/government officer conflict;

(iv) increased mobilization of local skill, labor, materials and money, reducing government capital and recurrent cost obligations; and,

(v) more equitable water distribution.

c. Farmer participation is most likely to be useful and effective where:

(i) rehabilitation or improvement of existing irrigation systems is needed;

(ii) new system construction is contemplated where a farming community is already in place;

(iii) problems of poor management and inequitable water distribution are more prominent at lower levels than at the main system level; and,

(iv) group action by farmers is necessary to secure a water supply by new construction efforts or by participation in higher levels of decision-making.

d. Successful efforts to develop sustained farmer participation in irrigation system planning, construction, operation and maintenance have important common elements such as:

(i) the use of specially trained committed people from outside the local community as "catalysts" in the organizing process. Initially, these catalysts operate outside the traditional civil service hierarchy;

(ii) high-level government commitment to the principle of increased farmer participation;

(iii) the perception by farmers of the value of the assistance from the government, and of the fact that they are likely to receive substantial benefits from the program;

(iv) a strategy of development in stages with experience gained during early stages used to modify and shape subsequent efforts; and,

(v) close integration of technical and institutional development activities.

e. Donor support should be provided within the overall framework of promoting an approach to irrigation development in which technical, social, economic and institutional factors are optimally integrated.

f. Areas specifically mentioned for donor support to national programs are:

(i) development of methodologies for farmers' mobilization and organization, training of the various target groups, and monitoring and evaluation, particularly through assistance to experimental and pilot projects (as elements of a learning process), training programs, development of training materials, and action research;

(ii) dissemination of information and transfer of experience gained in countries having successful participation programs, particularly through study tours, seminars, workshops and consultancies; and,

(iii) promotion of effective cooperation among the national agencies involved (such as departments of agriculture and irrigation) and among researchers and practitioners in various disciplines dealing with irrigation development.

C. Relationship to GOP and A.I.D. Policy and Other A.I.D. and Donor Projects

1. Relationship to GOP Policy

The Government's irrigation strategy is contained in its 1979 Revised Action Program for Irrigated Agriculture (RAP),[5] which recommends policy changes in two major areas:

> "Water-related policies are based on the premise that provision of "controlled" or "guaranteed" water supplies is the key to improving the production environment of the farmer. Irrigation water supply should match crop water needs to the extent possible. This can best be accomplished by the farmer having as much control of his water supply as possible. Financial policies are addressed to creation of an economic environment that will provide incentives for increased production, and to implement the strategy of increased mobilization of domestic savings to finance further investment."

These policies are reflected in the CWM Program's emphasis on matching water to crop requirements and its focus on the farmer as the influencer of his water supply. CWM also is concerned with providing incentives for farmers to maintain watercourses and to adopt and apply other water management techniques.

With respect to institutional development, the RAP recommends that water sector infrastructure projects be managed as area development projects, with the objective of generating increased returns for the farm population of the area. The RAP also emphasizes the importance of improving agricultural extension, research, seed certification and other agricultural sub-sectors. The CWM Program fully reflects and implements these recommendations.

In the GOP's Sixth Five-Year Plan (1983-1988), Rs 280 million has been allocated to Command Water Management, to cover about 620,000 acres in various provinces. The Plan also provides for an additional Rs 1 billion for provincial water management activities, with a larger role proposed for Water Users Associations (WUAs). At the provincial level, WUAs have been given legal status as corporate bodies with powers to hold property, enter into contracts and carry out legal proceedings. Their primary purpose is to improve and maintain watercourses, with a secondary function of obtaining agricultural inputs.

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[5] "Revised Action Programme for Irrigated Agriculture," Main Report (3 volumes), Summary, Water Planning and Development Authority, May 1979.

2. Relationship to A.I.D. Policy

USAID/Pakistan's Country Development Strategy Statement (CDSS) dated January 1984 for the period U.S. FY 1986-1990, identifies the following as the crucial issues in the Mission's irrigation strategy:

> "(a) how to insure that the farmer has an economic incentive to use water efficiently; (b) how to insure that system managers in irrigation have incentives to allocate and deliver water efficiently; (c) how to insure that the system rewards maintenance and sound stewardship of public irrigation assets; and, (d) how to insure a sustained flow of revenues for irrigation O&M."

In an April 1984 report on USAID strategy options in irrigation,[6/] Dean Petersen notes that CWM seems to provide the best instrument for testing approaches to issues a, b and c above. He goes on to suggest that:

> "USAID, through its access to U.S. institutions, has a large comparative advantage in the irrigation field, particularly in on-farm water and systems management involving multi-disciplinary approaches. A.I.D. and USAID's style, in contrast to large international donors for example, permits higher use of technical assistance resources in the irrigation sector. Irrigation development certainly will be a key factor in developing the economies of lagging areas. Certainly the opportunities for technology transfer, research and human resource development are large in the sector."
>
> "Program sustainability will be a continuing uphill struggle in many irrigation sub-sectors. Recurrent cost financing is troublesome, but there are a number of strategy elements in the sector such as greater water user participation which could transfer some of these from the public to private responsibility. After more than a decade, it looks like watercourse improvement may be approaching an institutional maturity which will persist in Pakistan, but will still need continuing donor reinforcement for some time in the future.
>
> The shift to a persisting Command Area Management mode may take an even longer period of gestation. Personnel resources for support of watercourse programs are in short supply. This will be a continuing consideration in program design. For this reason, a large share of USAID investments in the sector are going into training and personnel development."

6/ "Long-Range Strategy Options for Water Resources," Dean F. Petersen, USAID/Pakistan, April, 1984 pp.47-48.

The CWM Program is also fully consistent with A.I.D.'s Asia Regional Strategy Plan dated November 1983 which states:

> "Improving the ability of irrigation systems to control water effectively is critically important in keeping Asian food supplies in balance with the demand. In most Asian countries, institutions charged with this responsibility cannot discharge it effectively. Through its ability to access high quality technical and managerial expertise, A.I.D. can make a major contribution to building this institutional capability."

The Plan outlines a 3-stage model of irrigation development, with the first focusing on civil engineering issues and the second on delivery and allocation of water and the increased use of other agricultural inputs. In the third stage, the Plan states that:

> "In order to raise efficiency further and to provide adequate funds and labor for regular maintenance, it becomes apparent that farmers' interests must become more central and farmers' groups organized and involved in system operation and maintenance. The latter is what we refer to as 'community management'."
>
> "A.I.D. assistance can be most effective in stages two and three of this model: developing the institutional capacity to implement improved systems of water management and facilitating greater farmer participation in system design, construction, and management. Particularly in South Asia, involvement in these aspects of the irrigation sub-sector will be the dominant area of assistance for the next five to ten years."

The CWM Program focuses primarily on the third stage of "community management", and on elements of the second stage. As described below, other projects supported by A.I.D. and other donors are concentrating on the first and second stages of the Asia Bureau Model.

3. Relationship to Other A.I.D. Projects

CWM is an integral part of its parent project, the Irrigation Systems Management (ISM) Project. ISM has three components, other than CWM. These are:(a) rehabilitation of about 25 percent of the nation's irrigation system (co-financed by the World Bank); b) institutional development at the federal and provincial levels, with a view to increasing design and operation and maintenance capacity; and, (c) a research component, under which such topics as the following will be examined: how to reduce maintenance requirements through improved designs, how to increase the resource base, and how to use water for greater agricultural benefit. The linkages between CWM and this research component are very close; the sub-project areas will provide locations for field-testing of ISM research results. ISM's institutional development activities at the federal and provincial levels will complement CWM's field level development of new and existing institutions.

CWM also builds upon the activities of the On-Farm Water Management Project (OFWM), which focuses on how water is applied on the farm once it is delivered by the main irrigation works. The OFWM project shares with CWM the objectives of establishing more productive applications of water for improved yields, increased intensity of cropping and application of other inputs. CWM, however, seeks to broaden the scope of farmer involvement and integrate inputs from Agriculture and Irrigation Departments, while focusing on on-farm improvements in the total command area.

More efficient use of water resources will also contribute to the objectives of other A.I.D.-financed agricultural activities, notably the on-going Agricultural Research Project and its successor, the Management of Agricultural Research and Technology (MART) Project. MART's research focus will be on finding solutions to production problems and will thus benefit from lessons learned under the CWM Program.

As the Transformation and Integration of the Provincial Agricultural Network (TIPAN) Project is implemented, the Agricultural University at Peshawar will become an excellent training center for courses in the CWM approach. In the short run, TIPAN's training of NWFP extension workers will strengthen CWM activities in that province.

There will also be complementarities between CWM activities at the sub-project area at Las Bela and the water sector activities of the Baluchistan Area Development (BALAD) Project. The same applies to CWM activities in the NWFP sub-project area and water sector activities under the Tribal Areas Development and NWF Area Development Projects. The Agricultural Commodities and Equipment Program will finance about $50 million worth of equipment for the PIDs in support of the objectives of the ISM Project. The benefits in terms of improved federal and provincial maintenance capacity will be felt in the CWM sub-project areas.

4. Relationship to Other Donor Projects

Many donors, including the Asian Development Bank, Canada, the European Economic Community, France, Germany, Italy, the UK and the World Bank have provided assistance to Pakistan's irrigation system during the past 20 years. Over a dozen donors are currently providing complementary assistance in ground and surface water development and improved on-farm water management for a total of over a billion dollars. (See "Other Donor Assistance" Section of the ISM PP.)

With few exceptions, donor projects focus primarily on civil works activities. Some exceptions are the World Bank's proposed $30 million SCARP Transition Project, and the ADB's and World Bank's contributions totalling $67 million to the National OFWM Program. The CWM Program, with its emphasis on farmer participation and institutional development, fills a critical gap in donor assistance and will enhance the impact of the other donor-assisted projects.

The World Bank is also financing various projects to strengthen the quality of the extension services in the Punjab and Sind. These will

benefit activities in several CWM sub-project areas. Cotton maximization schemes (CMS) cover seven districts in Punjab (including the 6-R sub-project) whereas the Training and Visitation (T&V) Project of agricultural extension covers five districts in the Punjab (Pakpattan and Shahkot sub-projects) and five in the Sind (Sehra/Naulakhi sub-project).

D. Project Amendment Rationale

The GOP, with help from many donors, is developing its irrigation system along the same lines as the three-stage model outlined in A.I.D.'s 1983 Asia Bureau Strategic Plan. This model implies a progression over time from the development of a centrally administered supply system towards a decentralized management system, based substantially on demand.

While other donors continue to assist the GOP in the rehabilitation and maintenance of major civil works, A.I.D., since the 1970's, has been shifting its focus to the management of water by the Provincial Irrigation Departments and as it leaves the control of the Irrigation Departments and becomes the concern of its users, the farm owners and tenants who practice irrigated agriculture. CWM will expand their role in the control and management of water, while providing an institutional focus for close collaboration and joint planning among the line departments which affect farmers' production.

CWM builds on technologies and institutions that are familiar and have proved to be effective in improving irrigation efficiency. It adds three new elements: a multi-disciplinary planning, monitoring and evaluation system for a specific geographic (i.e. command) area; the creation of an office exclusively dedicated to agricultural production in that area, and to provide an institutional focus for collaboration among line agencies, which historically have operated independently; and a wider involvement of farmers both as sources of information to line agencies and as influencers of the delivery of water and non-water inputs. As such, CWM is consistent with and carries out national policy as articulated in the GOP Revised Action Program and Sixth Five Year Plan, which promotes the idea of community management of inputs at the watercourse command level.

Given the unique conditions that prevail in the nation's irrigation system, there is, however, uncertainty as to what is needed to make this form of management work. CWM will be testing strategies to answer questions that include: (1) what is an appropriate methodology for ensuring collaborative planning between provincial Departments of Irrigation and Agriculture; (2) what level and type of effort is required to encourage farmers to participate on a sustained basis in Water Users Associations; (3) what incentives can be introduced to encourage farmers to maintain irrigation systems and use water efficiently; and, (4) what methodologies can be developed to plan and implement activities that lead to increased agricultural production in command areas. The CWM Program is designed to field test critical hypotheses and monitor and evaluate results in seven locations over five years that will yield information on what will work and what will not at the level of the farmer and his community.

In summary, there is consensus among scholars and experts in the field that CWM is the way to go to harness Pakistan's abundant water resources to increase agricultural production and yields. The approach has been tried elsewhere with favorable results, and the GOP is committed to adopt the CWM approach in Pakistan. Therefore, it is not a question of "whether or not" but rather "how" to do it. While A.I.D., the IBRD/IDA, and the GOP are not positive that the approach we have identified will work, the purpose of this phase of the CWM Program is to experiment and identify those approaches that will work. However, even if the institutional objectives of the CWM Program fall short of expectations, the civil works components under both the A.I.D. and IBRD/IDA projects alone will yield substantial economic benefits. USAID/Pakistan, along with the IBRD/IDA and the GOP, fully expects that the proposed level of financial investment will have enormous pay-offs. The experience gained in answering the questions in the preceding paragraph and related questions will have a profoundly positive effect on the future of Pakistan's entire irrigated agriculture sector at the policy level as well as operationally at the level of the canals, drains and individual watercourses.

III. DETAILED PROJECT AMENDMENT DESCRIPTION: THE CWM PROJECT COMPONENT

A. Project Component Goal and Purpose

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 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.

End-of-project status indicators (EOPS) for the CWM component include the following:

1. increased agricultural production in the sub-project areas (see Section V.D., Economic Analysis);

2. improved water management techniques and programs developed which are replicable over a wide range of agro-climatic zones and land and water environments;

3. reduced inequities in actual water deliveries in the tail reach as compared to the head reach of canals at all levels in the sub-project areas;

4. capability institutionalized within provincial agencies to plan, implement and operate integrated programs for irrigated agriculture;

5. farmer-initiated, Water Users Association (WUA) - organized programs established to meet the O&M needs of rehabilitated watercourses in the sub-project areas;

6. meaningful and on-going participation by WUAs in Provincial Irrigation Department (PID) planning and decision-making concerning the operation of sub-project area surface water delivery systems and public tubewells;

7. increased private sector sales and appropriate use by farmers of fertilizer and pesticides and increased farmer use of certified seeds and institutional credit in the sub-project areas;

8. improved crop management and cultivation practices by farmers in sub-project areas as a result of improved extension services;

9. provincial and federal government policy measures implemented to reduce irrigation and input subsidies; and,

10. evidence of farmer willingness to pay increased water charges and higher prices for inputs.

Major assumptions for achieving these EOPs include:

1. the timely assignment by the Federal and Provincial Governments of an adequate number of qualified professional staff in the SMOs for the management and implementation of CWM activities;

2. high level federal and provincial support for the CWM concept and, in particular, the establishment of effective, representative WUAs;

3. the meaningful and on-going involvement of private and public sector suppliers of inputs and credit services in the sub-project areas;

4. the willingness of provincial level line department officials and field staff in the Agriculture and Irrigation Departments and the On-Farm Water Management (OFWM) and Extension Directorates to work closely together to achieve CWM objectives; and,

5. the willingness of farmers to work closely together once physical improvements are made at the watercourse level to carry out required maintenance and water management improvement activities.

The CWM Program has been designed to bring these conditions about and hence to make the assumptions valid. The speed with which they occur will determine the pace of implementation.

B. Project Component Outputs

The A.I.D.-financed CWM Project component is expected to produce the following outputs which, together with the outputs of the IBRD's CWM Project, should achieve the project purpose:

1. Institutional Outputs

a. establishment of over 1,000 formally organized and registered WUAs in the seven sub-project areas;

b. integration of WUAs into a network of federations and councils in the sub-project areas; and,

c. establishment of seven functioning CWM Sub-Project Management Offices (SMOs) (four in the Punjab and one each in the other three provinces), seven supporting Sub-Project Coordinating Committees, and four Provincial Policy Committees.

2. Training Outputs

a. approximately 25 staff members of the SMOs and Federal/Provincial Government officials trained in rural organization, water management, and planning, monitoring and evaluation techniques;

b. approximately 20 members of the OFWM Directorates' Field Teams and 100 field workers from the Provincial Extension Directorates trained in multidisciplinary problem-solving techniques related to water management, WUA development, and community participation;

c. approximately 5,000 WUA members trained in planning, watercourse improvement and maintenance, and improved water management and agricultural practices; and,

d. approximately 50 PID officials trained in improved operation and maintenance of irrigation facilities.

3. Water Management Planning Outputs

a. an irrigation system operational management plan developed for one of the CWM sub-project areas (most likely Sehra/Naulaki in the Sind) that will permit optimum use of surface water, public tubewells, and private tubewells;

b. a detailed methodology developed that can be applied to other irrigation command areas for deriving an irrigation system operational mana gement plan; and,

c. based on the methodology in b. above, irrigation system operational management plans developed for the remaining six sub-project areas.

4. Physical Outputs

a. approximately 1,000 farmer-implemented on-farm improvement programs completed;

b. about 1,000 agricultural demonstration plots, i.e., one in each rehabilitated watercourse command area, established;

c. precision land levelling completed on about 20,000 acres; and,

d. field testing completed and evaluated in several sub-project areas of such irrigation methods as pipelines, sprinkler or drip systems, small reservoirs, and tubewells.

5. Monitoring and Evaluation Outputs

a. methodology developed, field-tested, and adopted for the systematic and sustained monitoring of CWM activities, including their impact on farmer production and incomes;

b. reports and studies produced by CWM staff that record and evaluate actual progress in the sub-project areas; and,

c. reports and working documents produced by CWM staff that analyze the results and impacts of CWM, including recommendations for replication on a wider scale of those activities that have proved successful.

C. Project Component Activities

The CWM Project component will build on known and accepted technologies and established institutions in Pakistan. On this proven foundation, new institutions and operational procedures will be developed to optimize the use of water for agricultural purposes. Three new and inter-related elements will be introduced at the sub-project level. They are:

1. the creation of a single office dedicated exclusively to agricultural production in a given command area. This office will provide an institutional focus for linking activities of provincial line agencies (Irrigation, OFWM and Extension) as they pertain to farmers' productivity;

2. the development and implementation of a methodology for multidisciplinary planning, implementation and evaluation of an irrigation system within a command area. This contrasts with previous efforts that have been neither multidisciplinary nor have focused on a total command area but rather have proceeded piecemeal, watercourse by watercourse; and,

3. the strengthening of WUAs to allow farmers to become active participants with Provincial Departments of Irrigation and Agriculture in the planning, operation and maintenance of the irrigation system.

A.I.D.-financed CWM Program activities fall under five general areas: (1) institutional development; (2) training; (3) water management improvements; (4) physical improvements; and, (5) monitoring and evaluation.

1. Institutional Development

To achieve CWM objectives will require the creation of three new provincial entities and the strengthening of farmer organizations.

a. Provincial Institutions

i. Sub-Project Management Offices

Field level CWM operations will be centered in on-site Sub-Project Management Offices (SMOs). Separate offices will be established for each of the three sub-projects in the Sind, NWFP, and Baluchistan (Sehra/Naulakhi, Warsak Lift, and Las Bela, respectively). CWM activities in the Punjab will be directed from a single office

located, most likely, in Niazbeg, one of the four Punjab sub-project areas. Smaller sub-offices will be established in the other three Punjab sub-project areas.

Each SMO will be headed by a Manager, supported by a GOP-funded staff which is likely to be organized into three units similar to the following:

Administration Unit

Manager (1)
Bookkeeper (1)
Guard (1)
Driver (2)

Water Management (WM) Unit

Senior Manager, Water Management (1)
Information Management Specialist (1)
Enumerator (2)

Planning, Monitoring and Evaluation (PME) Unit

Senior Manager, Monitoring and Evaluation (1)
Surveyor (2)
Enumerator (2)

In addition, each SMO Manager will be supported by a Pakistani WUA Development Specialist, hired as part of the A.I.D.-financed CWM Technical Assistance (T.A.) Team.

ii. Provincial Policy Committees

Provincial governments will establish Provincial Policy Committees (PPCs) to be chaired by the Additional Chief Secretary, Planning and Development (P&D). The Secretaries of Agriculture, Irrigation and Finance will comprise the other committee members. The PPCs will be responsible for: (1) formulating overall policies to implement the CWM program; (2) resolving differences among line departments; (3) coordinating line department inputs at the provincial level and oversight at the sub-project level; (4) reviewing, revising as appropriate, and sanctioning annual work plans prepared by the SMOs; (5) programming provincial public and private sector inputs in line with the adopted annual work plans; and, (6) reviewing, at least quarterly, the status of CWM activities in their jurisdictions, identifying constraints to the meeting of targets, and taking remedial actions.

iii. Sub-Project Coordinating Committees

Seven Sub-Project Coordinating Committees (SCCs), one for each sub-project area, will be set up to serve as a link between the SMOs, the line departments, WUAs, agricultural input suppliers and other related groups. SCCs will be chaired by the respective Sub-Project Manager. Members will include at least the following: representatives of

WUAs; engineers from the Irrigation Department; Deputy Director, Extension; Coordinator, OFWM; representatives of credit institutions; and, representatives of agricultural input suppliers.

The SCCs will work from annual plans developed by the SMOs and sanctioned by the PPCs to prepare annual input delivery plans. The membership of the SCCs will be responsible for the timely and coordinated delivery of the total mix of water and non-water agricultural inputs in the sub-project areas.

b. Farmer Organizations

i. Water Users Associations

Existing legislation in each province provides for the establishment of Water Users Associations (WUAs). The primary responsibilities of WUAs include: operation, maintenance, improvement and rehabilitation of watercourses; improvement of water supply from surface or ground water; and, improvement of on-farm water management. WUAs are also expected to obtain agricultural inputs and to increase the economic and social well-being of the membership.

While the legislation clearly provides WUAs with the roles and responsibilities which CWM is intended to promote, in practice, however, nearly all WUAs are formed for the sole purpose of obtaining watercourse improvements. They become moribund once it is time to maintain the improvements or work on the management of water. Social and cultural reasons are responsible for the difficulties encountered in trying to encourage sustained activities for WUAs. These are discussed in detail in the Social Soundness Analysis. Through a combination of additional staff (in the SMOs and at the field level as well as from the expatriate Technical Assistance Teams) and training (for SMO staff, field workers, farmers and line department officials), CWM is designed to enable the WUAs to carry out the roles and responsibilities envisaged for them in the existing legislation.

Annex G presents various models for strengthening WUAs that might be appropriate in different parts of the country. Annex I presents examples of how the timing of various CWM activities may be used to create incentives for increased and sustained farmer participation. The selection and adaptation of models and incentives will be the responsibility of each Sub-Project Manager.

ii. WUA Federations and Councils

The CWM design calls for the development of WUA Federations. These organizations, whose structure will depend on the legal, physical, social and cultural conditions that obtain in different areas, will give farmers a more powerful voice in relating to the many provincial agencies that influence their agricultural productivity. Each year, the SMOs will focus on CWM activities in a particular section (minor command) of the sub-project area. WUAs from all the watercourses

in that command area will be organized into a Federation. As new sections of the command area are targeted for assistance over the life of the project, additional WUA Federations will be established. Ultimately, the entire sub-project area will be covered, and representatives from all Federations in the area will form a single WUA Council. In each area, from the outset, WUAs will meet at least quarterly with the Sub-Project Manager to review the sub-project program. WUAs will also be represented on each Sub-Project Coordinating Committee.

The IBRD considers WUA Councils critical to ensuring farmer participation in the upstream canal rehabilitation and remodeling and surface drainage activities it will finance. The IBRD's SAR states:

> "to ensure adequate farmer participation in civil works development decisions, line agencies (e.g., PIDs or OFWM Directorates) would seek the guidance of WUAs as to needed improvements and obtain their concurrence prior to formulating detailed plans; OFWM Directorate personnel would deal with a single WUA, whereas PIDs would normally deal with a federation of WUAs". (p.25)

Existing WUA Ordinances in Baluchistan, NWFP and Sind provide for the federation of WUAs at an intermediate (distributary) and a higher (canal) level. The Punjab Ordinance does not contemplate such federations. If found to be necessary, an amendment to the Punjab Ordinance, providing for WUA federations, will be sought.

WUA formation is planned to proceed sequentially in sub-project areas among watercourses within a single minor or distributary command. Initial efforts to encourage WUA federation will be informal and follow the first objective of CWM, which is to develop a network of strong WUAs at the watercourse command level. Once this is done and farmers gain organizational experience in their WUAs, federations will become the next objective of institutional development. It will therefore be some time (at least a year or more) before sufficient WUAs have been formed that can be aggregated into a minor or distributary federation. Indeed, it is entirely possible that the initiative for this activity may emerge from the WUAs themselves as their members and leadership recognize the value of a federation for addressing water management and O&M issues at the minor/distributary command level. (This happened in Gal Oya under the A.I.D.-financed Water Management Project in Sri Lanka.)

2. Training

The successful implementation of the CWM Program will require both formal and informal training of various levels of staff. These training activities include: (a) training staff of the seven SMOs; (b) farmer organization training for the field workers who will be encouraging WUA development, i.e., the Agricultural Officers and Field Assistants of the OFWM and Extension Directorates; (c) technical training for officials from Provincial Departments of Irrigation and Agriculture responsible for sub-project areas in subjects relevant to CWM; (d) training of farmers in water management, watercourse maintenance, and

organizational development; and, (e) training for supporting agency personnel such as faculty at university research centers and local administration officials and rural leaders.

a. Training for SMO Staff

As described in the Implementation Plan, SMO staff will be exposed, early on in the project, to an intensive 2 - week training course and additional training as needs are identified. The curriculum will cover: CWM concepts and approaches including the roles and responsibilities of farmers and WUAs, and methods for effective planning, monitoring and evaluation of WUA development. Technical topics will include: water management planning, monitoring and evaluation, elementary irrigation principles, agronomy and extension methods. SMO staff will also be given training and opportunities for practical use of micro-computers (linked with ISM efforts and standardized to a single system) to simplify their planning and monitoring responsibilities. The contractor under the A.I.D. centrally-funded Water Management Synthesis II (WMS II) Project will help design and initially conduct this training program, beginning in February/March 1985. The CWM Technical Assistance (T.A.) Team (see below) will continue to address training needs, once it arrives in-country. On-the-job as well as formal training in diagnostic analysis will also be provided during this activity by the WMS II contractor. The need for more intensive training in this area will be addressed early on during the preliminary phase of implementation.

b. Training for Field Workers

The day-to-day work of helping farmers to develop viable WUAs will be undertaken by Agricultural Officers (AOs) and Field Assistants (FAs) from either the OFWM or Extension Directorates or both (depending on the preference of the provincial governments), who will be working in coordination with the SMOs in the sub-project areas. FAs and many AOs live and work in the local villages and already have relationships with farmers. Details of the organizational structure and staffing of line departments in sub-project areas are found in Annex J. Additional staffing at the local level may be required if models for strengthening WUAs as outlined in Annex G are adopted.

All field workers in the sub-project areas will require training, early on in the project, in community and institutional development techniques and in orientation to CWM concepts and activities. The WMS II contractor will also help design and initiate the implementation of a series of intensive 6-week courses to begin in February/March 1985 for those field workers assigned to CWM sub-projects. As in the case of SMO training, the CWM T.A. Team will assist with this on-going training program. To accommodate the skill levels of trainees, two courses will be designed, one for AOs and one for FAs. In addition, the OFWM Training Institute near Lahore has made plans for an additional 2-week course, to be added to their on-going water management course for field workers. Similar courses may be offered at OFWM training centers in other provinces.

c. Technical Skills Training

OFWM AOs and FAs will join personnel from the Provincial Extension Directorates for technical skills training in such areas as water management, crops, and extension. Efforts will be made to "cross-train" officers in complementary fields.

CWM training for line department staff will, to the maximum extent possible, make use of existing training organizations such as the OFWM Training Institute and provincial centers and the three Agricultural Universities at Faisalabad, Peshawar and Tandojam. Incentives for collaborating organizations will include the provision of new equipment and training materials, and limited specialized training in Pakistan and abroad for senior officers and faculty. The CWM T.A. Team will assist in the identification of appropriate training sites and in the design of programs to supplement existing training capabilities.

d. Farmer Training

Most farmer training will be undertaken informally, in the field, by the AOs and FAs working in the watercourse command areas. Demonstration plots in each watercourse command area will be an important part of this training effort. In addition, SMO staff, the locally hired WUA Development Specialists, and members of the T.A. Team will also work directly with farmers to increase their knowledge of water management, watercourse maintenance, organizational development and farming practices. Farmer training will be an on-going activity over the life of the CWM Program.

e. Training for Supporting Agency Personnel

Senior staff at the Federal and Provincial levels of the Departments of Irrigation, Extension and OFWM will be given the opportunity to undertake study tours to India, Egypt, Sri Lanka or the Philippines to observe programs similar to CWM. This experience should generate recommendations on how successful strategies adopted elsewhere could be applied in Pakistan. Short-term training opportunities will also be made available to these personnel. For example, in October 1984, six PID officials from within the sub-project areas were sent to the U.S. to attend Utah State University's 6-week course in "Operational Management of Irrigation Districts."

In addition, as the CWM Program evolves, SMO staff, with the assistance of the CWM T.A. Team, will design programs to inform and secure support for the CWM approach from civil administration officials, rural leaders, and local commercial interest groups.

Provision is also made for advanced training for senior staff at the Provincial training centers and selected faculty members in universities who demonstrate an interest in improving their research and teaching skills in CWM-related areas. Short-term or master's level programs may be financed in: (i) water management; (ii) extension methods; (iii) monitoring and evaluation skills; and, (iv) rural sociology and farmer organization.

3. Water Management Improvements

A major objective of CWM is to develop a multidisciplinary planning approach to the command area, in terms of its physical, economic, social and cultural conditions, so that improvements can be made to maximize the efficiency of the entire system. Planning, design and operational objectives for most irrigation projects are largely established by engineers. As a result, multidisciplinary planning objectives are not defined nor accomplished in the design and operational plan phases. The result is that either social and organizational factors do not significantly affect how many farmers are served by an outlet, or that farmer preferences and abilities do not influence the methods and rules for water delivery. Crop needs are not realistically considered for their timing and volume requirements for water. Costs and returns to farmers are different from that assumed in the planning phase, resulting in cropping patterns frequently different from planned. In addition, the crops, soils and topography do not influence the type of field irrigation system assumed (commonly, no type is explicitly assumed but the choice left to the farmer) with the result that planned and designed water volumes, flow rates and durations are inappropriate. A multidisciplinary approach to planning, designing and developing operational plans for management of irrigation projects is needed.

To achieve this objective, a multidisciplinary team, consisting of personnel from Colorado State University as the lead organization, supplemented with staff from Utah State University and Cornell University, under the A.I.D. centrally-funded Water Management Synthesis (WMS) II Project, will be contracted to undertake the type of "diagnostic analysis" that has been conducted in other countries by the WMS II contractor. The WMS II team will consist of a team leader, agricultural economist, irrigation agronomist, agricultural engineer, irrigation engineer, groundwater hydrologist, and sociologist who will work with their counterparts intermittently for about 12 months in one of the sub-project areas (most likely one command of the three branch canals in the Sehra/Naulaki sub-project area in Sind Province).

The overall objectives of the WMS II contractor's work are three-fold: (a) develop an irrigation system operational management plan and a system for implementing it for one of the sub-project areas which will permit the optimum use of surface water and public and private tubewells; (b) based on the site-specific experience in (a) above, develop a generalized model and a methodology for applying this model in other irrigation command areas to derive and implement an irrigation system operational management plan; and, (c) develop guidelines and procedures for SMO staff and other appropriate staff responsible for developing and implementing operational management plans and train these individuals in their use.

The specific objectives of this study are as follows:

a. identify existing practices that contribute to, and constraints that inhibit improved crop production in a designated sub-project area through diagnostic analysis;

b. recommend priority physical and institutional improvements in one or two local areas (minor commands) in the sub-project area, most of which will be appropriate for the entire sub-project area;

c. develop an irrigation system plan for a CWM sub-project area for management of inputs and services within the organizational framework already described for CWM;

d. develop and demonstrate a methodology that can be applied to meet the above objectives in other sub-project areas; and,

e. provide on-the-job training to local personnel for development of operational plans and on-the-job experience for line department and sub-project management personnel and involve them in the development of the operational plan.

The principal outputs of this activity include the following:

a. a report describing the existing operation of the sub-project area, including the practices that contribute to, and constraints that inhibit improved crop production as identified from diagnostic analysis;

b. a report presenting recommendations for physical and institutional improvements in localized areas and a plan covering management of the delivery of irrigation water, inputs and services. This report will include the following important components:

i. identification of the appropriate roles for the line departments, other suppliers of inputs and services, Water Users Associations, and sub-project management staff, including recommended roles considered necessary for implementation of the improvements and the management plan;

ii. recommendations for the most suitable cropping patterns for the available water supplies before and after improvements;

iii. a plan for conjunctive use of surface and groundwater in the sub-project area including public and private tubewells and recommendations for improving the water supply;

iv. recommendations for the organization of Water Users Associations;

v. recommendations for improvement of the effectiveness of extension to increase the productivity of irrigated agriculture and the income of farmers; and,

vi. guidelines for applying the findings of the study to other CWM sub-projects.

It is anticipated that the WMS II team will begin work in the selected sub-project area in March 1985. While the study is being undertaken in one sub-project area, SMO staff in the remaining six sub-project areas

will be appointed and will focus on organizing the SMOs into functional entities. With the assistance of the WMS II contractor, collection of baseline data will be undertaken. With the assistance of the ISM Engineering Team of consultants, SMOs will begin to identify and prioritize, with the PIDs, needed improvements to canals and drains. Specific areas may also be identified where initial efforts will be focused, allowing the process of organizing farmers into WUAs to begin. Some watercourse improvements may also be initiated. By the time the WMS II-developed methodology is available for replication in the other sub-project areas, an adequate data base and institutional framework will have been established, staff will have been trained, and some experience with farmer organization activities will have been gained such that the SMOs should be able to develop and implement their own operational plans. (See Annex K for more details.)

The following section provides examples of the types of water management improvement issues which will be intensively studied by the WMS II team in the selected sub-project area and examined on a more limited basis in the other sub-project areas with the assistance of the CWM T.A. team during the first 12-18 months of the project.

a. Regulation/Control

Flow measurement devices will be installed as part of a monitoring and improved communications system whereby the need for changes in flows and other information can be readily identified. Gating of moghas will also be considered to permit control and regulation of delivery to the watercourse for purposes of implementing intermediate water delivery operations. (This equipment will be procured with IBRD funds budgeted for remodeling.)

b. Private Tubewells

With the inherent structural and supply limitations associated with use of surface water, the most viable alternative for matching supplies and demands is through conjunctive use of groundwater. CWM will be concerned with establishing appropriate policies and incentives to ensure that farmers with private tubewells assist in meeting peak demands and public tubewells are used and maintained properly.

c. Cropping Patterns

Changes in crops and planting dates can be made to take advantage of water supply excess at certain times of the year, and to attempt to match more closely overall crop water demand with available water supplies. Such changes permit an expansion of the cropping intensity without structural change, augmentation of water supply, or changes in irrigation schedules. Certain deep-rooted crops, such as alfalfa, are capable of extracting a large percentage of the water from root zone soil. During periods of peak crop demand or other times when water is in short supply, water is diverted from the buffer crop to higher value crops whose growth suffers if they are not provided with

frequent irrigation. The buffer crop, having extracted large volumes of water from the soil, can be left without water until it is again available in sufficient quantity. The planting of buffer crops will be encouraged wherever feasible.

d. Water Scheduling

On the basis of the first water management plans developed for each sub-project area, various forms of water delivery will be tested and long-term operational procedures developed. Sophisticated scheduling systems will be given consideration, initially probably by means of pilot testing in one sub-project area only. An example of such a system is the computer-based model used by the U.S. Bureau of Reclamation. The model yields highly detailed data, including soil moisture levels and weekly crop water requirements, for use by extension workers.

4. Physical Improvements

Under the A.I.D.-financed CWM Program component, physical improvements will be made to the irrigation system below the mogha in each sub-project area. Planning for these physical improvements will be a collaborative undertaking involving SMO staff, the CWM T.A. Team, the PIDs, the OFWM Directorates, and WUAs. Each year, planning and implementation of physical improvements will take place in a selected part (minor command area) of each sub-project area. Plans will take into account the needs of the overall command area as well as the need to complement the upstream improvements being financed by the IBRD-financed CWM Project. Plans will also reflect the role of physical improvements as incentives to farmer participation in WUAs, as described in Annex I. The physical works described below are illustrative.

a. Watercourse Renovation and Realignment

A.I.D. will finance the rehabilitation of about 1,000 on-farm improvement programs including watercourse rehabilitation. Rehabilitation will include brick or concrete lining of 15-50 percent of the total length of each watercourse, earthen improvement of the remaining 50-85 percent, and the installation of about 36,000 turnout structures, 4,000 culverts, and 2,000 buffalo baths. It is estimated that these improvements will result in increases in water availability by about 10 percent, due to reduction in seepage losses.

Where irregular shaped landholdings result in inefficient distribution of water, means other than simply improving the watercourse in its existing alignment will be sought to overcome this problem. Realignment of the watercourse may be feasible by acquisition of rights of way for critical reaches or by land consolidation by willing landowners. Redesign of watercourses or replacing one watercourse with two, for example, may also be required where the size of a watercourse command area needs to be reduced.

b. Cost-Recovery Arrangements

Labor and cost sharing for construction materials will be provided by beneficiaries in a manner similar to procedures currently being implemented under the IBRD's OFWM Project. Under that Project, Punjab and Sind Provinces have agreed that water users will repay part of the cost of OFWM materials. Baluchistan and NWFP water users have not, as yet, been required to repay anything. Costs are assessed by the OFWM Directorates following a two-year grace period. Repayments are made in ten bi-annual interest-free installments, collected by the Provincial Revenue Department.

For the CWM Project, the Sind, Punjab and Baluchistan Governments have agreed that farmers will contribute to materials costs. In Sind and Baluchistan sub-projects areas, beneficiaries will repay 25 percent of materials costs, whereas in the Punjab, 20 percent will be repaid. The difference compensates Punjab water users for paying the cost of masons, which water users in Sind and Baluchistan are not required to pay. It has been agreed that NWFP will carry out a review of cost recovery for rehabilitation materials and submit to A.I.D. a program for effecting an appropriate recovery. This program will provide the basis for a joint decision as to repayment of materials costs by beneficiaries in the NWFP.

c. Field Drainage Systems

Construction of field drainage systems will be undertaken in watercourse command areas where crops are often damaged by standing water. These activities will be coordinated with work on the surface drainage system under the IBRD-financed CWM Project. Farmers will contribute labor for this work, with engineering advice provided by OFWM field teams. If structures are required, financial arrangements will be the same as those described above for watercourse improvements.

d. Precision Land Leveling

Precision land leveling will be completed on an estimated 20,000 acres, resulting in improved farm irrigation application efficiency.

e. Other Irrigation Interventions

In Las Bela, Baluchistan, it may be found that non-traditional irrigation systems are appropriate. These might include pipelines and at least limited pilot testing of sprinkler or drip systems. Drip irrigation will also be considered in the Shahkot and 6-R sub-projects in Punjab. In these areas, applying saline groundwater through drip systems on salt tolerant crops may be found to be feasible.

Construction of small reservoirs near or on farms may be undertaken in some sub-project areas. These will be designed to permit storage of water deliveries during periods when water is not required. Also construction of tubewells under WUA ownership may be undertaken to provide needed incentives for farmer involvement.

f. Demonstration Plots

Demonstration plots will be established near improved watercourses to show farmers the results of effective management of water and non-water inputs. CWM Project funds may be used, if found to be necessary, both to lease the land and purchase the required inputs for the plots.

5. Monitoring and Evaluation

Monitoring and evaluation of the CWM Program will be crucial both for successful implementation and for determining which approaches should be adopted for wider replication. Section IV.E. outlines the monitoring and evaluation plan for the CWM project component. Three types of evaluation efforts are contemplated: (a) on-going monitoring and evaluation of project activities by the SMO staff with assistance from the CWM T.A. Team; (b) external impact evaluations by local universities and/or private sector organizations; and, (c) formal evaluations involving external evaluators.

The Planning, Monitoring, and Evaluation (PME) Unit of each SMO will be responsible for continuous monitoring of all CWM project activities, i.e. institution-building, training, water management improvements and physical improvements. Most important will be their role in setting production targets, identifying production constraints, and taking necessary action, through the SCCs and other means, to see that constraints are overcome. The WMS II Contractor and a local organization will assist the SMO/PME Units initially to collect baseline data and to design and establish data collection, monitoring and evaluation systems. The CWM T.A. Team will thereafter provide assistance to the SMO/PME Units as necessary throughout the life of the CWM Program. Local institutions, such as social science departments of local universities or appropriate private sector organizations will be contracted to undertake studies and analyses of the impact of CWM activities. Topics might include: the role of tenant farmers in WUAs; a comparison of water management improvements in different sub-project areas; an evaluation of incentives for farmer participation; and, a comparison of the monitoring and evaluation systems of the different SMOs.

A special effort will be made to monitor and evaluate efforts made to organize farmers into working, useful associations. In each sub-project area, a plan will be developed for an on-going evaluation of a sample of WUAs. Inputs will come from the field workers (OFWM and Extension AOs and FAs), the locally hired WUA Development Specialists and the expatriate CWM T.A. Team.

Under the parent ISM Project, the University of Idaho (U of I) has been contracted to develop a long-range water management research program and, if this program is approved, to help implement it and strengthen the capability of local organizations to undertake research in the water sector. U of I's recommendations will be taken into account in implementing CWM monitoring and evaluation activities.

D. Project Component Inputs

A.I.D. will provide technical assistance, training, commodities, and reimbursement for civil works under the CWM Project Component. An estimated $19.4 million will be allocated for the types of physical improvement activities described above in all seven sub-project areas. Approximately $2.5 million will be provided for the long-term and short-term participant training and in-country training activities also described previously. This section summarizes the technical assistance and commodity inputs to be financed by A.I.D.

1. Technical Assistance

a. On-Going Technical Assistance

Under the parent ISM Project, three teams of long-term advisors, provided by PRC/Checci, are already in-country providing technical assistance to the PIDs and the Federal Ministry of Water and Power. These teams consist of: four members of a Planning and Management Team; five members of an Equipment Management Team; and, six members of an Engineering Team. In addition, the University of Idaho is likely to field a four or five-person long-term Water Management Research Team, which should be in-country in the spring/summer of CY 1985. Similarly, a four-person team of advisors under contract with Sheladia Associates arrived in-country in July 1984 under the A.I.D.-financed On-Farm Water Management (OFWM) Project to work with the Federal OFWM Cell and the four provincial OFWM Directorates. All of these advisors will contribute to CWM objectives in a variety of ways.

For example, the ISM Planning and Management Team will help implement training activities for SMO personnel as well as other training programs. (See Section IV.A.) Both the Engineering and Equipment Management Teams will strengthen the capability of the PIDs to carry out their roles and responsibilities under the CWM Program in the sub-project areas. The University of Idaho Research Team will assist WAPDA and the PIDs to implement a comprehensive water research program which includes both technical assistance to design and implement research as well as in-country and overseas training to strengthen the capability of local institutions to undertake relevant and practical research. Research findings will be of direct relevance to the CWM Program. In addition, the OFWM expatriate team will strengthen the capability of the OFWM Directorates and the OFWM field teams to carry out their roles and responsibilities under the CWM Program and will also help facilitate coordination at the field level between the PIDs and OFWM Directorates.

b. Additional Technical Assistance

Five additional categories of technical assistance specifically for the CWM Program will be required: (i) a seven-person team of expatriate advisors from the WMS II contractor to undertake the diagnostic analysis of the irrigation system in one sub-project area as previously described as well as short-term assistance by the WMS II Contractor to design and initially conduct training programs for SMO

staff and field agents and to assist SMOs to design and establish data collection, monitoring and evaluation systems; (ii) local supervisory consultants; (iii) local university and/or private sector researchers; (iv) a CWM T.A. Team composed of expatriate and Pakistani consultants; and, (v) short-term assistance from such sources as NARC, PARC, the Agricultural Universities and expatriate consultants for specific training and evaluation activities. The discussion that follows describes the latter four categories of technical assistance.

i. Supervisory Consultants

Supervisory consultants, appointed by USAID/Pakistan, in consultation with the GOP, will review and approve civil works designs and cost estimates, oversee the quality of physical improvements, and certify the completion of work prior to reimbursement by A.I.D. These consultants also will work with ISM and OFWM expatriate consultants to address research needs and improvements in technical standards, and to train OFWM field staff and WUA groups in more effective rehabilitation planning and management techniques. They will assist SMO Managers in reviewing work plans and will keep A.I.D. informed of the technical adequacy of planning activities. Table 5 shows the proposed level of effort for the supervisory consultants who will be provided by a local consulting engineering firm under either a direct contract with A.I.D. or a sub-contract with the CWM T.A. contractor. The firm's Project Engineer and at least some of the Junior Engineers must have an adequate background in on-farm irrigation and drainage principles, and all of them must be familiar with surveying and design and construction of small channels.

TABLE 5

ESTIMATED LEVEL OF EFFORT OF SUPERVISORY CONSULTANT SERVICES BY YEAR

Classification	No.	Year 1	Year 2	Year 3	Year 4	Year 5	All Years
		(In Person-Months)					
Project Engineer	1	9	12	12	12	12	57
Junior Engineer	variable (5 max.)	24	60	48	36	36	204
Sub-Engineer	variable (3 max.)	--	24	36	36	36	132
TOTAL		33	96	96	84	84	393

ii. Local University and/or Private Researchers

The CWM design calls for beneficiary impact evaluations to be undertaken by parties other than project staff. There are several social science departments of Pakistani Universities, private local firms, and local non-profit organizations with the capacity to conduct comparative or impact evaluations of the type described in Section III.C.5., above. At least one such evaluation will be conducted in each sub-project area. Table 6 summarizes the proposed level of effort to be provided by local universities or private researchers who will be hired either directly by A.I.D. or under sub-contract(s) with the CWM T.A. contractor.

TABLE 6

ESTIMATED LEVEL OF EFFORT OF UNIVERSITY OR PRIVATE RESEARCH ORGANIZATIONS BY YEAR

Classification	No.	Year 1	Year 2	Year 3	Year 4	All Years
		(In Person-Months)				
Social Scientists	2	6	12	12	12	42
Advanced Graduate Students	variable (max. 4)	24	48	48	24	144
Field Researchers/ Documenters	variable (max. 6)	48	72	48	24	192
TOTAL		78	132	108	60	378

iii. CWM Long-Term Technical Assistance (T.A.) Team

(1) Expatriate Consultants

An estimated 252 person-months of long-term and short-term expatriate technical assistance will be provided by an institution/firm under a direct contract with A.I.D. The areas of specialization of the consultants in Table 7 indicate the range of technical, institutional and planning/management skills that are likely to be required. Offerors will be encouraged to propose a team composition and level of effort in accordance with their understanding of the scope of work. Options to possibly extend the contract and increase the level of effort will be provided in the contract in line with the GOP, IBRD/IDA and A.I.D.'s agreement to re-evaluate the level and composition of TA by the end of the first 2 years of the Program. It is anticipated that the team would consist of 2 multidisciplinary groups of 4 advisors each; one based in Lahore to support the SMOs in the Punjab

and NWFP and the other based in Hyderabad or Karachi to support the SMOs in the Sind and Baluchistan. In addition, a chief technical consultant/planner would oversee both field teams and be based in Lahore. The team will report to the Ministry of Water and Power and will maintain close coordination with the four Provincial Departments of Irrigation and Agriculture.

TABLE 7

ESTIMATED LEVEL OF EFFORT OF EXPATRIATE CWM TECHNICAL ASSISTANCE TEAM BY YEAR

Classification	Location	Contract Year 1	2	3	4	5	All Years
		(In Person-Months)					
Chief Technical Consultant/Planner	Lahore	12	12	12	-	--	36
Irrigation Operations Specialist	Lahore	9	12	3	--	--	24
Institutional Development Specialist	Lahore	9	12	3	--	--	24
Agricultural Development Specialist	Lahore	9	12	3	--	--	24
Farm Management Specialist	Lahore	9	12	3	--	--	24
Institutional Development Specialist	Hyderabad or Karachi	6	12	6	--	--	24
Farm Management Specialist	Hyderabad or Karachi	6	12	6	--	--	24
Irrigation Operations Specialist	Hyderabad or Karachi	6	12	6	--	--	24
Agricultural Development Specialist	Hyderabad or Karachi	6	12	6	--	--	24
Short-Term		3	2	2	8	9	24
TOTAL		75	110	50	8	9	252

The brief position descriptions of the members of the CWM T.A. Team which follow are illustrative, and are intended primarily to show the overall mix of skills which the Mission and GOP anticipate will be required. The final composition of the team and the specific approach it will take toward its work will be determined on the basis of actual proposals received and during final negotiations with potential contractors.

(a) Farm Management Specialists: These two team members will study farming systems at the field level; identify the interrelationships among water issues, input supply, and cropping and cultivation practices; and translate this knowledge into practical project design, monitoring systems, and implementation programs.

(b) Irrigation Operations Specialists: These specialists should be irrigation system operations engineers with practical experience at the field level, preferably in the sub-continent. They will be expected to work with their professional counterparts in the PIDs as well as line department officers, SMO staff, and WUA leaders.

(c) Institutional Development Specialists: These key team members will assume principal responsibility for assisting in the development of WUAs, in training SMO, OFWM, and extension staff in rural organization techniques, in evaluating the equity implications of CWM activities, and in identifying research needs related to farmer organization.

(d) Agricultural Development Specialists: These two professionals with practical farming and/or research station experience will work primarily to assist the water and farm management experts to define farmer needs, assist in the design and refinement of practical sub-project water management models, provide practical training in extension, assist in demonstration plot development, and help identify practical production potential parameters for design, monitoring, and evaluation purposes.

(e) Chief Technical Consultant/Planner: This consultant will primarily be an overall planner, advising the CWM sub-project managers in carrying out planning and management functions. He will also act as the chief of the technical assistance team, providing overall administration to the team members located in Lahore and Hyderabad/Karachi. This person will coordinate and schedule team members' activities, which, *inter alia*, will require direct contact with each of the sub-project managers, members of each provincial policy committee, appropriate administrators in the federal government, USAID and the IBRD. In short, he/she will be the prime "mover" in meeting CWM objectives. He will also provide technical assistance to all SMOs in preparing operational plans and analyses.

(2) Pakistani WUA Development Specialists:

In recognition of the critical importance of farmer participation through WUAs, seven Pakistani WUA Development Specialists will be hired by the CWM T.A. Contractor for each of the SMOs

for an initial period of three years each. Candidates for these positions should have a social science degree, and at least three years field experience in organizing rural groups. They should speak the local language of the sub-project area to which they will be assigned. They should be energetic people, motivated to assist farmers to take responsibility for decision-making and control in their irrigation systems and willing to spend long hours in village settings. These specialists will report to their respective Sub-Project Managers and will turn to the expatriate Social Scientists on the CWM T.A. Team for technical support.

iv. Short-Term Technical Assistance

In addition, A.I.D. will finance up to 24 person-months of short-term technical assistance, primarily from local sources such as PARC, NARC and the Agricultural Universities at Faisalabad, Tandojam and Peshawar, for training and evaluation activities. It is also anticipated that some of the short-term T.A. would be provided by expatriates. An expatriate soil scientist, for example, might be required to train field workers in a given sub-project area to take soil samples from farmers' fields, analyze them and consolidate them into a command area soil map.

2. Commodities

The IBRD's CWM Project will finance vehicles and office equipment for the SMOs. A.I.D. will finance seven right-hand, four-wheel drive diesel station wagons and seven short wheel base utility vehicles (jeeps) for use by the CWM T.A. team. In addition, A.I.D. will finance instrumentation for water management, communication equipment, micro-computers and software for the SMOs, various flow measurement, agro-climatic measurement and soil moisture measurement equipment, and training aids and equipment. (For details, see the Procurement Plan in Section IV.C.2 and Annex H.)

IV. IMPLEMENTATION PLAN

A. Implementation Schedule

The CWM project component will be implemented in two Phases: (1) a Preliminary Phase, that started in October 1984; and, (2) an Implementation Phase, beginning in the spring of 1985.

1. Preliminary Phase

Table 8 summarizes activities to be undertaken during the Preliminary Phase.

TABLE 8

SUMMARY OF CWM PRELIMINARY PHASE ACTIVITIES

Activity	Duration	Responsible Group
SMO Staff Training	2 weeks initially [a]	Water Management Synthesis (WMS) II Contractor
Field Worker Training	6 weeks series [a]	WMS II Contractor (design and initial implementation)
Baseline Data Collection	3 months intensive; 1 year in total [a]	SMOs, WMS II Contractor, and a Local Organization
Diagnostic Analysis	12 months [a]	WMS II Contractor and a Local Organization
Senior Official Study Tour/Workshop & Seminars	4 weeks	WMS II Contractor
U.S. Short-Term Training	6 weeks	A.I.D. ISM Project Officer and AED/DST Project

[a] These activities will continue into the Implementation Phase.

In October 1984, six PID officials from the sub-project areas were sent to the U.S. for training in irrigation systems operations. The training of SMO staff is scheduled to begin in February/March 1985. In addition, a series of six-week courses dealing with farmer organization will be presented beginning in February/March 1985 to extension, OFWM and rural development staff currently employed in sub-project areas. WMS II Contractor staff will design and conduct the initial courses for both types of training, starting in the Preliminary Phase, and the CWM T.A. Team will assist with these courses during the Implementation Phase. A two-week module on farmer organization development will also be added to the regular four to six week curricula offered by the Punjab OFWM Training Institute to field workers (i.e. Agriculture Officers and Field Assistants from the OFWM and Extension Directorates). The multi-disciplinary team to be provided under the WMS II Project is expected to begin work on a detailed analysis of the irrigation system in one of the sub-project areas in March 1985 and will be assisted in this effort by a local organization. Staff in USAID's Office of Agriculture and Rural Development (O/ARD) have begun collecting socio-economic data in the sub-project areas to supplement WAPDA's CWM Feasibility Study. This baseline data collection effort will be continued by the SMOs' Planning, Monitoring and Evaluation Units with the assistance of the WMS II Contractor's team, once the latter arrives in-country.

A January 1985 study tour/workshop has been planned by the WMS II Contractor for fifteen provincial, federal and university officials. The tour will include visits to Sri Lanka and India or Egypt to examine irrigation command area-based projects and associated farmer organizations. Two one-week workshops, one before and one after the study tour, are an integral part of this training effort. Major objectives of the workshops and study tour will be to increase understanding of CWM concepts, the need for farmer involvement, and the need to make organizational changes as CWM enters the Implementation Phase. Additional seminars will be held in each province and materials prepared and disseminated to increase the understanding and acceptance of CWM concepts by senior officials. The ISM Planning and Management Team will assist in these efforts.

2. Implementation Phase

After an initial nine-month period lasting from about January/February to September/October 1985, during which technical assistance and commodities will be procured, and SMOs will be established, the schedule of most CWM activities will follow an annual planning cycle.

a. Nine-Month Start-Up Period

Nine months after the ISM/CWM PP Amendment is authorized, the following activities are expected to have been completed:

i. SMOs established and equipped with vehicles and other commodities (to be financed by the IBRD CWM Project);

ii. CWM T.A. Team selected and in-country;

iii. Pakistani WUA Development Specialists hired and in place at SMOs;

iv. Sections averaging 20 watercourses selected within each sub-project area for first year CWM activities;

v. Supervisory consultants contracted;

vi. Interim report on diagnostic analysis submitted by WMS II Contract Team; and,

vii. Provincial Policy Committees and Sub-Project Coordinating Committees constituted and at least one formal meeting held for each.

b. Annual Planning, Implementation, Monitoring and Evaluation Cycle

The CWM design calls for activities to be focused on sections of sub-project areas each year. These sections would typically comprise the area commanded by all the watercourses on a given minor. The choice of the sections to receive initial attention will be determined by plans for upstream improvements to be undertaken by the IBRD CWM Project as well as site-specific physical, social and economic considerations. The SMOs, PIDs and OFWM Directorates will be responsible for site selection, with the concurrence of the Provincial Policy Committees and USAID. In subsequent years, adjacent minor command areas will be developed until the entire sub-project area has received attention. Examples of activities to be undertaken each year within the minor commands are shown in Table 9.

TABLE 9

ILLUSTRATIVE ANNUAL PLANNING, IMPLEMENTATION, MONITORING AND EVALUATION ACTIVITIES

Activity	Entity with Principal Responsibility	Collaborating Entities
1. WUA Formation		
a. Planning	SMO Manager	WUA Development Specialists, CWM T.A. Team Institutional Development Specialists, OFWM and/or Extension Field Workers and Local Leaders
b. Implementation	Field Workers	WUA Development Specialists, CWM T.A. Team Institutional Development Specialists, and Local Leaders

Activity	Entity with Principal Responsibility	Collaborating Entities
c. Monitoring	WUA Development Specialists	SMO/PME Units and CWM T.A. Team Institutional Development Specialists
d. Evaluation	Local Universities or Private Organizations	CWM T.A. Team Institutional Development Specialists
2. Watercourse Physical Improvements		
a. Planning	SMO Manager	PIDs and OFWM Directorates, CWM T.A. Team Irrigation Operations and Institutional Development Specialists, WUAs, and WUA Development Specialists
b. Implementation	OFWM Directorates	Supervisory Consultants and WUAs
c. Monitoring	SMO/PME Units	Supervisory Consultants and WUA Development Specialists
d. Evaluation	Supervisory Consultants	OFWM Expatriate Water Management Engineer
3. Water Management Improvements		
a. Diagnostic Analysis[a]	WMS II Team and Local Organization	All Agencies, WUAs, and SMOs
b. Planning	SMO/WM Unit	PIDs, OFWM and Extension Directorates, WUAs, WUA Development Specialists, and CWM T.A. Team Agricultural Development and Irrigation Operations Specialists
c. Implementation	Appropriate Line Depts.	Sub-Project Coordinating Committees, SMOs, CWM T.A. Team, and WUAs
d. Monitoring	SMO/PME and SMO/WM Units	CWM T.A. Team, WUAs, and Field Workers
e. Evaluation	Local Universities or Private Organizations	SMOs, WUAs and CWM T.A. Team

[a] In year one for one sub-project area only.

i. WUA Formation

Table 9 has somewhat artificially separated WUA formation from watercourse improvement. In fact, following OFWM practice, the CWM design calls for WUAs to be formed as a precondition for watercourse improvement. The new element which will be emphasized under the CWM Program is the encouragement of WUA activities beyond physical improvements to include maintenance, water management, and management of non-water inputs.

In each sub-project area, the SMO Manager will establish a plan for WUA formation for all farmers operating in the given command area. He will look to the WUA Development Specialists, the CWM T.A. Team Institutional Development Specialists, local leaders and field workers to apprise him of socio-cultural and tenurial issues that may affect implementation of the plan. Involving local leaders and commission agents in planning for WUA development is likely to ensure their collaboration in implementation. Monitoring of issues that arise during and after watercourse improvement will be the primary responsibility of the WUA Development Specialists who will rely heavily on the PME Units of the SMOs to record and analyze information. Universities and/or private groups will be contracted to undertake specific evaluations of issues that arise during WUA formation. Expatriate Institutional Development Specialists on the CWM T.A. Team will assist at each phase of WUA formation.

ii. Watercourse Physical Improvements

The SMO Manager will have primary responsibility for preparing and securing approval from Provincial Policy Committees and USAID for annual physical improvement plans. Technical inputs will be provided by the PIDs, the OFWM Directorates, and the CWM T.A. Team Irrigation Operations Specialists. Farmers, through their WUAs, will also contribute to the formulation of annual plans. They will be assisted by the local WUA Development Specialists and expatriate Institutional Development Specialists.

Implementation of watercourse improvements will be the job of the OFWM Directorates, using WUA members' labor. The Supervisory Consultants will monitor the quality of physical improvements. Monitoring of post-improvement activities, especially maintenance, will be the primary responsibility of the Provincial Agricultural Departments. Field Assistants and the WUA Development Specialists will work with WUAs to motivate them to undertake maintenance activities. Evaluation of completed improvements will be made by the Supervisory Consultants, who will certify work prior to reimbursement by USAID.

iii. Water Management Improvements

The diagnostic analysis of the irrigation system in one of the sub-project areas, started in the Preliminary Phase, will continue into the first year of the annual planning and implementation cycle. Once field work is completed, the WMS II Team will present the SMO Manager with an operational plan for the management of his sub-project

area, which will be implemented during the subsequent years. At the same time, the Team will present a methodology for replication of the diagnostic analysis and the preparation of operational plans in the other six CWM sites. SMO Managers and SMO/WM Unit staff will be intensively trained by WMS II contract personnel, and will start implementing improvements upon completion of their training, with the assistance of the CWM T.A. Team, the line departments, WUAs, and field assistants.

The diagnostic analysis is designed to give managers an operational plan for the entire sub-project area; the total command perspective will provide the context for physical and management improvements that will be made in localized areas (minor commands) on an annual basis. The operational plans will be approved by the Provincial Policy Committees, USAID, and the Sub-Project Coordinating Committees. The latter will be responsible, during implementation, for ensuring that appropriate line departments do their work in a coordinated and timely fashion. Monitoring of operational improvements will be the responsibility of the SMO/WM Units, assisted by the CWM T.A. Team, farmers and field workers. Evaluations undertaken by local universities or private organizations will provide recommendations for resolving any issues that arise. As WUAs are formed and physical improvements implemented, the SMO/WM Units, with assistance from line departments, farmers and CWM T.A. Team members, will assist in implementing plans for improved water delivery and management. WUA Development Specialists will provide guidance on how improvements can be used as incentives for strengthening farmer participation in WUAs.

iv. Reporting Requirements

All annual plans will be approved by the PPCs, SCCs, and USAID. Thereafter, the SMOs will be responsible for submitting quarterly and annual reports to their respective PPCs, SCCs, and USAID, showing progress towards achievement of plan targets, highlighting problems and making recommendations to overcome constraints. Members of the CWM T.A. Team will help SMOs in the preparation of reports.

v. Formal Evaluation Schedule

Formal external project evaluations will be scheduled towards the end of year 3 and year 5, as outlined in the Evaluation Plan below. SMO staff and CWM T.A. Team members will assist in preparing scopes of work for each evaluation and will serve as resource personnel for the evaluations.

B. Administrative and Monitoring Arrangements

1. A.I.D. Responsibilities

The USAID/Pakistan Office of Agriculture and Rural Development (ARD) will have overall responsibility for managing the project. A senior U.S. direct-hire Agricultural Development Officer will serve as Project Officer for this component of the ISM Project. He will work

full-time on CWM. The CWM Project Officer will work closely with the two other A.I.D. Project Officers assigned responsibility for the other ISM sub-projects and the OFWM Project to implement the Mission's integrated water sector strategy. The CWM Project Officer will also be supported by the entire ARD staff of 8 USDH and 26 FSN personnel.

The Project Officer will be assisted in contracting and procurement actions by USAID/Pakistan's Office of Project Development and Monitoring which will be supplemented by AID/Washington's Offices of Contracts Management and Commodity Management; in financial disbursement matters by the Office of Financial Management; in overseas training by the Office of Human Resources and Training; in evaluation by the Program Office; in logistical and administrative support activities by the Office of Management; and in legal matters by the Office of the Regional Legal Advisor. The Project Officer will also draw on the staff of the USAID Regional Affairs Offices, located in each provincial capital. Collectively, these staff resources are considered adequate to handle USAID/Pakistan's monitoring and administrative responsibilities under the CWM Project component.

Fixed Amount Reimbursement (FAR) procedures will be used for A.I.D. financing of physical improvements under the CWM Program. These improvements will consist primarily of lining and structures for watercourses, and may also include on-farm drainage structures, small reservoirs, WUA-owned tubewells, and other on-farm works. Construction of pipeline or other non-traditional types of irrigation distribution systems may be undertaken in the Las Bela sub-project area in Baluchistan, in which case reimbursement would be made for pipes and appurtenances or for other materials. Prior to the approval of individual civil works activities, USAID will execute a FAR Agreement with the Ministry of Water and Power, detailing the specific FAR procedures to be followed as in the case of the parent ISM Project. The A.I.D. Project Officer will review and certify all FAR work orders as eligible for reimbursement. He will be guided by the reports of the Supervisory Consultants, to be contracted by USAID, who will review and approve civil works designs and cost estimates and verify completion of work prior to reimbursement by A.I.D.

The Project Officer will provide overall guidance to the CWM T.A. contractor and will work with the respective Project Officers in the water sector to coordinate TA inputs from the ISM and OFWM long-term consultant teams. (See Section IV.C.1., below). In addition, local universities or private groups will be contracted to undertake on-going evaluations and applied research on WUA development. Periodic site visits will be made by the A.I.D. Project Officer and other USAID staff to monitor overall project progress.

In summary, A.I.D. will be responsible for:

a. contracting with the long-term CWM T.A. team, the local Supervisory Consultants, local universities and/or private groups chosen to undertake impact evaluations and other studies, and the multi-disciplinary team under the WMS II Project;

b. purchasing vehicles for advisors and other commodities;

c. approving civil works and reimbursement under the FAR system;

d. arranging for long-term and short-term overseas training;

e. providing sufficient staff to participate in scheduled evaluations; and,

f. coordinating with the appropriate government agencies in the implementation of this project.

2. GOP Responsibilities

a. Federal Government

The principal Federal organization with responsibility for CWM activities is the Ministry of Water and Power. Responsible officials of that Ministry will:

i. secure support for the CWM approach in the relevant Federal ministries including Finance and Agriculture;

ii. facilitate exchanges of information among the four Provincial Policy Committees;

iii. assist A.I.D., IBRD and the Provincial Policy Committees to monitor and evaluate the impact of the A.I.D. and IBRD-funded CWM Projects; and,

iv. submit requests for approvals of civil works schemes and reimbursement requests from SMOs to A.I.D.

b. Provincial Government Responsibilities

The Provincial Governments, through their line agencies in the Departments of Irrigation and Agriculture, will be responsible for implementation and operation of the sub-project activities financed by the IBRD and A.I.D. that take place in their jurisdictions. To carry out this responsibility, the following new entities will be established.

i. Provincial Policy Committees

Each province will establish a Provincial Policy Committee (PPC) to be chaired by the Additional Chief Secretary for Planning and Development, and with the Secretaries of Agriculture, Irrigation and Finance as members. The Additional Chief Secretary for Planning and Development will be responsible for monitoring and reporting on the use of Project funds in his Province. The PPCs will:

(1) formulate policies to realize the CWM goal and purpose and resolve differences among line departments;

(2) coordinate line department inputs at the provincial level and oversight at the sub-project level;

(3) review, revise as appropriate and sanction annual work plans prepared by the SMOs;

(4) program provincial department and private sector inputs in line with the sanctioned annual work plans; and,

(5) review, at least quarterly, the status of CWM activities in their jurisdictions, identifying constraints to the meeting of physical and institutional targets, and taking remedial action as necessary.

ii. Sub-Project Management Offices

Implementation of CWM activities at the sub-project level will be undertaken by Sub-Project Management Offices (SMOs) to be established in each sub-project area. The overall responsibilities of the SMOs will be to:

(1) transform PPC policy guidelines and directives into specific objectives and measurable inputs and outputs;

(2) plan and schedule activities to achieve the desired outputs; and,

(3) establish and manage a monitoring and evaluation program to provide continuous information on the status of activities.

Each SMO will have the following specific responsibilities:

(1) preparation of an annual work plan for each sub-project area and obtaining its sanction by the Sub-Project Coordinating Committees (see below) and the PPCs;

(2) preparation of quarterly and annual progress reports;

(3) conceptual review of civil works schemes prepared by OFWM Directorates and submission of these to A.I.D. through the Ministry of Water and Power; and,

(4) development of a training plan.

iii. Sub-Project Coordinating Committees

Provincial governments will establish a Sub-Project Coordinating Committee (SCC) for each sub-project to be chaired by the SMO Manager. Membership will include representatives from the PIDs, the Extension and OFWM Directorates, and the WUAs. Suppliers of non-water inputs and credit also may be invited to participate in planning activities. The SCCs will be responsible for coordinating line department and private sector delivery of inputs and services in accordance with the sanctioned annual operational work plan.

C. Procurement Plan

1. Technical Assistance

Technical assistance requirements for the CWM project component are summarized in Table 10.

TABLE 10

CWM TECHNICAL ASSISTANCE REQUIREMENTS

	Source	Function
1.	Expatriate CWM T.A. Team	Overall support for implementation of CWM
2.	Local WUA Development Specialists	Institution-building in SMOs especially with respect to WUA formation
3.	Local Supervisory Consultants	Physical improvements
4.	Local Universities and Private Organizations	Evaluations and applied research
5.	Expatriate WMS II Team and Local Organization	Diagnostic Analysis in one sub-project area; Preliminary Phase Training (workshops/study tour for senior officials; SMO and field worker training); Data Collection and Design of Monitoring and Evaluation Systems

A.I.D. will contract directly (or through sub-contracts) for the first four categories of technical assistance in accordance with A.I.D. procedures for competitive procurement. A.I.D. will obtain the services of the WMS II Team through a "buy-in" to the centrally-funded WMS II Project. In addition to the above sources of technical assistance and as discussed previously in Section III, the Planning/Management, Equipment Management, Engineering, and Research Teams under the parent ISM project and the long-term expatriate team under the A.I.D.-financed OFWM project are expected to participate in the implementation of the CWM Program.

2. Commodities

Seven right-hand drive diesel station wagons for use by the expatriate technical consultants will be procured from Japan by USAID/Pakistan. Seven short wheel base utility vehicles (jeeps), one to

be located in each sub-project area, will also be procured by USAID/Pakistan for use by the local WUA Development Specialists and expatriate advisors at the project sites. A vehicle source/origin waiver will be processed at the Mission for the seven station wagons since the total estimated cost is within the Mission Director's delegated authority. Vehicles and offices for the SMOs will be funded by the IBRD CWM Project.

Specific water management equipment needs will be identified during implementation and procured by the CWM T.A. Contractor. Micro-computers, software and basic equipment such as soil augers, current meters, and water level recorders needed for effective water management will be procured early in the project. Computers and software will be compatible with equipment used by other A.I.D.-assisted irrigation projects. Training aids and equipment will also be financed by A.I.D. and procured by the CWM T.A. Contractor. Annex H contains an illustrative list of commodities. With the exception of the station wagons, all commodities to be financed by A.I.D. are expected to have their source/origin in the U.S. or Pakistan.

D. Training Plan

As described in Section III.D.2., the majority of training under the CWM project component will take place in Pakistan. During the Preliminary Phase, the staff of the SMOs will receive two weeks of intensive training, followed by additional training to meet specific needs. Field workers will receive training in the development of WUAs and technical training through specially designed six-week courses to be given by a local institution with assistance from the WMS II Team during the Preliminary Phase, as well as through courses at OFWM training institutions in different parts of the country. Farmer training will be an on-going activity, and will, for the most part, take the form of informal "training and visitation" extension work. Occasional formal courses may be offered for WUA executives and others at the OFWM centers.

In addition to the above in-country training activities, SMO staff will be sent on study tours to other countries where successful approaches to CWM have been adopted. Senior staff from the Federal and Provincial Departments of Irrigation and Agriculture and the OFWM and Extension Directorates will also be given the opportunity to participate in study tours. Finally, short-term and degree training in the U.S. will be offered in such areas such as water management, monitoring and evaluation and rural sociology and development.

E. Evaluation Plan

Since the CWM Program involves the field testing of various approaches to improved water management with the objective of identifying successful strategies for replication nationwide, evaluation is an integral part of the Program. In addition to formal external evaluations, therefore, the CWM Program will include on-going internal and external monitoring and evaluation of inputs and outputs.

1. Internal On-going Monitoring and Evaluation

Each SMO will have a Planning, Monitoring and Evaluation (PME) Unit, which will be responsible for baseline and subsequent data gathering. Monitoring will take place in three main areas: (a) institutional development (the establishment and performance of WUAs and WUA federations, and the performance of PPCs and SCCs); (b) management and physical improvements; and, (c) improvements in agricultural production and farm incomes.

SMO staff will receive training during the Preliminary Phase in evaluation and data collection methods by the WMS II contractor who will assist the SMOs to design a monitoring and evaluation system for CWM that will provide guidance in data collection, the setting of targets, evaluating progress and making necessary adjustments to implementation plans. During implementation, members of the CWM T.A. Team will take on this responsibility.

Each year, the PME Units will develop annual evaluation plans, which will be approved by the SMO Manager and the USAID Project Officer. These plans will include a description of the data to be collected, the use to which it will be put, the methodology to be followed to collect and analyze the data, and a detailed implementation schedule including target dates for issuance of reports. All internal evaluations will follow a standard format to permit comparisons among approaches tried in different sites, while isolating the socio-cultural and agro-climatic variations that will affect progress towards the achievement of CWM objectives. It is anticipated that the format and indicators to be used in the internal evaluation effort will be developed with the help of such local groups as the Punjab Economic Research Institute as well as the CWM T.A. Team.

The results of this evaluation effort will be augmented by information submitted by all implementing agencies in the form of quarterly reports to the SMOs, indicating progress towards the achievement of annual plan targets. The SMOs, in turn, will provide reports to the PPCs, SCCs and USAID on implementation progress and reports on changes in water deliveries, cropping intensities, watercourse improvements, WUA development, net farm incomes and improved social well-being.

2. External Studies and Evaluations

To ensure objectivity and to focus on particular issues that are expected to be critical to CWM implementation, various outside groups will be contracted to undertake external studies and evaluations.

Under the parent ISM Project, the University of Idaho has been contracted to design and, if the design is approved, to help implement a long-term water management research program with local institutions and to strengthen the capability of these institutions through technical assistance and training. There are several local institutions that are likely to be contracted to assist in the CWM Program. These include universities and a range of private groups, both firms and non-profit organizations, that have experience in development studies and

evaluations. The need for research on specific CWM topics will be identified during implementation. Examples include the role of tenants in WUAs; the success of various incentives to farmer participation in WUAs; and, a comparison of WUA federations in different sub-project areas.

Information from these studies will be immediately fed back to CWM implementors. One objective of the external evaluations will be to alert SMOs to potential problem areas that are bound to arise in the course of institutional development. External evaluators will be assisted by the Pakistani WUA Development Specialists, who will have primary responsibility for monitoring the progress of WUA development in their sub-project areas. The CWM T.A. Team will also make substantial contributions to the scopes of work for all external studies and evaluations.

3. Formal External Evaluations

Two formal external evaluations are planned during the five year life of the CWM Program. The interim evaluation is tentatively scheduled to occur in July 1988, which corresponds with the end of the third year of implementation. The final evaluation, tentatively scheduled to occur in July 1990, will take the form of an impact evaluation. Each evaluation will require up to 8 weeks of work time in Pakistan, and will involve, as evaluation team members, both expatriate and local external consultants as well as AID/Washington direct-hire technicians. In addition, representatives of the Federal Ministries of Water and Power and Agriculture, the PIDs, SMOs, provincial OFWM and Extension Directorates, USAID, IBRD, the Supervisory Consultants, all the long-term consultant teams under the ISM and OFWM Projects, farmers, local leaders, and input suppliers will serve as resource personnel for the evaluations. Since the evaluation teams will have access to all the reports issued by the SMO/PME Units as well as the external studies and evaluations conducted by private entities and universities, it is expected that the evaluation teams will rely primarily on secondary source data, complemented by interviews and field visits to all or a representative sample of the 7 sub-project areas.

By the end of the third year of implementation, it is expected that all 7 SMOs will have prepared a water management operational plan based on the WMS II diagnostic analysis model in one sub-project area, and will have gone through at least one annual planning, implementation, monitoring, and evaluation cycle to implement the long-term plan. This time frame also coincides with the currently envisioned end of tour of the majority of CWM T.A. Team members. The primary objectives of this interim evaluation will be to assess progress in meeting the institutional development targets of the CWM Program as they relate to, in particular, the functioning of SMOs, PPCs, and SCCs and most importantly WUAs and WUA federations. Progress in meeting physical improvement targets will also be examined. Finally, the team will identify those water management strategies which appear most promising based on experience to date and will recommend a program of activities to be pursued during the remaining two years of implementation. The evaluation report will cover all five

components of the CWM Project component and will contain policy, technical, and operational recommendations which take into account progress to date under both the A.I.D. and IBRD CWM Projects.

The final impact evaluation will, inter alia, examine the effect of the CWM Program on agricultural production in the sub-project areas, the extent of adoption of improved water management techniques and crop cultivation practices by farmers, the impact of the Program on water deliveries, the effectiveness of WUAs, and the ability of provincial line departments to work together and with private input suppliers to improve agricultural productivity within a given command area. A major objective of this evaluation will be to identify those strategies and approaches which can be replicated nationwide, including a financial and economic analysis of the alternative approaches to improved water management.

V. PROJECT AMENDMENT ANALYSES

A. Technical Analysis

The CWM Program will involve the application of technology in three broad areas: WUA development, physical improvements and water management improvements.

1. WUA Development

A major objective of the CWM Program is to promote farmer participation in water management. The methodology chosen to achieve this objective involves the development and strengthening of Water Users Associations (WUAs). WUAs already exist in Pakistan. Several thousand were formed and legally registered in the course of implementing the On-Farm Water Management Program in different parts of the country. All four provinces have legislation that permits the formation of WUAs. CWM is therefore based on an institutional concept that is already accepted, but seeks to increase responsibilities and benefits to encourage wider participation by WUAs in irrigated agricultural activities.

An alternative approach would have entailed the development and encouragement of more traditional farmer cooperatives. Cooperatives, however, do not enjoy a good reputation with farmers. Nevertheless, experience in Pakistan suggests that the communal use of water, with its long historical necessity for collaboration, provides a better understood and more immediately practical reason for forming a farmer group. Therefore, one of the institutional development approaches that may be field-tested will be the registering of WUAs as cooperatives. (See Annex G.)

The concept of using WUAs to go beyond watercourse improvement and maintenance is new to Pakistan. What will work in the agro-ecologically and socio-culturally diverse sub-project areas is unknown. Therefore, a number of variations will have to be field-tested, all of which will involve sustained institutional development assistance to farmers, but which will reflect the different traditions of each area. An on-going evaluation program (see Section IV.E.) will enable project implementors to monitor inputs, outputs and impact, and, together with formal evaluations, will generate appropriate modifications and recommendations for future replication. Experience in other countries (see Section II.B.) suggests that intensive development assistance, coupled with concrete incentives is a feasible approach to developing viable farmer institutions in water sector activities.

Implementation of the CWM Program will also require skill upgrading for Agricultural Officers (AOs) and Field Assistants (FAs) who will have to live and work closely with farmers over sustained periods of time. Existing and newly hired FAs will need intensive training to learn to accept the CWM "bottom up" approach that is radically different from the way in which line department staff have traditionally interacted with farmers. The Social Soundness Analysis discusses the feasibility of this new approach.

2. Physical Improvements

A.I.D.'s input to the civil works activities under the CWM Program focuses almost exclusively on physical improvements downstream of the moghas or outlets. The physical improvements include: watercourse renovation and realignment, field drainage systems, land leveling, a limited number of other irrigation interventions such as sprinkler or drip systems and reservoir construction, and demonstration plots. The technology for all these improvements is known, proven and familiar to the line departments and farmers of Pakistan. The OFWM Directorates have been carrying out these improvements for many years, often with farmer participation. And A.I.D. has had experience with most of the planned interventions under the OFWM, Tribal Areas Development and NWF Area Development Projects.

The choice of which physical improvements will be undertaken in which areas will be made according to both the sub-project level and watercourse level plans and the need to use improvements as an incentive to farmer participation. The diagnostic analysis approach will also lead to an identification and prioritization of needed physical works. Under CWM, farmers, through their WUAs, will have a major voice in deciding which physical improvements will be made. In return, they will be expected to contribute labor and money for construction and rehabilitation and to participate fully in the management and maintenance of the improvements. This approach has been adopted to provide incentives for the institutional development of WUAs and to introduce the concept of "bottom up" planning and implementation.

3. Water Management Improvements

In addition to physical improvements, CWM will involve water management improvements such as alterations in cropping patterns, more effective use of tubewells to supplement surface irrigation, and improved criteria and procedures for the delivery of surface irrigation water. The nature and timing of recommended improvements will depend on a wide range of social, economic, agro-climatic, cultural and political considerations. These considerations will be taken into account by using a methodology known as "diagnostic analysis", which has been developed and field tested under the AID/Washington centrally-funded Water Management Synthesis (WMS) II Project.

This methodology was selected for CWM because the multidisciplinary analysis is ideally suited to the needs of the large and varied sub-project areas that have been selected by the provincial governments. The WMS II contractor has worked in other Asian countries, as well as in Pakistan, and is familiar with the types of problems likely to be encountered in the implementation of CWM. Based on the intensive study in one sub-project area, the team will prepare a working methodology for use by Sub-Project Managers in other locations. Training sessions will be held to familiarize SMO and other staff with the diagnostic methods. This proven technology provides an appropriate and timely approach to the achievement of CWM objectives.

4. Conclusion

CWM is considered by experts in the field to be the most feasible and appropriate alternative for harnessing Pakistan's vast water resources to increase agricultural production and yields. The physical improvement component of the CWM Program will use technologies which are known, proven, and familiar to its implementors. With respect to WUA development, several variations, that build on arrangements that are known, proven and familiar, will be field-tested and carefully evaluated to determine their feasibility and replicability. The same applies to the water management improvement element of the Program which will be based on a methodology that has been successfully applied in other countries. In summary, lessons learned from all elements of the CWM Program will ensure the technical feasibility of future CWM efforts in Pakistan.

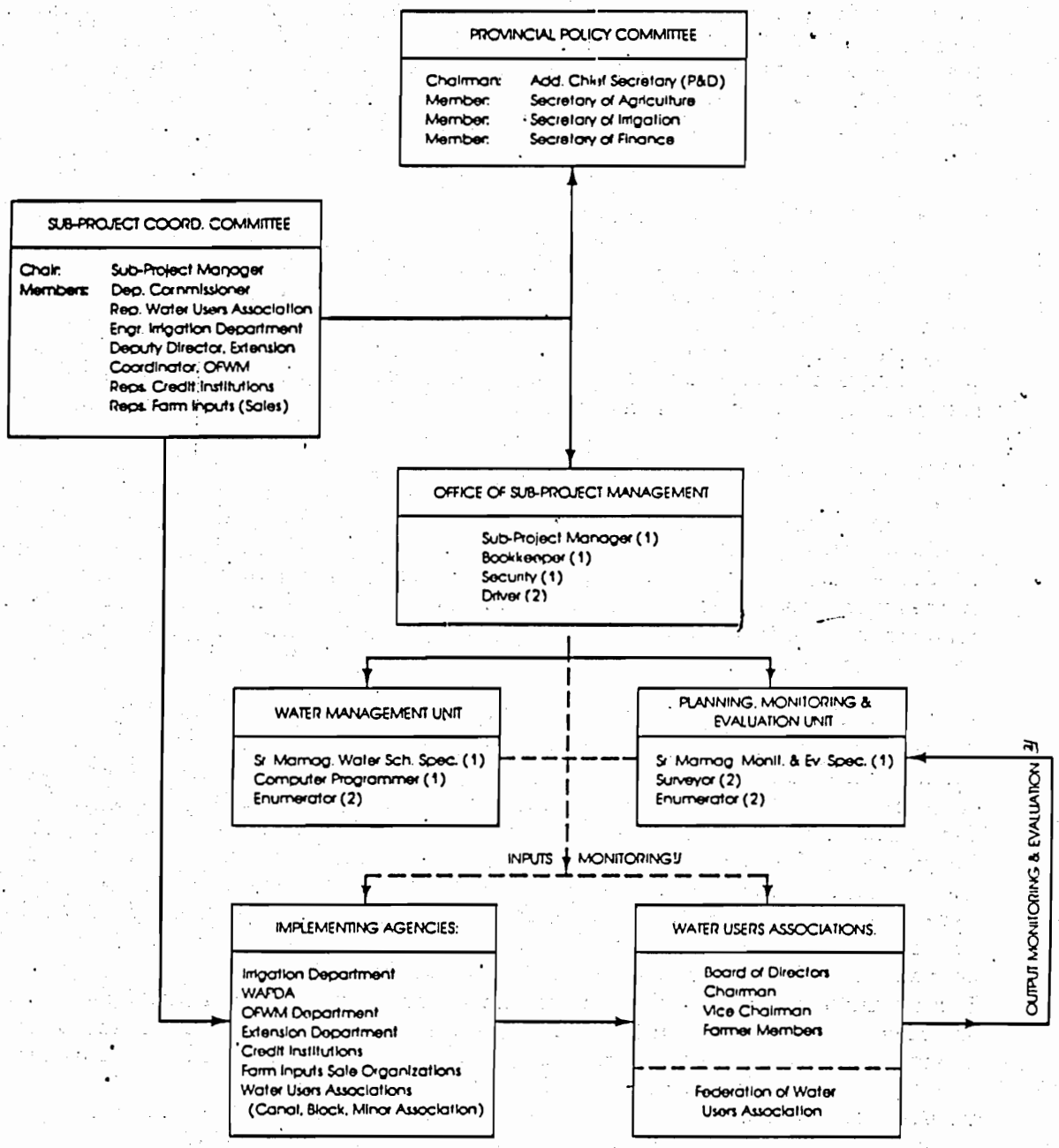
B. Administrative Analysis

Figure 3 shows the overall administrative structure agreed to by the GOP, IBRD/IDA, and A.I.D. to implement the CWM Program at the provincial level. The structure reflects the lessons learned from the implementation of other projects in Pakistan and other countries and also was designed to achieve three major objectives: (1) to provide a forum for senior provincial authorities in all the relevant departments to exercise policy and programming oversight and to resolve any interdepartmental issues that may arise; (2) to provide a forum for all relevant provincial line department staff, farmers, input suppliers, and Sub-Project Management Office staff to plan, implement and evaluate CWM field activities in a coordinated and collaborative manner; and, (3) to create a single office in the sub-project area dedicated exclusively to increasing the agricultural productivity of the area and to provide the head of this Office with sufficient authority and control at the field operational level to achieve the objectives of the Program.

A Provincial Policy Committee (PPC), comprised of the Additional Chief Secretary for Planning and Development and the Secretaries of Irrigation, Agriculture, and Finance, will provide overall policy and programming direction and oversight. Committees of this type have been successfully established to play similar roles under other donor-assisted projects. In order to focus responsibility and authority for CWM implementation at the field level, Sub-Project Management Offices (SMOs) will be established. The Manager of each office will have primary responsibility for increasing agricultural production in his area. His performance will be measured against improvements in productivity and farmer incomes, not improvements in civil works or increased water savings. He will be supported by a multidisciplinary staff and a team of expatriate and Pakistani consultants. He will also chair a Sub-Project Coordinating Committee which will include representatives from all interested parties: the line departments of Irrigation, OFWM and Extension, public and private input suppliers, and WUAs.

FIGURE 3

PAKISTAN
COMMAND WATER MANAGEMENT PROJECT
Organizational Chart



Project Management Information System
1/Will monitor project activities (in physical & financial terms) such as staff recruitment; procurement, implementation of civil works; input distribution & usage e.g., irrigation water, fertilizer, seeds, pesticides, & provision of agricultural services e.g., extension & credit
2/Will monitor & evaluate, among others, increased input distribution, services, crop yields, intensities, net farm income, employment etc.

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In order to ensure that provincial departments serve his area, the Sub-Project Manager can turn to his Provincial Policy Committee. If, for example, one department in his area is not performing adequately, the Sub-Project Manager can appeal to the PPC. The Secretary of that department can then direct the appropriate officials in his department to rectify the situation. If additional staff from a department are needed, the Secretary of that department will consider this requirement as part of the PPC agenda.

In order to ensure that inputs are delivered to his area in a coordinated, timely fashion, and in sufficient quantities, the Sub-project Manager can turn to the Sub-Project Coordinating Committee. Representatives of all private and public groups will meet at the SCCs to discuss the targets of the area, the need for specific inputs and their scheduling. The SCC will provide a venue for all parties to learn, perhaps for the first time, of the constraints individual groups may experience in supplying inputs, and to work together to overcome those constraints. PID and OFWM officials, for example, will have a forum to collaborate on planned improvements to serve a given section of a sub-project area, and avoid the problems that have been caused by un-coordinated up- and down-stream activities in the past. If the Sub-Project Manager finds that individual members of the SCC are uncooperative, he can again turn to the PPC to obtain the needed authority to improve the situation.

Experience suggests, however, that the support a Sub-Project Manager can expect to receive from the PPCs and SCCs will not, alone, be sufficient to ensure collaboration and decision-making at the field level. In addition, he will need the authority given him by the CWM design. This calls for the Sub-Project Manager to oversee the preparation of all physical and operational improvement plans and to approve all implementation activities. In this way, the Manager will have a major voice in the contributions of line departments in his area.

The implementation of civil works will be undertaken by the OFWM Directorates, working in collaboration with the PIDs. The work of encouraging farmers to associate in WUAs and WUA Federations and Councils will be undertaken by field workers from the OFWM and Extension Directorates. The SMO will have final approval, along with the USAID Project Officer, for all civil works, thus ensuring that physical improvements are integrated with other elements of the CWM Program, including the formation of WUAS and the design and implementation of water management improvements.

The contributions of the line departments involve familiar, on-going activities. The OFWM Directorates have considerable experience in undertaking the physical improvements called for under CWM. The OFWM and Extension Directorates also have worked with farmers to form WUAs in each province.

In summary, the proposed administrative structure is appropriate and feasible and provides for responsibilities and authorities to be placed in the right quarters with a complementary system of checks and

balances. The Provincial Governments have agreed to staff the SMOs with experienced and qualified personnel, and to provide adequate numbers of field staff in the sub-project areas. With adequate staff in place, the training and technical assistance inputs described in Section III should be sufficient to enable these individuals to perform their assigned roles and responsibilities under the CWM Program. As discussed in the next section, however, the key feasibility issues for CWM are socio-cultural, which, in the final analysis, will determine how successful the CWM Program will be.

C. Social Soundness Analysis

The key social issues of relevance to CWM include the spread of benefits, the acceptance of CWM concepts by participants, and the special situations that pertain to women and tenants.

1. Benefits

Benefits from the CWM Program have been estimated as follows:

Benefiting farm population:	719,000
Benefiting command area:	510,000 acres
Projected cropping intensities (after the Program):	110% - 185%
Additional agricultural employment:	18,000 man days/year
Construction employment (during the Program):	28,000 man days
Increase in per capita incomes:	Rs 1,600 - Rs 23,600

The most important output of the CWM Program will be the improved management of scarce water resources. It is reasonable to expect that higher farm productivity and farm incomes will result. An estimated savings of 290,000 ac/ft of irrigation water per year will be available to farms in the sub-project areas from planned canal remodeling/ rehabilitation to be financed by IBRD and from the A.I.D.-assisted on-farm improvements. Water management improvements will reduce the problem of unreliable and unpredictable water deliveries. Farm crop and property losses caused by high water tables and storm flooding are likely to be substantially reduced as well. Finally, further increases in farm productivity will be achieved by the coordinated delivery of non-water agricultural inputs and services from both private and public sector suppliers.

Net farm income increases were estimated to assess the financial benefits of the Program. These farm models were designed to be representative of each sub-project area in terms of present average size of farm and farm family, and typical cropping patterns, cultivation practices, input levels and yields. Projected increases in the net incomes of

owner-operator farm families with the Program (compared to without the Program) range between Rs 2,300 and Rs 3,200 in Punjab, and are estimated at Rs 1,600 in NWFP, Rs 3,500 in Sind and Rs 23,600 in Baluchistan. The range for incremental net farm income is from 19 percent in the Pakpattan sub-project to well over 100 percent in the Las Bela sub-project.[7/] The impact of the Program on the income of tenant farmers will vary with respect to their tenancy arrangements. It is likely, however, to range between one-third and two-thirds of the incremental benefits projected to accrue to owner-operator farmers. In general, incremental benefits received by farmers located in tail areas of minors and watercourses are expected to be somewhat greater than those of farmers located in head areas, resulting from increased equity in water distribution.

Increases in agricultural production will occur as a consequence of higher cropping intensities as well as from increases in cropped area and yields. Present cropping intensities in the sub-project areas range from a low of 15 percent in Las Bela, where irrigation from the Bela Canal was initiated only in early 1983, to a high of 170 percent in Shahkot.

Projected cropping intensities after the Program, based upon the assumption that 70 percent of the water saved will be used to expand irrigated acreage, are estimated to range from 110 percent in Las Bela and Warsak to 185 percent in Niazbeg. These represent incremental increases that range from over 7 percent (Niazbeg) to 26.5 percent (Warsak), except in the case of Las Bela where the projected incremental increase is likely to reach 175 percent.[8/] Increased cropping intensities, in particular, are expected to result in substantially greater direct annual farm employment (estimated at about 18,000 man/days), an important positive impact in sub-project areas where the estimated available agriculture labor surplus ranges between 50 percent to 75 percent of current agricultural requirements. Shorter term employment opportunities will result from proposed watercourse improvement, canal lining and drain construction activities that will require a rural labor contribution of an estimated 28,000 man days during the five-year life of the Program. With construction activities scheduled during periods when demand for agriculture labor is slack, up to 80 percent of the construction labor requirement could come from rural agricultural families.

Differences in agro-climatic conditions, soil productivity and socio-cultural variables will be important determinants of the impact and the distribution or spread of the benefits of the CWM Program. For example, farmers of all tenurial categories and land-holding sizes may operate along a single watercourse. The value of production increases may bear little relationship to the size of farm, but rather to a complex set of interrelated factors including water, soil quality and access to

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7/ Staff Appraisal Report, Pakistan: Command Water Management Project. The World Bank, April, 1984, pp. 31-5 and Annex 6, Tables 4-10.

8/ Ibid., p.31 and Annex 6, Table 2.

and availability of non-water agricultural inputs. Similarly, farmer participation is likely to be substantially affected by the ownership and control of land as well as by the location of the farm within the watercourse command. The complexity of variables has necessitated the extensive on-going monitoring and evaluation process for all Program components to ensure that problems and issues during implementation can be identified, corrective measures taken, and the achievement and more equitable distribution of expected positive benefits demonstrated.

2. Acceptance by Participants

The major participants in the CWM Program are:

a. irrigation farmers in the sub-project areas;

b. agricultural field workers;

c. other provincial line department staff; and,

d. public and private suppliers of agricultural inputs.

Annex B presents detailed descriptions of these groups, highlighting in particular the variations among farmers in the four provinces.

a. Irrigation Farmers

Irrigation farmers are aware of the benefits of watercourse improvements. In areas where the OFWM programs have been initiated, farmers are voluntarily forming WUAs, which are a pre-requisite for receiving assistance with watercourse lining. In some areas, in fact, demand exceeds the capacity of the OFWM Directorates to respond.

Experience suggests that farmers are less enthusiastic when it comes to providing labor for regular maintenance. (See Section II.B., Lessons Learned). The Annual Operational Improvement Plans for each sub-project area, therefore, will take into account the need to provide incentives for farmers to undertake routine maintenance. Such incentives may include assistance to WUAs to acquire tubewells, undertake land leveling, alter cropping patterns, and/or obtain improved inputs. In specific areas, varying forms of peer group pressure may be culturally appropriate and acceptable. For example, in Baluchistan, the head of the Karez Owners Association has the authority to fine and/or stop the flow of water to the fields of a member who refuses to participate in Karez cleaning and maintenance work.

The way in which WUAs are formed and developed will affect the degree to which farmers participate in CWM. If traditional leaders are consulted and encouraged to assume official positions in WUAs, they can be relied upon to lend their authority to ensuring the strength of the association. Since greater benefits will accrue to the larger landowners (assumed to be local leaders), their interest should be assured. The social situation varies, however, among sub-project areas. (See Annex B.) In Las Bela, for example, the large landowners are generally retired

army or government personnel. Most of these individuals are from Karachi, do not speak the local language, are not popular with the majority of local farmers and therefore could not provide leadership. On the other hand, in Las Bela more than any other sub-project area, established, effective, traditional leadership exists. Each of the three local groups of Baluch, Brohi and Vohora have their tribal hierarchy and leadership which is respected and followed. For the last two years, the PID has not taken over the Las Bela canal and the distribution systems from WAPDA. As a result, there is no governmental organization responsible for the distribution of water and its allocation to farmers. Instead, the people themselves manage the distribution, which attests to the effectiveness of the local leadership in the area. In the NWFP, the Khans already play the role of arbiters in issues of water distribution and use. Their involvement in the development of WUAs could help ensure the active participation of others.

The CWM design calls for improvements to be made section by section within the sub-project area. If the first minor command development is successful, word will spread, and other farmers will be anxious to obtain similar benefits. The selection of which site to tackle first will therefore be crucial. The training for SMO personnel will discuss the criteria for initial site selection and will pay particular attention to ways to ensure maximal participation by local leaders. Achievements obtained will be widely disseminated within the sub-project areas, and farmers will be encouraged to visit successful WUA locations.

As the Program is implemented, WUA Federations will form a focus for the delivery of non-water inputs. This will be a tangible benefit of interest to all farmers, particularly those, as in most Punjab sites, who currently must travel 15-30 miles to obtain inputs, which are generally not available in sufficient quantities nor at the appropriate time. The possibility of having fertilizer, seeds and pesticides delivered to them in a timely fashion may, alone, be sufficient incentive for farmers to participate in WUAs.

Further, as WUAs are formed, farmers will become involved in meetings of the SCCs. In this forum, farmers will have direct access to representatives of the line departments whose work affects their livelihood. This new voice for farmers should be a powerful motivator for sustained farmer participation.

b. Agricultural Field Workers

The day-to-day encouragement of strong, sustained WUAs will be the responsibility of the agricultural field workers from the OFWM and Extension Directorates. The empowering of farmers and the establishment of "bottom up" development represents a significant change for these workers who are used to the top-down attitudes and approach of government organizations.

The extension field workers are typically high school graduates, with inadequate agricultural training and insufficient equipment, facilities and incentives to provide farmers with appropriate advice and inputs. Field workers from the OFWM Directorates work in multidisciplinary teams, which vary in composition in the different sub-project areas. OFWM field teams will play an important role in WUA development and physical improvements in those sub-project areas where they are already strong. In other areas, e.g., Las Bela, there are no OFWM teams, and therefore field work will likely progress more slowly.

All field workers will receive special training to carry out CWM activities. In addition, their work will receive special attention from many sources including the SMOs, the T.A. Teams and the local university and private researchers. This special attention and the opportunities for training are expected to increase morale and performance and make field workers more receptive and better able to disseminate CWM concepts.

c. Officials of Provincial Line Departments

The success of the CWM approach is contingent on achieving collaboration among line departments involved in irrigated agriculture. Since 1952, the GOP has initiated several programs designed to involve the rural population in increasing agricultural production. All these programs called for coordination of line departments, and, in all cases, the level and nature of coordination achieved was insufficient to realize program objectives. An evaluation of the most recent effort, the Integrated Rural Development Project, was conducted by the Agricultural University, Faisalabad in 1976. The report stated that: "in order to implement the program effectively and efficiently, the representatives of all nation building (i.e., line) departments working in the project areas should come under direct control of a Project Manager". A 1980 review of the same program asserted that, "Policy measures simply reflected declaration of intent and lacked strong will and administrative power of government to rigorously enforce the policy objectives. The authority could not be asserted over powerful pressure groups and vested interests militating against the realization of development goals with social justice".

The lessons learned from these programs resulted in a "project approach" to the Salinity Control and Reclamation Project (SCARP). Although the project was headed by a project manager, achievements were only partially successful. The project manager did not have total control of project activities, and the various line departments officials would report to their departments instead of the project manager, causing serious delays in implementation.

Discussions with the Provincial Governments during the design of the CWM Program focused on the need to strengthen the authority and control exercised by the Sub-Project Manager, a concept which was endorsed by all. PPCs include the Secretaries of the major line departments. Their influence on the performance of their staffs will be crucial. The SCCs will provide a forum where issues of coordination can be resolved.

Nonetheless, the CWM approach, with the Sub-Project Manager having authority for project implementation, will require behavioral and attitudinal changes among line department officials that will take time to achieve. The role of other groups involved with CWM will be critical in maintaining pressure for change. These groups include the farmers, through their WUAs, members of the T.A. Team, the SMO staff, the IBRD, and USAID. The Mission believes that the administrative provisions for coordination, coupled with continual vigilance and pressure from project implementors will be sufficient to help bring about the required behavioral changes.

4. Public and Private Suppliers of Agricultural Inputs

The supply of agricultural inputs (i.e., seed, chemical fertilizer, insecticides and credit) to the farmers comes from four major sources - the district agricultural extension officers, banks, commodity dealers and commission agents. The district extension officers usually provide seed and fertilizer on a cash basis. The dealers and commission agents provide seed, fertilizer and insecticides on a cash or credit basis. The Agricultural Development Bank and commercial banks provide annual crop production loans and medium and long-term loans for tractors and implements.

Throughout the sub-project areas, the major suppliers of agricultural inputs are commodity dealers. Commission agents also supply small owner/operators and tenant farmers with necessary inputs. In return, farmers must sell all their produce to the agent at the end of the harvest. The agent deducts the loan amount which is interest free plus a commission fee when the produce is sold. However, most farmers do not like to use credit. Historically and psychologically, borrowing money is frowned upon, even when the advantages are clearly seen.

The poorer tenant farmers usually have no option and must borrow production expenses from their landlords. The loans are interest free and cover the half share of fertilizer and all the harvesting expenses. Tenants repay at harvest time in the form of produce. Landlords typically also purchase the tenants' shares to market crops in large lots.

The commercial banks in the sub-project areas provide production interest-free loans to small farmers with 12.5 acres or less. The maximum loan amount is Rs 6,000. Farmers must have title to their land and agree to repay the loan after harvest. Given the risk of not being able to repay, farmers continue to prefer to obtain credit from commission agents or landlords, who will usually carry loans, interest-free to the next harvest.

Commission agents and landlords will play an important part in motivating farmers to adopt new practices. It will be important for SMOs and T.A. consultants to convince these groups, who enjoy a close, if unequal, relationship with farmers, that the creation of strong WUAs and WUA federations will not be a threat to them. The training course for SMOs

will deal with this issue and suggest mechanisms for involving these informal sources of credit into CWM activities. One approach may be to suggest that newly developed WUAs make joint arrangements for credit with a single commission agent or large landlord. An alternative may be for WUAs to form and become registered as cooperatives and apply for cooperative bank loans.

3. Special Conditions with Respect to Women and Tenants

a. The Role of Women

Women have long played a vital role in the agriculture of Pakistan. In the socio-cultural context of the country, the public role of women is typically minimized, although most women in villages in the rural areas work in the fields. Insofar as the focus of CWM is to demonstrate the potential for increased agricultural production through farmer organization and participation, watercourse rehabilitation and improved on-farm water management practices and the coordinated management of non-water agricultural inputs, all men and women who are involved in agriculture in the sub-project areas are likely to be affected by CWM activities. Therefore, it is both important and appropriate that women are recognized as a specific group, and that efforts are made to ensure their involvement in community-related activities which seek to enhance the management and use of water and non-water resources.

Recent surveys in Pakistan have indicated that about 82 percent of all rural women are engaged in agriculture or agriculture-related (food storage and processing, seed selection) activities. These women spend as much as 45 percent of their time in agriculture, engaged in planting, cultivating and harvesting food and cash crops as well as in the care of farm animals. It is estimated that women's labor is directly responsible for about 25 percent of the total production of major crops in the country. Only in families owning more than 25 acres are women not actively involved in planting and harvesting crops. The economic benefits for women's labor for small holders and tenants are significant; surveys have demonstrated that household incomes rise relative to the degree of direct involvement of women in agricultural activities.

Women are actively involved in water use for domestic purposes--cooking, drinking water, washing laundry, cooking and eating utensils, bathing children and animals. The absence of individual household water systems in rural areas means that the public watercourse is frequently the source of water for many of these domestic purposes. Evaluations of the OFWM Project have shown that an unanticipated, but important and positive consequence of watercourse lining for village women has been that the concrete lined sections of the watercourse provide a cleaner, more convenient area for domestic, water-related activities. Moreover, in numerous instances, they are now focal points of social interaction for village women, in many cases affording the principal locus for social activity outside the home. Similar positive consequences for rural women should result from the CWM watercourse improvement component.

Because the largest and most direct impact of CWM is likely to be higher farm incomes resulting from increased farm productivity, this Program will have a number of benefits for sub-project area families of special interest to women. These include opportunities for increasing family welfare (e.g., education for children, dietary improvements, improved housing) and increasing investments in the family farm.

Current knowledge of the roles and conditions of women in the sub-project areas is inadequate for planning for the involvement of women in CWM. Baseline surveys to be conducted under the Program will therefore include data disaggregated by gender on topics related to women's dual roles as users of water for domestic and agricultural purposes and their direct role in agricultural production. This information will be used to take into account the role of women in CWM activities that involve the rural community as participants and/or beneficiaries. The SMO training course will include a special component on encouraging the participation of women. However, given existing socio-cultural patterns regarding especially decision-making, women will not participate in the CWM Program at levels proportionate to their levels in the work force. If anything, CWM will have a negligibly positive effect on women.

b. The Role of Tenants

The pattern of land holdings and farm operation varies among the sub-project areas. The Sind and Punjab areas have average size farms in the 10 - 17 acres range while the NWFP sub-project area has much smaller farms, averaging about 5 acres. The Sind area has as much of its land area in small farms as the Punjab areas, but only 21 percent are owner-operated compared with a 42 - 54 percent range for the Punjab and NWFP. Similar data are not available for Las Bela in Baluchistan. For medium size farms, owners in the Sind operate 19 percent of the farms while owners in the Punjab and NWFP operate 29 - 39 percent of the farms. Overall, tenants operate 66.5 percent of the farm in the Sind sub-project area and 27 - 40 percent in the Punjab and NWFP areas.

While tenant farmers are found in all the sub-project areas, they are particularly prevalent in Naulakhi and Sehra in Sind, where about two-thirds of the farms are tenant-operated. Owning farm land in the Sind is a matter of social prestige for the Sindhi landowner (Vadera). Even small landowners with marginally economic holdings prefer to have their farms operated by sharecropper tenants or haris. Sharecropping or tenant farming is part of a long-existing class structure in Sind, and the hari is a fixture of the social fabric of the rural community there. The socio-economic relationships between landlords and tenants is described in Annex B.

An issue to be addressed in CWM concerns how tenant farmers will participate in Program activities, including how they will share in the expected benefits. To fully realize Program productivity and income objectives, all farmers should be involved in the implementation of the CWM Program, not merely owner/operators. Tenants, however, are unused to decision-making on a large scale, and may be reluctant or feel unable to become active WUA members. Landlords of tenants will also be reluctant

to share authority with their tenants. The provincial laws, in one case, compound the problem. The WUA Ordinances that have been formally adopted in Baluchistan, NWFP, and Punjab permit the membership and participation of tenant farmers in WUAs. However, in Sind Province, the Ordinance does not allow for the inclusion of tenant farmers in WUAs, and nowhere in Sind have any tenant farmers been found to be members of WUAs organized through OFWM Program activities. Even in Punjab, tenant farmer participation in WUAs is reported to be limited to those with permanent occupancy rights to land.

The presence of tenants will affect the CWM Program most critically through the WUAs, especially in connection with the physical improvement activities. The farmers have to contribute their labor or pay for a replacement. The presence of tenants probably will not affect the formation of WUAs or the completion of the physical improvements because this potential problem was overcome in the OFWM project. WUAs were formed, and the work was done. In general, only tenants with permanent occupancy rights were WUA members. A more uncertain issue is whether the WUAs will continue to exist and function after the physical improvements are completed. The CWM Program envisages a continuing role, including maintenance of the watercourses, distribution of various inputs, and pressure on line agencies and policy committees to insure that services are available. The presence of tenants in the WUAs may not be important if the landowners are active because they will act in their own self-interests, and the tenant-farmed land will benefit. However, insofar as information is transmitted through the WUAs, effectiveness probably will decline slightly if tenants do not participate and only receive information second-hand.

The question of landownership is not an issue. The Pakistan Government does not have a policy to go beyond the land reforms already in existence. Ownership of assets, including land tenure, does directly influence factor payments in Pakistan as elsewhere. The distribution of income between the landowner and tenant is determined by several factors including social custom, risk, technological innovation, working capital, equipment, opportunity costs, and the like. CWM will affect some of these factors by increasing the supply of water and improving the delivery of other inputs including knowledge. The expected effect will be substantial. The owner-tenant shares could change under these circumstances. In the extreme case, the owner could capture all the benefits and perhaps remove the tenant in order to cultivate the land himself, using the farmer tenants as laborers. However, little evidence exists that such an extreme case will occur. The SMO's PME Units will attempt to measure participation in WUAs, changes in tenure, and income distribution patterns.

D. Economic Analysis

The economic analysis contained in the April 1984 IBRD Staff Appraisal Report (SAR) for the Command Water Management Project is the basis for the economic analysis which follows.

1. IBRD Economic Analysis

The Bank analyzed the economics of the CWM Program in the context of both IBRD/IDA and A.I.D.-funded civil works and on-farm improvements. The overall Economic Rate of Return (ERR) of 24 percent justifies the proposed investment. A sensitivity analysis, based on reasonable assumptions, indicated that the project would remain economically viable with acceptable ERRs even if the problems/risks used in the assumptions were to materialize.

a. Methodology

The Bank used a "with and without" analysis to assess CWM's net benefits in the seven sub-project areas. Benefit cost streams were computed for each sub-project area and aggregated to arrive at the total program's economic cash flows over a 20-year period. The benefits were based on illustrative farm budgets for each sub-project area. Tables 11-15 were derived from the SAR.

b. Benefits

Benefits will be derived principally from increases in cropping intensities and yields on about 510,000 acres. Increased cropping intensities will be reflected by a 10-30 percent increase in cereals other than rice, 12-22 percent expansion in cotton plantings in the southern Punjab and Sind sub-project areas, and in fodder and vegetable production increases in Las Bela and Niazberg sub-project areas. Increased crop acreages due to water savings and more regular water supplies are estimated in Table 11 for the seven sub-project areas. The increased water supply in the Warsak Lift area of the NWFP will permit the cultivation of some land now lying idle.

About 70 percent of the increased production would result from increased acreage (i.e. intensity) and 30 percent from higher yields generated by increased use of inputs and improved farming practices. Given improved water and other input supplies, the following increases in major crop yields are expected: wheat (35-50 percent); cotton (30-40 percent); maize (30-35 percent); fodder (30-50 percent); and sugar cane (25-30 percent). While ambitious, these yield increases would not raise average production above levels already achieved by surveyed "leading farmers" in the sub-project areas and are thus considered feasible. Table 12, adapted from Table 1, Annex 6 of the SAR, estimates the yield increases for the seven sub-project areas. Table 13 summarizes the overall production increases resulting from these combinations of acreage and yield improvements.

TABLE 11

ESTIMATED INCREMENTAL INCREASES IN CROPPING INTENSITY

Sub-Project Area	CCA a/ (Acres)	Annual Cropping Intensity b/ P	w	W	Increase with Project (%)
Shahkot	48,800	143	142	158	10
Niazbeg	41,410	170	172	185	8
Pakpattan	96,900	135	139	154	11
6-R	103,800	127	120	151	19
Sehra-Naulakhi	163,700	113	114	130	15
Las Bela	18,800	15	40	115	667
Warsak Lift	43,400	87	87	110	26

a/ Cultivated Command Area.
b/ P=Present, w=future without project, W=future with project.

TABLE 12

ESTIMATED PERCENTAGE INCREASES IN YIELD

Sub-Project Area	Rice	Cotton	Maize	Wheat	Fodder	Sugar-cane	Vege-tables	Orch-ards
Shahkot	35		30	35		25		
Niazbeg	40			40	35			
Pakpattan		40	35	40		25		
6-R		40	35	40				
Sehra/Naulakhi		30		40				
Las Bela					50		35	35
Warsak Lift			30	50		35		

Note: percentages calculated on kg./acre basis.

TABLE 13

ESTIMATED CROP PRODUCTION INCREASES FROM ACREAGE AND YIELD IMPROVEMENTS
(000 MT)

Crop	Without Project	With Project	Incremental Change
Rice	14.9	22.8	7.9
Cotton	52.9	84.2	31.3
Wheat	261.6	405.8	144.2
Maize	21.0	34.1	13.1
Fodder	242.8	340.7	97.9
Vegetable	5.2	25.9	20.7
Sugar Cane	312.8	410.0	97.2
Orchards	31.6	46.6	15.0

IBRD estimates of increased per capita farm incomes are based on sub-project area-specific and owner-operated models. Provisions are included for repayment over five years of about 25 percent of the materials cost for watercourse rehabilitation, and about Rs 22 per acre per annum thereafter for operations and maintenance (O&M) expenses. The Bank also estimates that increases in tenant incomes would average from 50-60 percent of that realized by owner-operators. Benefits would be skewed in favor of farmers in water deficient areas in the middle and on the tail of the watercourses and in water-logged areas. IBRD income projections for the owner-operated model are presented in Table 14.

Beyond increasing income through increased production, annual on-farm employment is expected to rise by about 18,000 person-days. In addition, 28,000 person-days of employment will be generated through canal and watercourse rehabilitation and improvement programs. Feasibility studies suggest that about two-thirds of the project beneficiaries will be small farmers operating less that 12.5 acres, with current annual incomes in the $50 to $150 per capita range (the 1981 estimate for a "rural poverty income level" is $150). IBRD estimates that 25-33 percent of total project benefits will accrue to this group.

TABLE 14

PROJECTED NET FARM PER CAPITA INCOME FOR OWNER OPERATED "MODEL FARM"
(In Rupees)

Sub-Project	Present	Future Without Project	Future With Project	Per Capita Increment (%)
Shahkot	1,700	1,700	2,100	26.0
Niazbeg	1,700	1,800	2,300	27.0
Pakpattan	1,700	1,800	2,200	19.0
6-R	1,600	1,500	1,900	32.0
Sehra/Naulakhi	2,100	2,200	2,600	22.0
Las Bela	600	1,200	4,100	250.0
Warsak Lift	600	800	800	43.0

c. Project Costs

The total costs of the CWM Project (See Table 16 in Section V.E., Financed Analysis) are estimated at $87.6 million, which includes a GOP contribution of the equivalent of $9.3 million; $46.5 million from IBRD/IDA; and $31.8 million from A.I.D. (which includes $19.4 million for civil works; $1.2 million for commodities; $7.5 million for technical assistance; $2.5 million for training; and $1.2 million for contingency).

Supporting SAR studies indicate that to date, O&M expenditures are only about 60 percent of the required levels. To a very large extent, however, the cost recovery shortfalls were due to GOP subsidies for tubewell irrigation. As a result, the GOP has agreed to and is beginning to implement a tubewell privatization program which will shift these irrigation costs to users. Nevertheless, the same studies recommend a 50 percent increase in water user charges to farmers. The estimated levels of O&M recurrent costs at the farm and non-farm levels for each of the seven sub-project areas were incorporated into the SAR analysis with water user charges being raised to the full recovery cost by 1992.

d. Economic Rates of Return

Table 15 summarizes the ERR estimates for the seven sub-project areas. In the SAR, IBRD assumed a 10 percent opportunity cost of capital. The accompanying sensitivity tests indicate that Las Bela in Baluchistan, which accounts for only 3 percent of the overall

TABLE 15

ERRs AND SWITCHING VALUES

Sub-Project Area	Net Present Value (Rs Million)	Economic Rate of Return	Switching Values (%) a/				
			Net Benefit	Costs			
				Capital	Recurrent	Production	Total
Shahkot	107.3	24	-26	209	553	46	36
Niazbeg	85.9	27	-29	253	695	51	40
Pakpattan	203.1	30	-27	298	1197	44	37
6-R	144.0	16	-15	81	425	23	17
Sehra/Naulakhi	518.0	36	-37	384	1742	73	59
Las Bela	11.3	12	-10	29	121	19	11
Warsak Lift	40.4	17	-20	98	318	38	25
Total Project	1106.5	24	-27	204	780	47	36

a/ Switching values = percentage change in the specified stream of benefits or costs that reduces the Net Present Value (NPV) to zero at the opportunity cost of capital (10%).

project area, is the only sub-project area with a marginal ERR. Inclusion of this sub-project area, however, responds to the high priority given by the GOP to development activities in Baluchistan, the nation's most underdeveloped province.

2. A.I.D.'s Assessment of Economic Feasibility

The results of the IBRD economic analysis support the economic worthiness of the project, even after considering possible weaknesses in the analysis. For example, use of the more common 12 percent opportunity cost of capital rather than the 10 percent used in the analysis would not change the conclusions of the analysis. Similarly, the sensitivity analysis shows that small differences in assumptions will not affect the outcome. The assumptions about yields are very conservative; yields for field trials and in the Indian Punjab are much higher than the yields

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assumed for this project (which are similar to those already achieved by leading farmers in these areas). Although the yields with the project are not overstated, the yields in the "without project" scenario probably are understated in the sub-project areas where yields have been increasing. On the other hand, yields in two sub-project areas have been declining because of waterlogging and salinity. Thus there is not a consistent bias in either direction. The economic viability of the Program is not critically dependent on the success of the institutional development and project management elements. Seventy percent of the increased production comes from the physical improvements that will increase the amount of useable water. These types of improvements in Pakistan have resulted in the outcomes that can be forecast with considerable confidence.

Beyond these substantial improvements, additional progress depends on the effectiveness of institutional and social changes which would enable average farmers to obtain yield levels equal or close to those already attained by leading farmers. During the project, adjustments will be made to develop the best approach and to seek to optimize actual outcomes. The water scheduling activity, which is one of the key innovative elements and is to be defined fully during the project, is an illustration of the need to be flexible and responsive to experience gained during the project. Thus, GOP, IBRD/IDA and A.I.D. agreement, collaboration and coordination are essential at the outset of the Program and throughout implementation to ensure that the required institutional and project management conditions assumed in the IBRD economic analysis actually exist. These conditions will be necessary to test the CWM concept in Pakistan. Among the routine activities that will have to work better are the purchase and use of appropriate non-water input and service packages (i.e., fertilizer, pesticides, seed, implements, tractors). The provision of institutional and/or retail supplier credit may also be necessary for successful farmer adoption of new technologies and cropping practices.

Another type of uncertainty will be the availability of adequate O&M funds for the IBRD/IDA and A.I.D.-funded civil works activities. Without adequate O&M, the additional water supplies will not be fully forthcoming. Further research during project implementation is required to assess and monitor the O&M recurrent cost requirements in the sub-project areas. Accordingly, A.I.D. has initiated studies under the ISM Project aimed at determining more accurate funding requirements for irrigation O&M. Maintenance of improved watercourses is another critical aspect of the project. The farmers along the watercourses are responsible for maintenance, not the GOP or PIDs. Technical assistance inputs will focus on increasing the abilities of the OFWM Directorates to assist in on-going watercourse rehabilitation and maintenance work, and in identifying and introducing incentives and mechanisms to maximize WUA participation in these areas.

The project design calls for all work, both physical and project management, to be completed within five years and for the maximum benefits to be achieved within eight years after the completion of the

physical facilities. Although it is useful to maintain the five-year target, it can be anticipated that a longer period may be required. Delays could hamper the civil works and thus lower the rate of increase in cropping intensity and income. Technical assistance inputs and the project management activity might have to be extended both because of the physical delays and the need for a longer effort to obtain the yield increases. Neither of these events is likely to have a significant effect on the economic viability of the project.

The economic rate of return depends on a comparison of the discounted stream of benefits and costs. A delay in benefits will lower their present value and consequently the EER. A delay in benefits due to slower completion of the civil works will not have an appreciable effect on the EER, however, because the costs of the physical works will also be discounted to the same degree. Because benefits from the civil works and consequent increases in cropping intensities account for 70 percent of total benefits, the overall EER will still be acceptable even if yield increases are stretched out.

The yield increases are more uncertain than the increases flowing from the civil works. They could take a longer time to appear and might require additional project management inputs. These extra costs would be quite small and not very significant to the analysis. A delay in yield increases after the civil works have been completed would probably lower the EER because the benefits would likely be discounted to a greater degree than the costs. The effects on the EER will be limited in this case because only 30 percent of the benefits are expected to flow from the yield increases. The overall EER still would be comfortably above the critical level.

E. Financial Analysis

1. General

Financial resources for the CWM Program will come from three different sources: (a) the IBRD/IDA's Command Water Management Project; (b) A.I.D.'s Irrigation Systems Management (ISM) Project (391-0467); and, (c) the Federal and Provincial Governments of Pakistan. The total estimated cost of the CWM Program is $87.6 million, consisting of a $46.5 million IBRD/IDA credit; $31.8 million in grant funds under A.I.D.'s ISM project; and, a GOP/GOPROV contribution of the equivalent of $9.3 million. The A.I.D. contribution is equivalent to 36 percent while that of the IBRD and the GOP/GOPROV is 53 percent and 11 percent, respectively. 9/

9/ The Bank's CWM Project was negotiated in April 1984. A Staff Appraisal Report (SAR) was prepared in April 1984, and the IBRD/Provincial Government Agreements were signed in June 1984. The Bank's SAR shows an A.I.D. contribution of $25 million, distributed as follows: $19.4 million for civil works; $0.3 million for equipment and vehicles; and $5.3 million for technical assistance. The $25 million A.I.D. contribution in the SAR reflects the funding to be added to the ISM project by this ISM/CWM PP amendment. The remaining $6.8 million A.I.D. contribution includes funds which have been reprogrammed from existing funds under other components of the ISM Project for training and additional costs for technical assistance and commodities.

Three summary tables are provided on the following pages: Table 16 depicts project costs by project component, expense category, local and foreign exchange costs, and source of funding; Table 17 describes project costs by expense category, local and foreign exchange costs, and source of funding; and, Table 18 summarizes project costs by fiscal year, FX and LC, and source of funding. The budget tables reflect current estimates for all ISM Project/Program activities. They include both IBRD/IDA-funded ISR and CWM Projects, the entire A.I.D.-funded ISM Project of $90 million, and the total GOP/GOPROV contribution to the entire effort. The A.I.D. contribution by project component also reflects the reprogramming of funds and a minor restructuring of project components as compared with the budget tables in the original ISM PP.

Project costs for the A.I.D. contribution are defined as anticipated earmarkings or commitments of funding through, e.g., PIOs, contracts, purchase orders, or work orders for civil works. Inflation was calculated for A.I.D. project costs on the basis of 5 percent per year for U.S. salaries and all other foreign exchange costs; 10 percent per year for local costs and 12 percent per year for construction costs, all compounded annually. Local costs are expressed as dollar equivalents at the exchange rate of U.S. $1.00 = Rs 14.50.

2. Summary Cost Estimates and Financial Plan

a. A.I.D. Contribution

Allocation of the $31.8 million A.I.D. contribution to the CWM Program by expense category is as follows: 4 percent for commodities; 23 percent for technical assistance; 8 percent for training; 61 percent for civil works; and, 4 percent for contingency.

Of the $31.8 million A.I.D. grant for the CWM Program, $7.0 million or 22 percent will be used to finance foreign exchange costs. The remaining $24.8 million or 78 percent will be used to finance local costs associated with civil works, technical assistance, vehicle operating expenses, and contingency. To the maximum extent possible, A.I.D. grant funds which are used to finance local costs will be disbursed in U.S. dollars in order to maximize the balance of payments impact of this program in accordance with the overall objectives of the renewed USG-GOP economic and development assistance program. A FAA Section 612(b) certification, signed by the USAID/Pakistan Mission Director, is included in the original PP and shall remain valid for the ISM/CWM PP amendment.

The proposed obligation schedule for the ISM project grant of $90 million is as follows: FY 1983 = $30.5 million; FY 1984 = $19.4 million; FY 1985 = 18.0 million; FY 1986 = 0; and, FY 1987 = $22.1 million.

TABLE 16

SUMMARY OF TOTAL PROJECT COSTS BY PROJECT COMPONENT, EXPENSE CATEGORY, AND SOURCE OF FUNDING a/
(In $ 000)

Project Component b/	Life of Project Funding					
	A.I.D. Grant			c/	d/	
	FX	LC c/	Total	GOP	IBRD/IDA	Total
1. Rehabilitation Works						
a. Technical Assistance	-	-	-	-	1,600	1,600
b. Commodities	2,000	-	2,000	-	-	2,000
c. Civil Works	-	13,700	13,700	17,300	28,700	59,700
d. Contingency	-	774	744	-	9,700e/	10,474
Sub-Total	2,000	14,474	16,474	17,300	40,000	73,774
2. General Institutional Improvement						
a. Technical Assistance	13,600	1,800	15,400	-	-	15,400
b. Training	4,000	1,000	5,000	700	-	5,700
c. Commodities	1,100	500	1,600	500	-	2,100
d. Contingency	1,000	204	1,204	1,792	-	2,996
Sub-Total	19,700	3,504	23,204	2,992	-	26,196
3. Water Management Research						
a. Technical Assistance	5,290	3,500	8,790	-	-	8,790
b. Training	3,200	800	4,000	1,100	-	5,100
c. Commodities	2,000	310	2,310	-	-	2,310
d. Other Costs	50	2,460	2,510	6,438	-	8,948
e. Contingency	760	179	939	-	-	939
Sub-Total	11,300	7,249	18,549	7,538	-	26,087
4. Command Water Management						
a. Technical Assistance	3,722	3,746	7,468	-	-	7,468
i. LT Expatriate Teams	3,256	712	3,968	-	-	3,968
ii. Supervisory Consultant	-	1,000	1,000	-	1,800	2,800
iii. Local University or Private Researchers	-	500	500	-	-	500
iv. 24 PM of ST Expatriate & Local	466	60	526	-	-	526
v. Local Advisors	-	1,474	1,474	-	-	1,474
b. Training	2,000	500	2,500	-	-	2,500
c. Commodities	1,100	100	1,200	1,200	1,500	3,900
d. Civil Works	-	19,400	19,400	3,200	39,600	62,200
e. Other Costs	-	-	-	4,900	3,600	8,500
f. Contingency	200	1,005	1,205	-	-	1,205
Sub-Total	7,022	24,751	31,773	9,300	46,500	87,573
Total	40,022	49,978	90,000	37,130	86,500	213,630

a/ Project costs for A.I.D. contribution are defined as anticipated earmarkings or commitments of funding through, e.g., PIOs, contracts, purchase orders, or work orders for civil works.

b/ Inflation is 5% of FX salaries and all other FX costs, 10% of local costs and 12% of construction costs, all compounded annually.

c/ Expressed as dollar equivalents at the exchange rate of US $1.00 = Rs 14.50.

d/ Includes both IBRD/IDA-funded Irrigation Systems Rehabilitation and CWM Projects.

e/ Includes both contingency and inflation.

TABLE 17

SUMMARY OF TOTAL PROJECT COSTS
BY EXPENSE CATEGORY AND SOURCE OF FUNDING a/

(In $ 000)

Expense Category	Life of Project Funding					
	A.I.D. Grant			b/		
	FX	LC b/	Total	GOP	IBRD/IDA	Total
1. Technical Assistance	22,612	9,046	31,658	-	3,400	35,058
2. Training	9,200	2,300	11,500	1,800	-	13,300
3. Commodities	6,200	910	7,110	1,700	1,500	10,310
4. Civil Works	-	33,100	33,100	20,500	68,300	121,900
5. Other Costs	50	2,460	2,510	11,338	3,600	17,448
6. Contingency	1,960	2,162	4,122	1,792	9,700	15,614
Total	40,022	49,978	90,000	37,130	86,500	213,630

a/ Project costs for A.I.D. contribution are defined as anticipated earmarkings or commitments of funding through, e.g., PIOs, contracts, purchase orders or work orders for civil works.

b/ Expressed as dollar equivalents at the exchange rate of US $ 1.00 = Rs 14.50.

TABLE 18

SUMMARY OF TOTAL PROJECT COSTS BY U.S. FISCAL YEAR, FX AND LC, AND SOURCE OF FUNDING a/

Source of Funding	FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90	Total
A. A.I.D. Grant									
1. Rehabilitation Works									
FX	-	-	1,000	1,000	-	-	-	-	2,000
LC b/	7,870	2,300	-	774	3,530	-	-	-	14,474
2. General Institutional Improvement									
FX	14,575	5,125	-	-	-	-	-	-	19,700
LC b/	2,300	1,204	-	-	-	-	-	-	3,504
3. Water Management Research									
FX	3,445	4,611	705	905	1,480	154	-	-	11,300
LC b/	2,310	1,800	460	2,310	310	59	-	-	7,249
4. Command Water Management									
FX	-	-	6,522	350	50	50	50	-	7,022
LC b/	-	-	5,246	3,352	6,051	6251	3851	-	24,751
Total A.I.D.	30,500	15,040	13,933	8,691	11,421	6,514	3,901	-	90,000
B. GOP	4,200	11,500	13,490	2,360	2,232	1,395	1,953	-	37,130
C. IBRD/IDA	11,220	13,750	16,318	5,612	8,100	11,500	14,500	5,500	86,500
Total	45,920	40,290	43,741	16,663	21,753	19,409	20,354	5,500	213,630

a/ Project costs for A.I.D. contribution are defined as anticipated earmarkings or commitments of funding through, e.g., PIOs, contracts, purchase orders, or work orders for civil works.

b/ Expressed as dollar equivalents at the exchange rate of US $1.00 = Rs 14.50.

b. GOP Contribution

The GOP will provide the equivalent of $9.3 million or 11 percent of the total cost of the CWM Program. The GOP allocation by expense category is as follows: 1 percent for investigations and surveys; 15 percent for land acquisition; 34 percent for civil works; 13 percent for equipment and vehicles; and, 37 percent for recurrent costs. Additionally, farmers benefitting from on-farm improvements will contribute (repay) the equivalent of $1.1 million, or about 2 percent of the total CWM Program cost for civil works.

c. IBRD/IDA's Contribution

The IBRD/IDA's $46.5 million credit for the CWM Program represents 53 percent of the total costs of the Program. The IBRD allocation by expense cateogy is as follows: 2 percent for investigations and surveys; 85 percent for civil works; 3 percent for equipment and vehicles; 4 percent for technical assistance; and, 6 percent for recurrent costs. Of the total estimated cost of $62.2 million for civil works under the CWM Program, the IBRD will contribute $39.6 million or 64 percent while A.I.D. will contribute $19.4 million or 31 percent, with the remaining 5 percent to be provided by the GOP/GOPROV. The $1.6 million allocated by the IBRD/IDA for technical assistance is to finance the services of a supervisory consultant that will have reponsibilities for all and only IBRD-financed civil works activities under the CWM Program. (A.I.D. will hire a separate supervisory consultant for A.I.D.-financed civil works.)

3. Methods of Implementation and Financing

Table 19 provides a summary of the proposed methods of implementation and financing for the CWM component of the ISM Project, in accordance with A.I.D.'s Payment Verification Policy Implementation Guidance dated December 30, 1983. No departures from the three preferred methods of financing are contemplated for this project component.

F. Environmental Analysis

Under the CWM component of the ISM Project, physical improvements and strengthened management of the irrigation infrastructure are emphasized in association with improved deliveries of non-water inputs in seven selected areas. Civil works will primarily include canal rehabilitation/remodeling, including desilting, strengthening embankments, linking of small distributaries and minors, and improvements to structures; surface and sub-surface drainage; watercourse improvements; and farm drainage improvements. Of these, A.I.D. will fund only watercourse and farm drainage improvements. (Consideration will also be given to funding a small amount of other works such as small on-farm reservoirs and WUA-owned tubewells.) The IBRD/IDA will fund the other activities. As a result of these improvements, problems of poor surface drainage, drainage from waterlogging and salinity, and loss of

TABLE 19

METHODS OF IMPLEMENTATION AND FINANCING
FOR CWM PROJECT COMPONENT (A.I.D. CONTRIBUTION ONLY)

METHOD OF IMPLEMENTATION	METHOD OF FINANCING	ESTIMATED AMOUNT (In U.S.$ 000)
TA-USAID/P Competitive Institutional (CWM T.A. Team Expatriates and Locals)	Direct Payment	4,242
TA-USAID/P Competitive A&E Contract (Local Supervisory Consultants) a/	Direct Payment	1,000
TA-USAID/P Buy-In to AID/W WMS II Project (Diagnostic Analysis and Training and Data Collection/Monitoring)	Direct Payment	1,200
TA-USAID/P Competitive Institutional Contract(s) (Local Universities and Private Researchers) a/	Direct Payment	500
TA-USAID/P PSCs, IQCs or Buy-Ins to Central Projects (Local and Expatriate)	Direct Payment	526
Participant (Overseas) Training (through DST Contractor)	FRLC	2,000
Local Training (PILs to earmark funds) b/	HC Reimbursement	500
Commodities (Vehicles and Household/ Office) - AID Procurement	Direct Payment	450
Commodities (All others) - CWM TA Team Procurement c/	Direct Payment	750
Civil Works (Reimbursement Agreement + PILs to earmark funds)	HC Reimbursement (Modified Fixed Amount Reimbursement)	19,400
	TOTAL	30,568
Contingency	Direct Payment or HC Reimbursement	1,205
	GRAND TOTAL	31,773

a/ These may be sub-contract(s) with the CWM T.A. Team U.S. Contractor. In either case, the method of financing would be direct payment.

b/ Most, if not all, of these funds may be included in the long-term, direct A.I.D. major CWM T.A. contract, in which case the method of financing would be direct reimbursement/payment to the contractor.

c/ These funds will probably be included in the long-term, direct A.I.D. CWM T.A. contract, in which case the method of financing would be direct reimbursement/payment to the contractor.

Note: In the event a non-profit organization is awarded the competitive U.S. institutional contract for T.A., the Mission may utilize a FRLC as the method of financing.

The Development Support Training (DST) Project Contractor (Academy for Educational Development) is a non-profit organization and hence is eligible for a FRLC.

good quality water by deep percolation in areas with saline groundwater will be reduced and agricultural production and farm income will increase. In addition, employment opportunities will increase, government officials and farmers will receive training, and an institutional framework will be established by which farmers will participate in the management of the system.

A.I.D.-funded watercourse improvements and farm drainage improvements will have an unquestionably positive effect. Limited changes in alignment of watercourses will affect the landscape, but such changes will be made with full involvement and approval of affected farmers. Physical improvements will have a positive environmental effect, in the amelioration of watercourse breaching, flooding and waterlogging. Furthermore, farmers will be trained to construct, operate and maintain watercourses in an environmentally sound manner. Overall, the CWM Project Component will have a highly positive effect on the environment. An Initial Environmental Examination (IEE) for the CWM Project Component, which recommends a negative determination, is included as Annex D.

G. Narcotics Impact Statement

There is no direct linkage between this Project Component and the illicit cultivation of opium poppies or the manufacture of heroin. Poppies are not grown on lands serviced by public irrigation systems. Nevertheless, to assure that this continues to be the case and to further the U.S. Government's continued efforts, in conjunction with the GOP, to curtail opium poppy cultivation and the processing of opium into heroin in Pakistan, a poppy clause was included in the original ISM Project Agreement and shall remain in full force and effect for the CWM Project Component.

VI. CONDITIONS, COVENANTS AND NEGOTIATING STATUS

A. Conditions Precedent to Disbursement for Civil Works under the CWM Program in a Specific Province

Except as A.I.D. may otherwise agree in writing, prior to any disbursement under this Project Amendment for civil works under the CWM Program in a specific province, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Grantee shall furnish or have furnished to A.I.D., in form and substance satisfactory to A.I.D., a written statement from that province documenting that:

1. a Provincial Policy Committee (PPC) has been established to be responsible for, inter alia, formulating policy and coordinating the activities of the Departments and Agencies involved in carrying out the CWM Program in that province;

2. Sub-Project Management Offices (SMOs) are adequately staffed with full-time officers. For provinces other than the Punjab, adequate SMO staffing shall include, at a minimum: one (1) Sub-Project Manager; one (1) Senior Manager, Monitoring and Evaluation; one (1) Senior Manager, Water Management; and necessary supporting staff, such as Enumerators, Surveyors, and Information Management (Computer) Specialists; and,

3. For Punjab Province only: (a) a Project Director Cell has been established with full-time staff appointed to include, at a minimum: one (1) Director; one (1) Assistant Director, Monitoring and Evaluation; one (1) Assistant Director, Water Management; and, necessary supporting staff; and, (b) SMOs for each of the four (4) sub-project areas within the Punjab are adequately staffed with full-time officers including, at a minimum: one (1) Liaison Officer and necessary supporting staff.

B. Covenants

1. Except as the Parties may otherwise agree in writing, the Grantee shall assure that each Province assigns sufficient Agriculture Officers, Field Assistants, and/or other staff as required to help establish, strengthen, and assist Water Users Associations to play a meaningful role in the CWM Program and to provide water management extension services to farmers in the CWM sub-project areas.

2. Except as the Parties may otherwise agree in writing, the Grantee shall cause each Province to recover from beneficiaries the cost of materials provided to them for renovation of watercourses and other farm-level works at the following approximate levels:

a. Punjab: 20 percent of such costs.

b. Sind and Baluchistan: 25 percent of such costs.

c. NWFP: Not later than August 31, 1985, or such other date as the parties may agree to in writing, the NWFP shall submit to A.I.D. a written proposal for effecting cost recovery in that Province and agrees, thereafter, to implement a cost-recovery program in a manner and within a time frame mutually acceptable to A.I.D. and the Province.

C. Negotiating Status

As mentioned previously, the GOP has already negotiated and signed an agreement with the IBRD/IDA for the CWM Project. As was the case under the A.I.D.-financed parent ISM Project and the IBRD/IDA's ISR Project, A.I.D. and IBRD officials have held numerous joint discussions with the GOP on major issues and conditions under the CWM Program. A.I.D. representatives attended the IBRD/GOP negotiations in Washington, D.C. in April 1984. The above Condition Precedent (with the exception of the specific SMO staffing pattern for the Punjab province) and the two covenants have already been negotiated, agreed to by the GOP, and are included in the Agreements between the IBRD/IDA and the GOP and Provincial Governments. Negotiations are currently underway with the Punjab regarding how the SMOs will be staffed and organized for the four sub-project areas in that Province. It is anticipated that a firm decision will be made prior to negotiation of the Agreement Amendment, and appropriate language will be included therein to reflect the mutual agreement reached on this matter. No difficulties are foreseen in the GOP's acceptance of these conditions and covenants in the ISM Project Agreement Amendment.

ISM/CWM PP AMENDMENT

VII. A N N E X E S

USAID/PAKISTAN

JANUARY 1985

AID 1020-28 (1-72)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1983 to FY 1990
Total U. S. Funding $90 million
Date Prepared: January 1985

Project Title & Number: Irrigation Systems Management (391-0467) - Command Water Management Project Component

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: Same as in original PP.	Measures of Goal Achievement: Same as in original PP with specific targets in the 7 sub-project areas relating to increases in income, yields, cropping intensities, employment and the like as contained in the Social Soundness and Economic Analyses (Sections V.C. and V.D.)	Same as in original PP plus: - Data collected by the SMO/PMEs - Special studies conducted by private researchers and universities - Diagnostic analysis by WMS II Contractor	Assumptions for achieving goal targets: Same as in original PP plus: - GOP and GOPROV officials continue to support the CWM concept and approach
Project Purpose: Same as in original PP plus: - To carry out physical improvements to the system.	Conditions that will indicate purpose has been achieved: End of project status. See Insert A.	Same as in the original PP plus the above.	Assumptions for achieving purpose: See Insert B.
Outputs: ← See Insert C. →	Magnitude of Outputs:	Same as above.	Assumptions for achieving outputs: Same as in original PP.
Inputs: Same as in original PP for A.I.D., GOP, and IBRD/IDA.	Implementation Target (Type and Quantity) See financial analysis, implementation schedule and commodity, technical assistance and training plans in the ISM/CWM PP Amendment.	Same as above.	Assumptions for providing inputs: Same as in original PP.

INSERT 'A'

End-of-project status indicators (EOPS) for the CWM component include the following:

1. increased agricultural production in the sub-project areas (see Section V.D., Economic Analysis of the PP Amendment);

2. improved water management techniques and programs developed which are replicable over a wide range of agro-climatic zones and land and water environments;

3. reduced inequities in actual water deliveries in the tail reach as compared to the head reach of canals at all levels in the sub-project areas;

4. capability institutionalized within provincial agencies to plan, implement and operate integrated programs for irrigated agriculture;

5. farmer-initiated, Water Users Association (WUA) - organized programs established to meet the O&M needs of rehabilitated watercourses in the sub-project areas;

6. meaningful and on-going participation by WUAs in Provincial Irrigation Department (PID) planning and decision-making concerning the operation of sub-project area surface water delivery systems and public tubewells;

7. increased private sector sales and appropriate use by farmers of fertilizer and pesticides and increased farmer use of certified seeds and institutional credit in the sub-project areas;

8. improved crop management and cultivation practices by farmers in sub-project areas as a result of improved extension services;

9. provincial and federal government policy measures implemented to reduce irrigation and input subsidies; and,

10. evidence of farmer willingness to pay increased water charges and higher prices for inputs.

INSERT 'B'

Major assumptions for achieving these EOPs include:

1. the timely assignment by the Federal and Provincial Governments of an adequate number of qualified professional staff in the SMOs for the management and implementation of CWM activities;

2. high level federal and provincial support for the CWM concept and, in particular, the establishment of effective, representative WUAs;

3. the meaningful and on-going involvement of private and public sector suppliers of inputs and credit services in the sub-project areas;

4. the willingness of provincial level line department officials and field staff in the Agriculture and Irrigation Departments and the On-Farm Water Management (OFWM) and Extension Directorates to work closely together to achieve CWM objectives; and,

5. the willingness of farmers to work closely together once physical improvements are made at the watercourse level to carry out required maintenance and water management improvement activities.

The CWM Program has been designed to bring these conditions about and hence to make the assumptions valid. The speed with which they occur will determine the pace of implementation.

INSERT 'C'

The A.I.D.-financed CWM Project component is expected to produce the following outputs which, together with the outputs of the IBRD's CWM Project, should achieve the project purpose:

1. Institutional Outputs

a. establishment of over 1,000 formally organized and registered WUAs in the seven sub-project areas;

b. integration of WUAs into a network of federations and councils in the sub-project areas; and,

c. establishment of seven functioning CWM Sub-Project Management Offices (SMOs) (four in the Punjab and one each in the other three provinces), seven supporting Sub-Project Coordinating Committees, and four Provincial Policy Committees.

2. Training Outputs

a. approximately 25 staff members of the SMOs and Federal/Provincial Government officials trained in rural organization, water management, and planning, monitoring and evaluation techniques;

b. approximately 20 members of the OFWM Directorates' Field Teams and 100 field workers from the Provincial Extension Directorates trained in multidisciplinary problem-solving techniques related to water management, WUA development, and community participation;

c. approximately 5,000 WUA members trained in planning, watercourse improvement and maintenance, and improved water management and agricultural practices; and,

d. approximately 50 PID officials trained in improved operation and maintenance of irrigation facilities.

3. Water Management Planning Outputs

a. an irrigation system operational management plan developed for one of the CWM sub-project areas (most likely Sehra/Naulaki in the Sind) that will permit optimum use of surface water, public tubewells, and private tubewells;

b. a detailed methodology developed that can be applied to other irrigation command areas for deriving an irrigation system operational mana gement plan; and,

c. based on the methodology in b. above, irrigation system operational management plans developed for the remaining six sub-project areas.

INSERT 'C' (Continued)

4. Physical Outputs

a. approximately 1,000 farmer-implemented on-farm improvement programs completed;

b. about 1,000 agricultural demonstration plots, i.e., one in each rehabilitated watercourse command area, established;

c. precision land levelling completed on about 20,000 acres; and,

d. field testing completed and evaluated in several sub-project areas of such irrigation methods as pipelines, sprinkler or drip systems, small reservoirs, and tubewells.

5. Monitoring and Evaluation Outputs

a. methodology developed, field-tested, and adopted for the systematic and sustained monitoring of CWM activities, including their impact on farmer production and incomes;

b. reports and studies produced by CWM staff that record and evaluate actual progress in the sub-project areas; and,

c. reports and working documents produced by CWM staff that analyze the results and impacts of CWM, including recommendations for replication on a wider scale of those activities that have proved successful.

SOCIAL SOUNDNESS ANNEX: A PROFILE OF FARMERS IN THE SUB-PROJECT AREAS

1. Baluchistan: Las Bela

Water from the Hub Dam, located on the Hub River which forms part of the Sind-Baluchistan border, about 30-35 miles west of Karachi, supplies the Bela Canal in the Las Bela sub-project area. There are four distinct farmer groups or tribes in this area. The three main groups speak Baluchi but are from different areas of Baluchistan. These groups are Baluch, Brohi, and Vohora. The fourth group, which represents about 3 percent of the farmer population and is referred to as "outsiders" by the other groups, consists of private businessmen or retired military officers from Karachi. This group has either taken up farming as a hobby or functions as land speculators. Although not numerically very significant, the average size of farms of this group is relatively large compared to that of other farmers.

The Brohi-speaking tribe represents about 60 percent of all farmers in the sub-project area. Formerly nomadic herders from the Khuzdar Mountains, they settled in this region during the reign of the Jam of Las Bela. The Baluch community also consists of settled nomadic herdsmen, who originate from many parts of Baluchistan. The Vohora community is a Sindhi tribe who also speak Baluchi. They are the oldest settled community in the sub-project area, but they are economically less well off and most often are tenant farmers.

Prior to 1947, Las Bela was a princely state governed by the Jam of Las Bela. After Independence, some of the land in the sub-project area was granted to the Jam Sahib by the GOP as compensation for the take-over of the princely state. Subsequently, the majority of this land was sold at a nominal rate to those farmrs who had occupied it. However, only those farmers who registered the land with the Government were recognized as legal owners. Some farmers never registered their land and, as a result, they were considered to be squatters. The Jam Sahib later sold the squatter-occupied land to "outsiders" from Karachi, but many squatters refused to vacate their holdings, claiming that they should be considered legal owners on the basis of their long occupancy and active cultivation of this land. Most litigation surrounding these conflicting claims has been settled, though a few cases still remain unresolved.

Land holdings in the sub-project area range in size from less than 5 acres to as large as 540 acres. The majority of farmers own 50 acres or less, but many landowners have holdings in the 100 - 150 acre range. There does not appear to have been any enforcement of a legal limit on farm size. Less than 50 percent of the cultivable command area in Las Bela (about 8,000 acres of the 18,282 acres) is now being cultivated because of inadequate water supplies, insufficient resources to fully develop the land, and land speculation activities.

The Las Bela sub-project area is characterized by a mix of agro-economic activities ranging from field crop agriculture, to fruit and vegetable production, to nomadic pastoralism. The socio-cultural context of agricultural production is equally varied. Small to medium size farmers are typically subsistence-focused, producing relatively little marketable surplus. Many of these farm families obtain supplementary income to meet family needs from work as agricultural laborers or from industrial employment in factories in the industrial estate at Hub Chawki or in Karachi. Large farmers have put a very large proportion of their cultivated area into fruit tree production, seeking to maximize their returns over the long run in developing their farms. They do not depend upon their farms primarily to meet subsistence needs.

The majority of farmers--an estimated 80 percent in the sub-project area--however, are tenants. In these cases, the landowner determines the crops to be grown, as well as what land improvements, if any, are necessary. Tenants only make decisions that affect day-to-day farming operations. The landowner provides funds for land improvement (e.g., land leveling, watercourse improvement), and the tenant provides labor for land preparation, sowing and harvesting of crops. General costs of production--seed, fertilizers, insecticides--are shared on a 50-50 basis, with the tenant paying his share of these costs from his portion of the harvest. The harvest also is usually divided on a 50-50 basis. Within the tenant farmer group, women as well as men typically are actively engaged in farming operations.

Although Union and District Councils have been established in Las Bela, the traditional clan leader and community elders remain the principal decision makers among the three major groups within the sub-project area. Landowners on each canal minor have established informal committees to settle disputes which typically emerge over water allocation or individual farmers altering the flow of water within the channel. If the dispute cannot be settled by the committee, the local leader will request the Assistant Commissioner (AC) to convene an informal meeting of the parties involved to further discuss the dispute. The AC can, and often does, call upon a number of technical people to assist in reaching a satisfactory solution to conflicts between disputing parties. Here the role of the AC is often that of a facilitator or coordinator, but it also can be that of final arbiter.

2. NWFP: Warsak Lift Canal

The farmers of the Warsak Lift Canal sub-project area reflect the diversity of tribes that inhabit the NWFP. The sub-project area, substantially influenced by its proximity to Peshawar, reflects a considerable variety of economic and agronomic activities. Agricultural activities in the Warsak Lift Canal command include both food and fodder production and animal husbandry that is more transhumance in character, specializing in raising sheep and goats. Livestock producers depend upon fodder crops raised on irrigated fields to carry their animals through the dry season.

The ability of farmers in the Warsak Lift Canal command to fully develop their farming enterprise is directly affected by farm size and existing conditions of land tenure. Small farmers predominate in agricultural enterprises here, with more than 90 percent of the farms less than 12.5 acres and averaging 3.5 acres in size. They are primarily owners or owners-cum-tenants. Most small farm production is subsistence, and little if any surplus is generated for sale in the open market.

Large farms, though less than 2 percent of all farms, comprise 13 percent of the cultivated area. Although there is a legal ceiling on individual farm size, registration of land under the names of other family members has allowed large landlords, the Khans or Nawabs, to continue to control much larger acreages. Large landowners often make annual arrangements with nomadic tribes, who descend to the plains around Peshawar in the winter, to harvest their crops in exchange for fodder and feed for their livestock. Some large landowners also lease their lands to tenants through various sharecropping arrangements. The advantage that larger farmers have in their ability to mobilize resources to adopt new or improved cultural practices is reflected in the increased mechanization of many large farms. This process is displacing some tenants whose only option is to work as seasonal agricultural laborers if they wish to remain in the area. Some obtain work as unskilled labor in Peshawar as well.

By and large, farmers in the sub-project area follow traditional cultivation practices in land preparation, planting, crop tillage and harvesting, and have little knowledge or understanding of modern irrigated agriculture. Some traditional agricultural implements still in use, e.g., the bar point plow, are only effective within a narrow range of soil moisture conditions, and traditional cropping patterns do not make the most efficient use of irrigation water. Watercourses within the sub-project area are often meandering, reflecting perhaps the inability of the agricultural community through its decision-making process to negotiate rights of way with intransient individual farmers. Maintenance of watercourses is relatively poor, and the head reaches of many watercourses are so deep below the surrounding land surface as to preclude easy access for periodic maintenance. Many farm fields reflect a genuine need for access to effective land leveling resources. Non-water agricultural inputs--seed, fertilizer, insecticides--are normally not available either in the required quantities or on a timely basis, although the advantages of these inputs seem to be understood and appreciated. Adequate credit facilities are similarly lacking.

In spite of the advent of formal local governing bodies--union and district councils--to which representatives were elected in 1979 and 1981, the traditional village-level jirga (meeting of the clan or tribal elders) remains the primary forum for decisions that affect the community. The community or clan leader (Khan) commonly mediates a variety of disputes, and, in most instances, he is instrumental in decisions regarding the distribution and use of irrigation water within the community.

3. Punjab : Niazbeg, Pakpattan, Shahkot and 6-R

The farmers in the four sub-project areas are characterized by their small and fragmented holdings. Of the estimated 26,000 farms, over 22,000 or 87 percent are of 25 acres or less. Owner cultivators, owners-cum-tenants and tenants, all considered subsistence farmers, work on these small holdings.

Owner/cultivators operate almost 10,000 or 37 percent of the small holdings. The owner-cum-tenant farmers operate their own farms but pay rent or share additional land needed to sustain their families. This group operates about 5,000 farms or 19 percent. Tenants share their crops 50-50 with owners. They operate 8,000 or 31 percent of the small farms.

The average cropping intensity of these subsistence farmers is higher than in other provinces, but crop yields are still considered low. Water storages at critical periods during the growing season, lack of management of watercourses, inadequate use of fertilizer and pesticides, use of poor quality seed, traditional cultural practices, lack of credit, poor marketing and transportation facilities and lack of new and improved technology, all contribute to low yields. Most farmers in the sub-project areas must travel 15-30 miles to obtain agricultural inputs, which are generally not available in sufficient quantities nor delivered to the suppliers on a timely basis. Many farmers feel that the time spent in procuring the inputs and the cost of transporting them back to the farms makes their use unprofitable. A similar situation pertains to credit. Most credit is obtained from commission agents, landlords, professional money lenders, relatives and friends. Commercial banks are increasing their lending to small farmers, but farmers feel that the amount of time required to secure loans (usually three weeks) and the cost of travel to follow-up on applications makes commercial credit unattractive even though loans are interest-free.

4. Sind : Naulakhi/Sehra

The Naulakhi/Sehra sub-project area in Sind is commanded by the Sehra and Naulakhi Branches of the Rohri Canal. The Rohri is a perennial canal, and its commanded area is considered to be the most fertile region in the province with a consequent high degree of agricultural activity concentrated here.

About two-thirds of the farms in the sub-project area are tenant-operated, by far the highest proportion of tenant-operated farms (and the smallest proportion of owner-operated farms) in any CWM sub-project area. Farming in Sind is a matter of social prestige for the Sindhi landowner (Vadera). Even small landowners with marginally economic holdings prefer to have their farms operated by sharecropper tenants or haris. Sharecropping or tenant farming is part of a long-existing aristocratic system in Sind, and the hari is a fixture of the social fabric of the rural community here. There is a close, interdependent relationship between tenant and landlord, especially strong in the case of small and medium size Vaderas.

The Sind Tenancy Act of 1975 specified that all tenants who have cultivated the same unit of land for 3 years can claim permanent occupancy rights to that unit and cannot be ejected from it by the landlord. To circumvent the legal ceiling on individual farm size established by the Tenancy Act, landlords have sub-divided their holdings into smaller units and registered them under the names of other family members. In addition, landlords now commonly shift their haris from one unit of land to another about every two years. Consequently, large Vaderas have retained their control of substantial acreages. And throughout the Sind sub-project area, haris have not acquired permanent occupancy rights to land for which the law provides even though the same tenant families have been cultivating the lands of the same landlord families for many years, even generations.

Decisions regarding the use of land in tenant-operated farms are made by the landlord, who also determines when and where irrigation water will be used on his land. Continued landlord control over the water resource is implicitly reaffirmed by the Sind Water Users' Association Ordinance which permits only landowners to be members of legally constituted WUAs. Landlords and tenants share equally the costs of land preparation (if tractors are used), fertilizer and insecticides. Landlords usually provide seed and pay all taxes and water charges while the hari must meet any need for animal power and covers all harvesting expenses. In the latter instance, tenants typically must arrange for additional casual labor either against the higher wage rates which prevail at the time of peak labor demands, or from neighbors, friends and/or relatives on the basis of reciprocated "mutual help."

Crop production is shared on a 50-50 basis between the landowner and tenant. Purchased farm inputs and any loans for harvesting or personal family needs are deducted from the hari's share. Cash crops (e.g., sugarcane, cotton) are sold to government or private traders, and the hari receives cash, less deductions, for his share of these crops. In the case of such food crops as rice, wheat or maize, the hari typically will retain a small portion for family consumption and sell the balance remaining, although the amount retained for consumption is rarely sufficient to meet family needs through the entire following season. Thus haris usually must approach the landlord for a loan of food grain or cash to purchase additional food. Such advances customarily are interest-free.

Tenant farming is not the only source of income for a hari family, most of whom also own several head of livestock--buffalos, cows, sheep and goats. These animals produce marketable products and are an important supplementary income source. A hari's livestock is fed fodder produced on the farm and is pastured on the lands of the Vaderas as well. Indeed, there often is a degree of tension between the tenant farmer's preference to produce more fodder for his livestock, and the landlord's desire to increase the area under cash and food crops.

Haris have and do exercise the option to change landlords, and there is a reported increase in the frequency of this activity. Such a move is often a consequence of a hari requesting a substantial interest-free, long-term cash loan from his landlord. Because of the social prestige that accrues to a Vadera who does not actively cultivate his own land and the fact that there are always a number of landlords seeking new or additional haris, it is often possible for a hari whose request for such a loan is refused to abandon his tenancy for a sharecropping arrangement with another landlord who is prepared to meet his demand for a long-term cash advance. Rarely, however, will a hari make such a change if it involves a move to another district of Sind. Haris are also, however, vulnerable to displacement from their tenancies as larger landlords gradually move to the increased mechanization of their agricultural operations.

DRAFT PROJECT AMENDMENT DESCRIPTION FOR PROJECT AGREEMENT AMENDMENT

A. Project Goal and Purpose

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 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.

B. Project Amendment Description

This Project Amendment describes the activities which will be financed by A.I.D. under the CWM component of the ISM Project. The CWM component is closely related to the rehabilitation works, institutional improvement, and research components of the parent ISM Project. The latter three project components will lay the foundation for the improved delivery of water through the canal system. Efficient and effective operation, maintenance, and management of the irrigation system are essential to implement a strategy aimed at improving the productivity of the land and water resources in Pakistan. The CWM Program will provide the basis for all relevant agencies to cooperate, with the active participation of water users, to match water supplies with crop requirements and to provide other necessary inputs and services in a coordinated and timely manner in order to increase agricultural productivity.

As is the case for the on-going ISM Project, the CWM component constitutes A.I.D.'s contribution to a Program which was collaboratively designed with and will be co-financed by the World Bank (IBRD) through its International Development Association (IDA) affiliate under the IBRD/IDA CWM Project. The specific objectives of the CWM Program are to:

1. 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;

2. 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;

3. 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,

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

The CWM approach will introduce three new elements to the management of the irrigation system in Pakistan: (1) increased farmer participation in the planning and management of the irrigation system; (2) coordinated institutional, physical and operational improvements in specific sections of the command areas; and, (3) the creation of a single entity, the Sub-Project Management Office, to be the focus for the coordinated delivery of water and non-water inputs to increase agricultural production.

CWM Program activities will be carried out in seven sub-project areas in all four provinces. Over 700,000 people live in the sub-project areas, which are very different agro-climatically and socio-culturally. Each 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. Sub-project areas are also referred to as "command areas". IBRD/IDA will finance the rehabilitation and remodelling of the canals that serve the seven command areas as well as improvements to surface and sub-surface drainage in each sub-project area. A.I.D. will finance rehabilitation of watercourses and other down-stream physical improvements and will provide technical assistance and training to examine the feasibility and replicability of the CWM approach for the improved management of water and non-water inputs.

CWM builds on approaches that have already proved effective and popular (i.e. the creation of Water Users Associations to facilitate watercourse improvements, started under the A.I.D.-financed On-Farm Water Management Project) to establish new institutions and strengthen existing organizations. Sub-Project Management Offices (SMOs) will be established to implement CWM activities. They will be supported at the provincial level by Policy Committees and at the local level by Sub-Project Coordinating Committees. SMOs will be further assisted by consultant teams already under contract under the parent ISM project as well as by a CWM Technical Assistance Team of expatriate and Pakistani specialists; a team from the Water Management Synthesis II Project; and, local supervisory consultants. With this assistance, SMOs will work on a section by section basis (each section typically defined as the area served by a given minor), preparing plans and implementing physical and

operational improvements. They will also encourage Water Users Associations (WUAs) to adopt new roles and responsibilities and to join in section federations and command-wide councils to provide farmers with organizations through which to express their needs and views. Each SMO will have a Planning, Monitoring and Evaluation Unit, which will gather baseline data and monitor progress for all CWM activities in its sub-project area. External researchers, drawn from local universities and private groups, will be hired to conduct studies and evaluations on particular issues that arise during implementation.

Farmer beneficiaries include large and small land owners, owners-cum-tenants, and tenants, farming at subsistence level, or producing small marketable surpluses or large cash crops. The Project will involve Government workers at all levels, from the Additional Chief Secretary for Planning and Development and the Secretaries of Irrigation, Agriculture, and Finance in each province, who will comprise the Provincial Policy Committees, to the Field Assistants of the On-Farm Water Management and Extension Directorates, who will be working directly with Water Users Associations. The private sector, i.e. agricultural input suppliers, sources of formal and informal credit, and agricultural commodity buyers, will also play a major role and will be represented on the Sub-Project Coordinating Committees.

C. Illustrative Implementation Plan

The CWM project component will be implemented in two Phases: (1) a Preliminary Phase, that started in October 1984; and, (2) an Implementation Phase, beginning in the spring of 1985.

1. Preliminary Phase

In October 1984, six PID officials from the sub-project areas were sent to the U.S. for training in irrigation systems operations. The training of SMO staff is scheduled to begin in February/March 1985. In addition, a series of six-week courses dealing with farmer organization will be presented beginning in February/March 1985 to extension, OFWM and rural development staff currently employed in sub-project areas. WMS II Contractor staff will design and conduct the initial courses for both types of training, starting in the Preliminary Phase, and the CWM T.A. Team will assist with these courses during the Implementation Phase. A two-week module on farmer organization development will also be added to the regular four to six week curricula offered by the Punjab OFWM Training Institute to field workers (i.e. Agriculture Officers and Field Assistants from the OFWM and Extension Directorates). The multi-disciplinary team to be provided under the WMS II Project is expected to begin work on a detailed analysis of the irrigation system in one of the sub-project areas in March 1985 and will be assisted in this effort by a local organization. Staff in USAID's Office of Agriculture and Rural Development (O/ARD) have begun collecting socio-economic data in the sub-project areas to supplement WAPDA's CWM Feasibility Study. This

baseline data collection effort will be continued by the SMOs' Planning, Monitoring and Evaluation Units with the assistance of the WMS II Contractor's team, once the latter arrives in-country.

A January 1985 study tour/workshop has been planned by the WMS II Contractor for fifteen provincial, federal and university officials. The tour will include visits to Sri Lanka and India or Egypt to examine irrigation command area-based projects and associated farmer organizations. Two one-week workshops, one before and one after the study tour, are an integral part of this training effort. Major objectives of the workshops and study tour will be to increase understanding of CWM concepts, the need for farmer involvement, and the need to make organizational changes as CWM enters the Implementation Phase. Additional seminars will be held in each province and materials prepared and disseminated to increase the understanding and acceptance of CWM concepts by senior officials. The ISM Planning and Management Team will assist in these efforts.

2. Implementation Phase

After an initial nine-month period lasting from about January/February to September/October 1985, during which technical assistance and commodities will be procured, and SMOs will be established, the schedule of most CWM activities will follow an annual planning cycle.

a. Nine-Month Start-Up Period

Nine months after the ISM/CWM PP Amendment is authorized, the following activities are expected to have been completed:

i. SMOs established and equipped with vehicles and other commodities (to be financed by the IBRD CWM Project);

ii. CWM T.A. Team selected and in-country;

iii. Pakistani WUA Development Specialists hired and in place at SMOs;

iv. Sections averaging 20 watercourses selected within each sub-project area for first year CWM activities;

v. Supervisory consultants contracted;

vi. Interim report on diagnostic analysis submitted by WMS II Contract Team; and,

vii. Provincial Policy Committees and Sub-Project Coordinating Committees constituted and at least one formal meeting held for each.

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b. Annual Planning, Implementation, Monitoring and Evaluation Cycle

The CWM design calls for activities to be focused on sections of sub-project areas each year. These sections would typically comprise the area commanded by all the watercourses on a given minor. The choice of the sections to receive initial attention will be determined by plans for upstream improvements to be undertaken by the IBRD CWM Project as well as site-specific physical, social and economic considerations. The SMOs, PIDs and OFWM Directorates will be responsible for site selection, with the concurrence of the Provincial Policy Committees and USAID. In subsequent years, adjacent minor command areas will be developed until the entire sub-project area has received attention.

i. WUA Formation

Following OFWM practice, the CWM design calls for WUAs to be formed as a precondition for watercourse improvement. The new element which will be emphasized under the CWM Program is the encouragement of WUA activities beyond physical improvements to include maintenance, water management, and management of non-water inputs.

In each sub-project area, the SMO Manager will establish a plan for WUA formation for all farmers operating in the given command area. He will look to the WUA Development Specialists, the CWM T.A. Team Institutional Development Specialists, local leaders and field workers to apprise him of socio-cultural and tenurial issues that may affect implementation of the plan. Involving local leaders and commission agents in planning for WUA development is likely to ensure their collaboration in implementation. Monitoring of issues that arise during and after watercourse improvement will be the primary responsibility of the WUA Development Specialists who will rely heavily on the PME Units of the SMOs to record and analyze information. Universities and/or private groups will be contracted to undertake specific evaluations of issues that arise during WUA formation. Expatriate Institutional Development Specialists on the CWM T.A. Team will assist at each phase of WUA formation.

ii. Watercourse Physical Improvements

The SMO Manager will have primary responsibility for preparing and securing approval from Provincial Policy Committees and USAID for annual physical improvement plans. Technical inputs will be provided by the PIDs, the OFWM Directorates, and the CWM T.A. Team Irrigation Operations Specialists. Farmers, through their WUAs, will also contribute to the formulation of annual plans. They will be assisted by the local WUA Development Specialists and expatriate Institutional Development Specialists.

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Implementation of watercourse improvements will be the job of the OFWM Directorates, using WUA members' labor. The Supervisory Consultants will monitor the quality of physical improvements. Monitoring of post-improvement activities, especially maintenance, will be the primary responsibility of the Provincial Agricultural Departments. Field Assistants and the WUA Development Specialists will work with WUAs to motivate them to undertake maintenance activities. Evaluation of completed improvements will be made by the Supervisory Consultants, who will certify work prior to reimbursement by USAID.

iii. Water Management Improvements

The diagnostic analysis of the irrigation system in one of the sub-project areas, started in the Preliminary Phase, will continue into the first year of the annual planning and implementation cycle. Once field work is completed, the WMS II Team will present the SMO Manager with an operational plan for the management of his sub-project area, which will be implemented during the subsequent years. At the same time, the Team will present a methodology for replication of the diagnostic analysis and the preparation of operational plans in the other six CWM sites. SMO Managers and SMO/WM Unit staff will be intensively trained by WMS II contract personnel, and will start implementing improvements upon completion of their training, with the assistance of the CWM T.A. Team, the line departments, WUAs, and field assistants.

The diagnostic analysis is designed to give managers an operational plan for the entire sub-project area; the total command perspective will provide the context for physical and management improvements that will be made in localized areas (minor commands) on an annual basis. The operational plans will be approved by the Provincial Policy Committees, USAID, and the Sub-Project Coordinating Committees. The latter will be responsible, during implementation, for ensuring that appropriate line departments do their work in a coordinated and timely fashion. Monitoring of operational improvements will be the responsibility of the SMO/WM Units, assisted by the CWM T.A. Team, farmers and field workers. Evaluations undertaken by local universities or private organizations will provide recommendations for resolving any issues that arise. As WUAs are formed and physical improvements implemented, the SMO/WM Units, with assistance from line departments, farmers and CWM T.A. Team members, will assist in implementing plans for improved water delivery and management. WUA Development Specialists will provide guidance on how improvements can be used as incentives for strengthening farmer participation in WUAs.

iv. Reporting Requirements

All annual plans will be approved by the PPCs, SCCs, and USAID. Thereafter, the SMOs will be responsible for submitting quarterly and annual reports to their respective PPCs, SCCs, and USAID, showing progress towards achievement of plan targets, highlighting problems and making recommendations to overcome constraints. Members of the CWM T.A. Team will help SMOs in the preparation of reports.

v. Formal Evaluation Schedule

Formal external project evaluations will be scheduled towards the end of year 3 and year 5. SMO staff and CWM T.A. Team members will assist in preparing scopes of work for each evaluation and will serve as resource personnel for the evaluations.

D. A.I.D. and GOP Responsibilities

1. A.I.D. Responsibilities

A.I.D. will be responsible for:

a. contracting with the long-term CWM T.A. team, the local Supervisory Consultants, local universities and/or private groups chosen to undertake impact evaluations and other studies, and the multi-disciplinary team under the WMS II Project;

b. purchasing vehicles for advisors and other commodities;

c. approving civil works and reimbursement under the FAR system;

d. arranging for long-term and short-term overseas training;

e. providing sufficient staff to participate in scheduled evaluations; and,

f. coordinating with the appropriate government agencies in the implementation of this project.

2. GOP Responsibilities

a. Federal Government

The principal Federal organization with responsibility for CWM activities is the Ministry of Water and Power. Responsible officials of that Ministry will:

i. secure support for the CWM approach in the relevant Federal ministries including Finance and Agriculture;

ii. facilitate exchanges of information among the four Provincial Policy Committees;

iii. assist A.I.D., IBRD and the Provincial Policy Committees to monitor and evaluate the impact of the A.I.D. and IBRD-funded CWM Projects; and,

iv. submit requests for approvals of civil works schemes and reimbursement requests from SMOs to A.I.D.

b. Provincial Government Responsibilities

The Provincial Governments, through their line agencies in the Departments of Irrigation and Agriculture, will be responsible for implementation and operation of the sub-project activities financed by the IBRD and A.I.D. that take place in their jurisdictions. To carry out this responsibility, the following new entities will be established.

i. Provincial Policy Committees

Each province will establish a Provincial Policy Committee (PPC) to be chaired by the Additional Chief Secretary for Planning and Development, and with the Secretaries of Agriculture, Irrigation and Finance as members. The Additional Chief Secretary for Planning and Development will be responsible for monitoring and reporting on the use of Project funds in his Province. The PPCs will:

(1) formulate policies to realize the CWM goal and purpose and resolve differences among line departments;

(2) coordinate line department inputs at the provincial level and oversight at the sub-project level;

(3) review, revise as appropriate and sanction annual work plans prepared by the SMOs;

(4) program provincial department and private sector inputs in line with the sanctioned annual work plans; and,

(5) review, at least quarterly, the status of CWM activities in their jurisdictions, identifying constraints to the meeting of physical and institutional targets, and taking remedial action as necessary.

ii. Sub-Project Management Offices

Implementation of CWM activities at the sub-project level will be undertaken by Sub-Project Management Offices (SMOs) to be established in each sub-project area. The overall responsibilities of the SMOs will be to:

(1) transform PPC policy guidelines and directives into specific objectives and measurable inputs and outputs;

(2) plan and schedule activities to achieve the desired outputs; and,

(3) establish and manage a monitoring and evaluation program to provide continuous information on the status of activities.

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Each SMO will have the following specific responsibilities:

(1) preparation of an annual work plan for each sub-project area and obtaining its sanction by the Sub-Project Coordinating Committees (see below) and the PPCs;

(2) preparation of quarterly and annual progress reports;

(3) conceptual review of civil works schemes prepared by OFWM Directorates and submission of these to A.I.D. through the Ministry of Water and Power; and,

(4) development of a training plan.

iii. Sub-Project Coordinating Committees

Provincial governments will establish a Sub-Project Coordinating Committee (SCC) for each sub-project to be chaired by the SMO Manager. Membership will include representatives from the PIDs, the Extension and OFWM Directorates, and the WUAs. Suppliers of non-water inputs and credit also may be invited to participate in planning activities. The SCCs will be responsible for coordinating line department and private sector delivery of inputs and services in accordance with the sanctioned annual operational work plan.

ILLUSTRATIVE

SUMMARY OF TOTAL PROJECT COSTS BY PROJECT COMPONENT AND SOURCE OF FUNDING a/
(In $ 000)

PROJECT COMPONENT b/	CUMULATIVE FY1983, FY1984 AND FY1985 TO DATE				LIFE OF PROJECT FUNDING			
	A.I.D. GRANT	GOP c/	IBRD/IDA e/	TOTAL	A.I.D.d/ GRANT	GOP c/	IBRD/IDA e/	TOTAL
1. Rehabilitation Works	12,944	17,300	30,970	61,214	16,474	17,300	40,000	73,774
2. General Institutional Improvement	23,204	2,000	-	25,204	23,204	2,992	-	26,196
3. Water Management Research	16,546	5,000	-	21,546	18,549	7,538	-	26,087
4. Command Water Management	15,206	4,890	10,318	30,414	31,773	9,300	46,500	87,573
TOTAL	67,900	29,190	41,288	138,378	90,000	37,130	86,500	213,630

a/ Does not include approximately $38 million under the A.I.D.-financed Agricultural Commodities and Equipment Program (391-0468) for earthmoving and workshop equipment and spare parts and hydraulic measurement and research equipment for use in this Project, subject to the availability of funds to A.I.D. for this purpose.

b/ Includes funding for technical assistance, training, commodities, civil works, other costs, and contingency, as appropriate.

c/ Expressed as dollar equivalents at the exchange rate of US $1.00 = Rs 14.50.

d/ Subject to the availability of funds to A.I.D. for this purpose and to the mutual agreement of the parties to proceed at the time of each subsequent increment.

e/ Includes both IBRD/IDA-funded Irrigation Systems Rehabilitation and CWM Projects.

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Project Location	Pakistan
Project Title and Number	Irrigation Systems Management, (391-0467) - Command Water Management Component
Funding	A.I.D. : $90 million (of which CWM=$31.8 million) IBRD/IDA: $86.5 million (of which CWM=$46.5 million) GOP: the equivalent of $37.2 million (of which CWM=$9.3 million)
Life of Project:	FY 1985 - FY 1990
IEE Prepared by	Kenneth P. Lue Phang, Environmental Officer, Office of Energy and Environment and Jalil U. Ahmad, Water Resources Specialist, Office of Agriculture and Rural Development, USAID/Pakistan, Islamabad
Environmental Action Recommended	Negative Determination
Mission Director's Concurrence	Signature: _____ Donor M. Lion Date: 3 Feb. 1985
Decision of Environmental Officer of the Bureau for ASIA	Approved: _____ Disapproved: _____ Date: _____

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I. CWM Project Component Description

The Command Water Management (CWM) Program involves the strengthened management of existing institutions, infrastructure, agricultural inputs and services in order to efficiently remove major constraints to irrigated agricultural production in selected sub-project areas. In irrigated areas, the adequacy and reliability of the water supply are the key to agricultural production. Small farmers cannot afford the risk of applying expensive inputs unless they are assured of reliable supply. Hence, under CWM, improvements and strengthened management of the irrigation infrastructure are emphasized in association with improved deliveries of non-water inputs and services. Whereas the parent ISM project involves a broad effort encompassing the entire irrigation and drainage system network, major policy issues, management approaches, planning strategies, and research, the CWM Project component will center on the selected pilot areas in terms of the physical improvement of water delivery systems and strengthening of the institutional framework needed to achieve substantial increases in the agricultural production, incomes, and productivity of individual farm families by integrating all inputs and services.

Altogether, there are seven sub-project areas - four in the Punjab and one each in Baluchistan, NWFP, and Sind provinces. All of these sub-projects, except Las Bela (Baluchistan), are located in the Indus River Basin and are served by the Indus Irrigation System. Las Bela is located near Karachi and received its first water delivery in 1984 from the Hub River Dam. The sub-projects cover a range of agro-climatic conditions characteristic of the Indus Plain. These sub-projects comprise about 614,000 acres, with about 510,000 acres being commanded by irrigation canals, as follows:

Province/ Sub-project	Irrigation Canal Command	Gross Area (000 Acres)	Command Area (000 Acres)
Punjab			
1. Pakpattan	3R, 3AR, 4R, 5R, and 6R distributaries of Pakpattan Canal	119	97
2. Shahkot	Shahkot distributary of Lower Chanab Canal	63	49
3. 6-R	6-R distributary of Hakra Branch of Eastern Sadiqia Canal	133	104
4. Niazbeg	Niazbeg distributary of Lahore Branch of BRBD Link	45	41
		(360)	(291)

Province/ Sub-project	Irrigation Canal Command	Gross Area (000 Acres)	Command Area (000 Acres)
Sind			
5. Sehra-Naulakhi	Sehra and Naulakhi Branches of Rohri Canal	165	164
NWFP			
6. Warsak	Warsak Lift Canal	55	43
Baluchistan			
7. Las Bela	Las Bela Branch of Hub River Canal	34	12 a/
		614	510

a/ Limited to upper five minors

Various kinds of improvements are needed in all sub-project areas in order to accomplish project objectives. These include the following:

- Agricultural production cannot be substantially increased through improved water management and scheduling until physical bottlenecks such as deteriorated canals and watercourses, ineffective surface drains, and waterlogging are removed.

- Inequities in water delivery cannot be reduced without restoring the capability of canals and watercourses to deliver water to tail reaches, and, in some cases, improving canal outlets.

- The farmer's role in managing water and other inputs cannot be effectively strengthened without his being convinced that physical constraints to water delivery and management are being removed.

Works to be completed under the CWM Program are discussed below:

A. On-Farm Improvements (A.I.D.-Funded)

During implementation, priority physical constraints will be identified with farmer participation. Rehabilitation of watercourses will include concrete or brick lining of 15-50 percent of the total length, earthen improvement of the remaining 50-85 percent, turnout structures, culverts, and buffalo baths. It is estimated that watercourse improvement will result in an annual savings of 237,000 acre feet of water.

Construction of field drainage systems will be undertaken in watercourse command areas where crops are often damaged by standing water. These activities must be coordinated with work on the surface drainage system (see "B" below). Farmers will contribute labor for this work, with engineering advice provided by OFWM field teams.

Where irregular shaped landholdings result in inefficient distribution of water, means other than improving the watercourse in its existing alignment will be sought to overcome this problem. Realignment of the watercourse may be feasible by acquisition of rights of way for critical reaches, or by land consolidation by willing landowners. Realignment of watercourses (replacing one watercourse with two) may also be required where the size of a watercourse command area needs to be reduced.

Precision land leveling will be completed on an estimated 20,000 acres, resulting in improved farm irrigation application efficiency. Further, there will be about 1,000 demonstration plots, within chaks where OFWM improvements are made, to show farmers effective management of water and non-water inputs.

In Las Bela, it may be found that non-traditional irrigation systems are appropriate. These might include pipelines and, after testing on a limited pilot basis, sprinklet or drip systems. Drip irrigation will also be considered in Shahkot and 6-R sub-projects. In these areas, applying saline groundwater through drip systems on salt tolerant crops may be found to be feasible.

Construction of small reservoirs near or on farms may also be undertaken in some sub-project areas. These will be designed to permit storage of water deliveries during short periods when water is not required, for utilization when needed.

Construction of tubewells under WUA ownership may provide needed incentives for farmer involvement. This may also be found to be a feasible OFWM improvement for funding by A.I.D.

B. Canal System Rehabilitation and Remodeling (IBRD/IDA Funded)

Canal system rehabilitation will primarily include repairs to structures, desilting, and strengthening of embankments to safeguard against breaches and facilitate equitable distribution. Such rehabilitation is needed in varying degrees in portions of all seven sub-projects. The Warsak sub-project in the NWFP will require repairs to the lined portion of the canal as well as earthen section rehabilitation. Construction of super passages for safe conveyance of flood water and debris from hill torents across the upper reaches of the canal will also be required.

Certain canals will require remodeling, including improvements to structures and change of gradient, with consequent changes in location, to enable more efficient service of the command area. Such remodeling may require land acquisition depending upon the extent of alignment relocation required. On a limited scale, remodeling may include the installation of automated water control structures in order to meet water management requirements.

Remodeling of outlets in all of the sub-projects will be necessary to improve their efficiency, including better control of the outlets in the upper reaches to enhance delivery to the tail-end users. In cases where continuous watercourse flows cause damage to crops due to insufficient drainage or to meet similar water management needs, gating of outlets will be considered.

Certain sections of minors and smaller distributaries will require lining to reduce the excessive seepage losses being experienced now. Recovery of such losses either for irrigation purposes or to prevent waterlogging would require capital investment and energy costs for pumping facilities. It is estimated that about 50,000 acre-feet of water annually would be saved by this lining.

C. Sub-surface and Surface Drainage (IBRD/IDA-Funded)

The sub-surface drainage problems are acute in the 6-R and Lower Shahkot sub-projects in Punjab Province. Drainage tubewells and disposal channels will be required in the 6-R and Lower Shahkot sub-projects, as well as low lift pumping units and an interceptor drain in 6-R. Lower Shahkot is located within the SCARP-I Project, but existing drainage tubewells are operating at sub-optimum levels and many need to be repaired or replaced. Drainage problems in the sub-projects in Sind Province are not severe. Moreover, they are within SCARP Rohri North Project areas.

Surface drains will be provided to serve as outlets for sub-surface drainage effluent from Shahkot and 6-R sub-projects, and for disposal of excess storm water for most sub-projects, with Shahkot, 6-R, Warsak, and Las Bela having the greatest need. Investigations during project implementation will determine whether there is a need to extend drains to watercourse command areas where improvements are made.

II. Description of Environmental Impact

A. Land Use

There will be little or no change in the landscape since no new canals or drains will be constructed. It is possible that under the IBRD/IDA component, some canals may be realigned to a very limited extent. A.I.D. may also finance, on a limited basis, realignment of watercourses. This would have no adverse effect on land use.

B. Water

There will be no detrimental change in the physical, chemical or biological state of water. In most cases, the availability and flow rates of water will increase as a result of reduction of seepage losses in the delivery system due to lining of distributaries, minors, and watercourses. As a result of the Project, the canal water will be carried more safely than at present. The incidence of canal breaches and accumulation of water at undesirable places in the conveyance system will be reduced. Therefore, the Project will have a positive effect on the environment.

Efforts will be made under the Project to promote the conjunctive use of surface and groundwater to meet irrigation water requirements and to address waterlogging and salinity problems. In some areas, groundwater is used for drinking purposes. Depending upon the requirement of groundwater pumpage in a particular time period, in areas where saline groundwater lies beneath a level of good quality water from which drinking water is pumped, it is conceivable that the water table would be significantly lowered. This could result in increased salinity of the drinking water. However, by careful monitoring of ground water levels and by proper scheduling of ground water pumpage for multipurpose uses, in conjunction with surface water supplies, the chances of excessive drawdown of wells can be controlled during operation. Hence, the negative impact on the environment can be completely eliminated.

IBRD/IDA-funded sub-surface drainage activities will result in pumping water with a salinity level that is not suitable for irrigation. Such effluent from the 6-R project will be disposed of in a desert evaporation pond. Effluent from the Shahkot sub-project area will be conveyed to the surface drainage system.

C. Flora and Fauna

The Project includes construction of a few buffalo baths, in which cows and water buffalos can easily wallow without damaging canals and watercourses. The Project will not have any other impact on the flora and fauna in the sub-project areas.

D. Social and Economic Effects

The major objective of the CWM Program is to demonstrate the effectiveness and replicability of an approach to increase agricultural production and farmer income by physical improvement of the water delivery system and providing the institutional framework needed to integrate all water and non-water inputs and services. The Program should, therefore, result in substantial increases in agricultural production in the 510,000 acres included in the seven sub-projects, with concomitant favorable social and economic benefits to the population.

III. Recommendation

The CWM Project component will have no adverse effect on the environment. In fact, the social and economic impact of the Project as well as the impact on land and water will be highly favorable. An environmental assessment is not required. It is, therefore, recommended that a Threshold Decision for a Negative Determination be approved.

CHECKLIST

A. Direct Changes - Questions 1-19 fit into the blank space in the following question:

Does the implementation of this proposal require or cause significant (insert question here) within the project area?

N 1. Change in capacity to support an abundance of different kinds of plants and animals.

N 2. Alteration of important microclimates.

Y 3. Change to specific places or routes which are of strategic biologic significance (such as breeding grounds, feeding areas, migration routes, winter or dry season range).
(Reduced stagnation & flooding)

Y 4. Alteration of supply, flows, or quality and location of waters.
(increased flow)

N 5. Alteration of surfaces, including vegetation, soils.

N 6. Alteration of air quality.

N 7. Modifications of flows or cycle of nutrients, (such as might be caused by devegetation, irrigation leaching, exports of food, cattle, minerals, applications of fertilizers etc.).

N 8. Changes affecting the susceptibility of soils to accelerated erosion.

N 9. Alteration of extant agricultural systems, especially in genetic diversity of crops, animals, and combinations thereof.

N 10. Changes to human population, including relocation, (such as resettlement, infrastructure, family planning, etc.).

N 11. Change in contexts which might affect transmission of diseases of man, animal, plants.

N 12. Changes in nutritional status of human population(s).

N 13. Change to the rates and quantities of concentrated energy transformation (such as fertilizer use, power generation, adoption of petroleum engine, etc.).

N 14. Changes to the rates and quantities of non-renewable resource use.

N 15. Transformation of uses of land which may be of cultural significance (such as holy places, cemeteries, supplemental fishing or hunting, or medicinal herb gathering).

Y (reduce flood hazard) 16. Changes which alter either the potential for environmental hazards or the capacity to cope with them.

Y (silt clearance) 17. Possibility that waste products from the proposed activities will be fully utilized, contained within the premises, or properly disposed of.

Y 18. Modification of capacity to utilize and distribute locally abundant resources, skills, information and materials.

N 19. Replacement of local land use systems of proven sustainability with others of questionable longevity.

B. Indirect Consequences - Although this section re-runs the previous topical questions, they are to be considered in a context of potential links to areas outside the immediate project region or site. Consideration should also be given to interrelationships between institutions and technology as they affect capacity to change in scale and intensity of environmental impacts.

Respond in the same way, with a Y, N or ? to the questions.
For areas or sectors outside the immediate or direct concern of the proposed project, are there significant probabilities that:

N 1. Some changes to habitats will alter capacity to support diverse and self-regulating sets of plant and animal population.

N 2. Alteration of lands of marginal productivity will affect their capacity to provide a broad array of ecosystem services (such as: watershed protection provides nutrient cycling, water quality maintenance, oxygen, gatherable products, and aesthetic satisfactions)?

N 3. Non-reversible commitments of biologic resources will occur?

N 4. There will be changes in the qualities, flow rates, and consumption of waters?

N 5. Change to the rates, quantities, containment and cycling routes of waste products, including agricultural byproducts, will occur.

N 6. There will be changes in the capacity of people to protect themselves from environmental hazards (such as disease transmission, flood, drought, cold, water pollution, pest populations, etc.). Farm family income will increase.

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N 7. The locations chosen for infrastructure development will alter values of lands or places so as to cause serious changes in intensities of use that in turn alter ecologic viability (such as: a road may lead to settlement near the borders of a previously protected forest, leading thus to unintentional destruction).

Y 8. Change to regional relationships of resource allocation would require either changes to or coordination with another project or country.
(Irrigation Departments deliver water to sub-project areas)

N 9. Changes in food supply structure would create changes in nutrition, health and/or poverty levels?

Y 10. Given the circumstances of technology and social conditions, this proposal will be perceived as using the natural resources in a conservative and efficient manner? (Does the project sacrifice the long range options of one ethnic group or national class for the benefit of another? Or, are the long range options knowingly being traded off?)

N 11. Alterations of landscape will affect the character of places which have significance to the history, ethnic identity, aesthetic well-being or cultural continuity of the people(s) involved.

N 12. Serious commitment to high energy content inputs will alter social structures, marketing connections, political dependencies, agricultural systems and resource availabilities.

N/A 13. This project will assist people to organize sustainable health services and technology in relation to changes in environmental conditions, (such as diet, disease vectors, sanitation, shelter).

Y 14. The institutions developing from this proposal will have continuity of environmentally aware participant involvement in supervision and monitoring, including questions of conflict, both legal and political.

Y 15. The developments sought will contribute to the establishment of incentives to conservation of natural resources.

N 16. The project will create changes which may become national or international political controversies.

5C(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, ar criteria applicable to individual fur sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 481; FY 1985 Continuing Resolution Sec. 528. Has it been determined or certified to the Congress by the President that the government of the recipient country has failed to take adequate measures or steps to prevent narcotic and psychotropic drugs or other controlled substances (as listed in the schedules in section 202 of the Comprehensive Drug Abuse and Prevention Control Act of 1971) which are cultivated, produced or processed illicitly, in whole or in part, in such country or transported through such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully?

   It has not been so determined.

2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?

   We are aware of no such liability.

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3. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

We are aware of no such action.

4. FAA Sec. 620(a), 620(f), 620(D); FY 1985 Continuing Resolution Sec. 512 and 513. Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Syria, Vietnam, Libya, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver?

Recipient is not a Communist Country. Assistance will not be provided to other countries cited.

5. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property?

It has not.

6. FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC?

It has not.

7. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters?

It has not.

(b) If so, has any deduction required by the Fishermen's Protective Act been made?

N/A

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8. FAA Sec. 620(q); FY 1985 Continuing Resolution Sec. 518. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any AID loan to the country? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the appropriation bill (or continuing resolution) appropriates funds?

It has not.

It has not.

9. FAA SEC. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment? (Reference may be made to the annual "Taking Into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

Yes, taken into account at the time of approval of FY 1984 OYB and expect no change.

10. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

It has not.

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11. FAA Sec. 620(u) What is the payment status of the country's U.N. obligations? If the country is in arrears were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? (Reference may be made to the Taking into Consideration memo.)

U.N. has not determined country in arrears.

12. FAA Sec. 620A; FY 1985 Continuing Resolution Sec. 521. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual group which has committed an act of international terrorism? Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed a war crime?

We are aware of no such action.

13. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?

It does not.

14. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.)

F.A.A. Section 620E permits a special waiver which exists for Pakistan.

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15. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Assembly of the U.N. of Sept. 25 and 28, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the Taking into Consideration memo.)

It was so represented, but it disassociated itself from the Communique.

15. FY 1985 Continuing Resolution. If assistance is from the population functional account, does the country (or organization) include as part of its population planning programs involuntary abortion?

No.

16. FY 1985 Continuing Resolution Sec. 530. Has the recipient country been determined by the President to have engaged in a consistent pattern of opposition to the foreign policy of the United States?

No.

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

No.

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2. Economic Support fund Country Criteria

FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the country made such significant improvements in its human rights record that furnishing such assistance is in the national interest?

It has not been so determined.

LIST OF CONTRIBUTORS TO THE PROJECT PAPER AMENDMENT

A.I.D.

Mr. S. Khalil Ahmad	Financial Analyst, Office of Finance Management, USAID, Islamabad, Pakistan
Mr. Jalil U. Ahmad	Water Resources Specialist, Office of Agriculture and Rural Development USAID, Islamabad, Pakistan
Mr. John R. Anania	Asst. Agri. Development Officer,Office of Agriculture and Rural Development, USAID, Islamabad, Pakistan
Mr. Russel B. Backus	Asst. Agri. Development Officer, Office of Agriculture and Rural Development, USAID, Islamabad, Pakistan
Mr. M. Asif Bhattee	Program Assistant, Office of Agriculture and Rural Development, USAID, Islamabad, Pakistan
Mr. John S. Blackton	Chief, Office of Program, USAID, Islamabad, Pakistan
Mr. John H. Foster	Project Manager (Irrigation), Office of Agriculture and Rural Development, USAID, Islamabad, Pakistan
Mr. Richard H. Goldman	Deputy Chief, Office of Agricultural and Rural Development, USAID, Islamabad, Pakistan
Mr. Allen C. Hankins	Chief, Office of Agriculture and Rural Development, USAID, Islamabad, Pakistan
Dr. Linda N. Lion	Chief, Office of Project Development and Monitoring, USAID, Islamabad, Pakistan
Dr. Donor M. Lion	Director, USAID, Islamabad,Pakistan
Mr. Kenneth P. Lue Phang	Deputy Chief, Office of Engineering and Environment, USAID, Islamabad, Pakistan
Mr. Robert P. Mathia	Asst. Project Development Officer, Office of Project Development and Monitoring, USAID, Islamabad, Pakistan
Mr. Paul F. Mulligan	Program Economist, Office of Program, USAID, Islamabad, Pakistan

Mr. Stephen J. Spielman	Regional Legal Advisor, USAID, Islamabad, Pakistan
Mr. Jimmie Stone	Deputy Director, USAID, Islamabad, Pakistan
Mr. Tom L.Wilson	Agriculture Officer, Asia/TR/ARD, A.I.D., Washington, D.C.

Consultants

Dr. Wade H. Andrews	Rural Sociologist, Logan, Utah, USA
Mr. Leo A. Busch	Chief, Water Operations, Minidoka Project Office, Bureau of Reclamation, Burley, Idaho, USA
Dr. Marian Fuchs-Carsch	PSC Consultant
Mr. Thomas F. McCarthy	Management Advisor, PRC/Checchi, Islamabad, Pakistan
Dr. Kenneth C. Nobe	Institutions Development Specialist, Fort Collins, CO, USA
Dr. Dean F. Peterson	Professor Emeritus, College of Engineering, Department of Agriculture and Irrigation Engineering, Logan, Utah, USA
Dr. Edward J.Vander Velde	Associate Professor of Geography, Aquinas College, Grand Rapids, MI., USA

GOP

Mr. A. Wahab F. Shaikh	Secretary, Ministry of Water and Power, Islamabad
Mr. R.A. Akhund	Secretary, Ministry of Food, Agriculture and Cooperatives, Islamabad
Maj. Gen. Agha Manzoor Rauf	Additional Secretary (Water), Ministry of Water and Power, Islamabad
Mr. Manzur Ahmad	Additional Secretary, Ministry of Food Agriculture and Cooperatives, Islamabad
Mr. Navaid Ali Nasri	Joint Secretary (Water), Ministry of Water and Power, Islamabad

Ch. Altaf Hussain	Chief Engineering Advisor/Chairman, Federal Flood Commission, Ministry of Water and Power, Islamabad
Mr. A.M.H. Kango	Director General, Water Management Cell, Ministry of Food, Agriculture and Cooperatives, Islamabad
Mr. Ataur Rehman	Chief Engineer (Flood Control), Federal Flood commission, Ministry of Water and Power, Islamabad

Government of Sind

Mr. A. Rashid Sheikh	Secretary, Irrigation and Power Department, Karachi
Mr. A.G.N. Abbassi	Secretary, Department of Agriculture, Karachi

Government of NWFP

Mr. Abdul Rauf Khan	Secretary, Irrigation and Public Health Engineering Department, Peshawar
Mr. Faqir Mohammad Khan	Secretary, Department of Agriculture, Peshawar

Government of Punjab

Mr. Mian Masud Akhtar	Secretary, Irrigation and Power Department, Lahore
Mr. Amin Ullah Ch.	Secretary, Department of Agriculture, Lahore

Government of Baluchistan

Mr. Abdul Raziq Khan	Secretary, Irrigation and Power Department, Quetta
Brig. Mohammad Usman Hassan	Secretary, Agriculture, Cooperatives and Forestry Department, Quetta

VARIOUS APPROACHES TO THE STRENGTHENING OF WATER USERS ASSOCIATIONS

The sub-project areas are located in areas with very different socio-cultural conditions. As a result, different approaches will be required to encourage farmers to participate in WUAs on a sustained basis. The material presented below represents some initial thinking on models that might prove useful. The actual approaches to be adopted will be selected by the staff of the Sub-Project Management Offices, with help from the CWM TA Team and the locally-hired WUA development specialists.

1. Modification of OFWM Approach

One approach would be based on a partial modification of the current activity of the On-Farm Water Management Directorate (Punjab) in organizing WUAs as part of its existing program of watercourse improvement. This approach would involve OFWM Teams being supplemented by an additional cadre of Extension Field Assistants intensively trained in organization/institution-building and water management extension skills by the On-Farm Water Management Training Institute at Niazbeg or other OFWM training centers. Working initially in conjunction with the OFWM Team, each Field Assistant would be responsible for assisting WUA development, following a "bottom-up" strategy of working with farmers in advance of watercourse improvement to identify existing watercourse and water distribution problems, irrigation practices, and potential areas of dispute using a diagnostic analysis approach. This information would be used by the OFWM Team in developing a watercourse improvement plan with the WUA. After watercourse renovation, these FAs would continue with WUA-focused assistance and water management extension contact within a limited area (e.g. from 4 to 10 watercourses/WUA consisting of 200-600 farmers in 2-5 villages). This special cadre of FAs would remain in specific areas of assignment for a year or more. The duration of this assignment would depend on organizational and water distribution/management problems encountered in the area and the success achieved in resolving them and in strengthening WUA skills for on-going O&M and improved water management practices. Training would be arranged for the FAs who would be fielded three months in advance of the OFWM Teams.

2. Adaptation of Faisalabad Approach

A second approach would adopt and expand the program followed by the Water Management Research and Training Project for Rural Development, University of Agriculture, Faisalabad, in organizing Water Users Associations in the Shahkot research area over the past five years. Here, a specially-trained OFWM Team, with a strengthened AO and FA cadre, would organize farmers into Water Users Groups, registered as Cooperative Societies with the Cooperative Department. The Team would also plan and implement the proposed watercourse improvement program in conjunction with farmers using a "bottom-up" strategy and diagnostic analysis techniques. A significant element of this approach would be an intensive field-oriented training program based on the University Project Team's findings from its Shahkot experience, to increase the organizational, motivational, problem solving, and water management skills of the OFWM Team, particularly its Extension AO/FA members. Again, the AOs and FAs would be expected to continue to work with these "Cooperative Water Users Associations" in a specified limited area in an active supporting role for a sustained period of time. A major objective in testing this approach in a CWM sub-project area would be to determine whether or not an association of water users organized as a cooperative facilitated the establishment of stronger service delivery contact points for effectively linking both water and non-water agricultural inputs.

3. Village Resident Approach

A third approach would strengthen WUAs organized by an OFWM Team following the current practice in the Punjab. In this case, WUAs would be asked to identify a village resident (probably a young man with at least matric level education) who would be trained in basic watercourse O&M skills and procedures, e.g., record-keeping of water flows at the mogha, monitoring of farmer irrigation turnouts, identifying distribution and maintenance problems in the watercourse, scheduling and coordinating maintenance activities, tubewell O&M, etc. Such training would be done at the On-Farm Water Management Training Institute, Punjab, and a special, practical curriculum (intensive and field-based) would be developed for this purpose. This person would then be hired as a watercourse "manager" by the WUAs--typically two--in the village, with some percent (maybe 50%) of his salary paid by the WUAs and the rest paid by the Government through the OFWM Directorate. The watercourse manager would work for the WUAs in the village, and he would be assigned to work with an Extension FA. This FA would be effectively trained in institution-building and water management extension skills (in the same training course suggested for FAs in the first approach described above), and he would be responsible for assisting the watercourse manager in as many as 10 villages, particularly with the more technical matters of watercourse O&M and water management extension.

4. Approaches for NWFP and Baluchistan

An informal approach to organizing WUAs in the CWM sub-project area in the NWFP seems likely to be both more appropriate and more effective, recognizing the very different socio-cultural and agro-hydrologic environments that will be encountered there. WUAs do not exist as yet in either CWM sub-project area, although the OFWM Directorate, NWFP, through its OFWM Teams, has organized WUAs in World Bank, ADB and Mardan SCARP project areas. Only very limited experience in organizing WUAs is reported in Baluchistan. However, in Baluchistan Province, there is a long history of indigenous experience of localized water resource development for irrigated agriculture through informal, but highly effective water user groups, called the "karez associations."

a. NWFP Approach

In the NWFP, WUAs reportedly are organized through the Khans--traditional landlords and village chiefs--and essentially are grafted on to existing village social organizations. The OFWM Directorate reports substantial success with this approach, particularly for rapid WUA formation and subsequent watercourse improvement, and "good" watercourse maintenance after improvement has occurred. Nevertheless, there is evidence of a need to strengthen the capabilities of the OFWM Team to follow both a more participatory approach in developing the watercourse improvement plan and to continue to work intensively with these WUAs for a substantial period after watercourse improvement to strengthen their O&M and water management skills (e.g., to help change a "climate of violence" where water stealing is backed by force). The NWFP OFWM Directorate currently proposes to strengthen its post-watercourse improvement and water management extension activities in the World Bank, ADB, and Mardan SCARP project areas by fielding an additional one Extension AO and two Extension FAs for every 50 renovated watercourses. While it is too early to tell if this level of additional extension field staff would be sufficient to meet the objective of strengthened WUAs and sustained water management assistance, it seems reasonable to propose that at least the same level of additional extension staff, specifically trained to work with farmers in a "bottom-up" supporting mode, should be fielded to assist the OFWM Team in WUA development in both the pre and post-watercourse improvement phase for the Warsak Lift sub-project area. The approach there would be similar to the first approach proposed above with the notable difference being that WUAs would be less formalized, based upon the traditional social organization of the community.

b. Baluchistan Approach

In the Baluchistan CWM sub-project area, watercourses remain substantially undeveloped. Water availability is not yet a limiting factor, and farmers irrigate their fields whenever the need arises rather than following a formal or even informal warabandi. Nevertheless, water disputes between farmers within the command of a minor do occur, often when farmers attempt to irrigate their fields at the same time by diverting more than their share of water from the minor to what are essentially private watercourses. Landowners within each minor canal command have formed informal committees to settle these disputes and to informally allocate canal water to individuals or groups of farmers, reportedly with modest success. Such informal organizational initiatives by farmers in the Las Bela sub-project area will be strengthened and expanded, possibly by adapting the familiar indigenous "karez association" model to the canal irrigation environment, with the assistance of the OFWM Teams. These teams would be trained to work with farmers in a participatory framework to identify water distribution problems in the minor-watercourse system and existing irrigation practices, plan for minor and watercourse improvement, implement improvement plans and support WUAs in developing skills and experience in carrying out subsequent minor-watercourse O&M.

ILLUSTRATIVE LIST OF AID-FINANCED COMMODITIES FOR CWM PROGRAM

	Type	No.	Estimated Cost (In US $)	Source	Method of Procurement
A.	Vehicles				
	1. Station Wagons	7	50,000	Japan	USAID/Pakistan
	2. Jeeps	7	120,000	U.S.	USAID/Pakistan
B.	Household/Office Equipment/ Supplies	-	280,000	U.S.& Pakistan	USAID/Pakistan
C.	Water Management Equipment		500,000	U.S.	CWM T.A. Contractor under Direct A.I.D. Contract
	1. Computers (IBM PCs)	7			
	2. Flow Measurement Equipment				
	a. Price type AA current meters	7			
	b. Pygmy current meters	7			
	c. Stevens Type F water level recorders	42			
	3. Agro-Climatic Data Collection Equipment				
	a. Instrument shelter	7			
	b. Maximum and minimum thermometers	7			
	c. Anemometer	7			
	d. Eight-inch diameter precipitation gauge	7			
	e. Pyronometer	7			
	f. Evaporation station	7			
	g. Hydrothermograph	7			
	h. Sling psychrometer	7			
	i. Precipitation gauges (fence post type)	350			
	j. Maximum and minimum self-registering thermometers	350			
	4. Soil Moisture Monitoring Equipment				
	a. Neutron probes	14			
	b. Tube driving and pulling equipment	7			
	c. Tubing for probe sites (3500 feet)	-			
	d. Rapid soil moisture measurement kit	7			
	e. Balance scale	7			
	f. Soil hydrometer set	14			
	g. Oakfield soil probes	28			
	h. Two-inch soil augers	21			
	i. Three-inch soil augers	14			
D.	Training Materials & Equipment		250,000	U.S. & Pakistan	CWM T.A. Contractor under Direct A.I.D. Contract
	1. Audio-visual equipment	-			
	2. Library material	-			
	3. Farm implements	-			
	4. Classroom fixtures/furniture	-			
TOTAL ESTIMATED COST			1,200,000		

CREATING INCENTIVES AND RESPONSIBLITIES FOR WATER USERS ASSOCIATION PARTICIPATION

It is unlikely that the mere promise of increased benefits in the form of increased crop yields resulting from the coordination of agriculture extension activities, timely and enhanced supplies of inputs (improved seeds, fertilizers, insecticides), and irrigation extension efforts through Command Water Management will be a sufficient incentive for farmers to contribute the necessary time and effort to develop and sustain WUAs. Too many similar promises have been made to farmers in Pakistan, only to result in unfulfilled expectations. As a pilot project, CWM presents an unusual opportunity to address the important question of creating incentives necessary for farmers to want to continue to participate actively in WUAs on a sustained basis.

1. Insufficient Incentives

a. Watercourse Maintenance

Maintenance of watercourses is already a WUA responsibility. However, evaluations of WUA post-watercourse improvement O&M activities have clearly established that, in most instances, watercourse maintenance is not sustained and WUAs cease to function as formal organizations over time. Responsibility for watercourse O&M is therefore an insufficient incentive to ensure the long-term vitality and existence of the WUA. Allocating additional and meaningful on-going water control and water management responsibilities to WUAs will establish both a need for a continued organizational structure and a set of activities through which experience will be gained in strengthening that structure.

b. Watercourse Improvement

OFWM Project experience in Pakistan suggests that there is considerable demand for the watercourse improvement program, especially in the Punjab and Sind where, reportedly, demand for the program exceeds existing capability to fulfill it. Farmers now will "form a WUA" largely through their own initiative because it is a prerequisite to securing the watercourse improvement benefit and a place on the waiting list for the program. Under these circumstances, it is not surprising that the existence of such WUAs is tenuous, once the watercourse improvement is completed. The lesson of this experience is that farmers, particularly in an environment of both perceived and actual water scarcity, will organize and cooperate if it results in more water for them. What remains is to build on this knowledge by combining the prospect of more water with the responsibility for continuing to control and manage it.

2. Additional Incentives and Responsibilities

a. Control of Water Distribution

The most readily apparent combination of incentive and responsibility is farmer control of the water resource through a WUA at an appropriate point in the water distribution system. Traditionally in the Indus canal irrigation system, the Government, through its Irrigation Department, is responsible for the allocation and distribution of water through main and secondary canals to the watercourse turnout. In practice, this means that the formal warabandi cannot be changed without the approval of the PID, and such flexible water distribution activities between shareholders as trading irrigation turns or selling canal water are illegal. By and large, however, the exercise of government responsibility for water distribution below the mogha in the sarkari khal remains beyond the personnel and financial resources of the PID to carry out. Thus, de facto control of water distribution in the sarkari khal is exercised by large landowners in collaboration with local civil administrations. Farmers often trade and/or sell canal water from their irrigation turns, giving them a modest but significant water management flexibility in what is generally an inflexible system.

The CWM Program offers an opportunity to experiment on a controlled basis with eliminating this "gray area" of overlapping responsibility for actual water management and, simultaneously, to create an important incentive and responsibility for farmers to remain organized and active in a WUA. This experiment also would initiate the process of moving operational control of irrigation water by farmers up the distribution system, generally assumed to be a prerequisite for shifting system management from a supply-driven mode to a demand-driven mode, a stated objective of the ISM Project. In selected sub-project areas, WUAs wull be given formal responsibility for watercourse operations as well as maintenance functions. The WUA would thus have the opportunity to fix and adjust the warabandi as it saw fit to increase equity in water distribution among farmers (e.g., a WUA might find it desirable to initiate on a trial basis the so-called "reverse warabandi." The WUA would oversee and facilitate trading of irrigation turns and the sale of water among association members, mediating any disputes that might emerge from such activities). This activity cannot be readily and successfully initiated without the support of and assistance from the PID and the OFWM Directorate through its OFWM Team. A learning process approach that is carefully monitored and evaluated to provide feasible and timely solutions to problems that emerge will be needed.

b. Groundwater Development

Another water-related incentive for increased and continued farmer participation in WUAs concerns groundwater development. In those watercourse commands of selected CWM sub-project areas where public tubewells do not exist and where there are opportunities to develop the groundwater resources for conjunctive use, it may be feasible to assist WUAs in estasblishing

a WUA controlled and operated tubewell. (A pilot program along these lines is underway in 50 watercourse commands in the ADB-assisted OFWM project area in Punjab. Credit up to Rs 25,000 will be made available to each WUA on a surety basis through the Agriculture Development Bank of Pakistan for tubewell development at the head of the watercourse. This program may be a suitable model for implementation under the CWM Program). In this instance, the WUA would become a wholesaler of water to its membership to supplement insufficient canal irrigation supplies and create greater flexibility in meeting farmer water needs during critical periods of crop growth. The attractiveness of this activity is twofold: it would help solve farmer water supply and distribution problems, and it would require consistent, season-long WUA O&M activity.

c. Water Delivery Records

As part of the watercourse improvement program to be implemented in CWM sub-project areas, every watercourse should be provided with a simple and appropriate water measurement device so that daily water deliveries made to the watercourse can be monitored. An appropriate WUA activity would be to maintain a record of canal water deliveries to the mogha. Such water measurement data will be useful for WUAs (and, aggregated to the canal command level, for WUA federations) to monitor expected improvements in canal operations through PID main system management that are to be achieved through the ISM Project. Because collecting and recording such information is a tedious task, an important incentive for WUAs to carry out this activity would be the assurance from the PID that the information will be promptly used to correct water supply problems thus identified.

d. Water Tax Fund

In selected sub-project areas, it may be possible to adjust the water tax system so that a modest percentage of abiana is retained by the Sub-Project Manager. The use of these funds for water management-related activities would be decided by the WUA federation in conjunction with the Sub-Project Manager (e.g., they might be proportionately distributed to WUAs to pay a portion of the salary of a watercourse manager, or to repay loans received for WUA-owned tubewells developed through the program).

e. Water/Crop Planning

An additional WUA responsibility requiring continued organizational activity would be the provision of essential management information to the PID (e.g., expected seasonal cropping pattern in the chak) in exchange for the PID guaranteeing improved system scheduling reliability and predictability in water supplies. At the same time, the PID would agree to provide accurate and timely information on likely seasonal water availability to the canal command (or the chak), and in conjunction with Sub-Project Water Management Units, develop several appropriate cropping patterns that farmers in the chak could follow. A likely prerequisite to this activity is an improved WUA/OFWM/PID working relationship.

Moreover, this activity implies both a high level of knowledge of crop/water relationships and information management skills. Thus, it may be most appropriate for pilot implementation and testing in one or more selected sub-project areas at a later stage in the CWM Program to allow comparative evaluations against more usual practices to determine if gains achieved are worth the time and effort involved.

3. Introduction of Incentives and Responsibilities

It will not be possible to introduce these incentives and added WUA responsibilities in all CWM sub-project areas. Monitoring and evaluation will be needed over an extended time period. The introduction of incentives and responsibilities must be carefully coordinated with water user organization and canal rehabilitation activities. The order in which they have been discussed here is suggestive of the order in which they may be progressively introduced in the selected sub-project area(s), initiating the process with incentives and adding increased water management responsibilities as WUAs demonstrate increased capabilities to fulfill those they already have.

In addition to the likelihood that these incentives and additional responsibilities will attract greater farmer participation in WUAs and provide a wider range of activities that require more effective, on-going WUAs than now exists, they also advance the process of moving the private farm sector into a more active water management role within the canal irrigation system in Pakistan. The learning and experience gained by their implementation in the CWM Program will be important in creating the necessary conditions for moving this sector further up the system in critical O&M activities.

ORGANIZATIONAL STRUCTURE AND STAFFING OF LINE DEPARTMENTS IN THE CWM SUB-PROJECT AREAS [1]

A. Provincial Departments in General

Within each province, two departments have prime responsibility for inputs and services to irrigated agriculture: The Provincial Irrigation Department (PID) and the Provincial Agriculture Department (PAD).

1. Provincial Irrigation Departments

The distribution of surface water within and between canal systems and the operation of public tubewells are the responsibility of the PIDs. Each PID is organized according to the physical characteristics of the irrigation system to be operated and maintained. Table 1 shows the hierarchy of PIDs by position and level.

TABLE 1

Organizational Hierarchy of PIDs

Position	Level
Secretary	Province
Chief Engineer (CE)	Region
Superintending Engineer (SE)	Circle
Executive Engineer (XEN)	Division
Sub-Divisional Officer (SDO)	Sub-Division
Sub-Engineer (Overseer)	Section

[1] This annex is abstracted from a more detailed paper of the same title, on file at AID/Washington and USAID/Pakistan.

2. Provincial Agriculture Departments

The organizations within each PAD with direct involvement with irrigated agriculture are the Agricultural Extension and the On-Farm Water Management Directorates.

a. Agricultural Extension Directorate

Agricultural Extension is organized along civil administration boundary lines. Table 2 shows the hierarchy of a typical provincial agricultural extension directorate.

TABLE 2

Organizational Hierarchy of Agricultural Extension

Position	Level
Secretary of Agriculture	Province
Director-General (DGA)	Province
Director (DA) a/	Region
Deputy Director (DDA) b/	District
Extra Assistant Director (EADA)	Tehsil c/
Agricultural Officer (AO)	Markaz d/
Field Assistant (FA)	Union Council e/

a/ In NWFP and Baluchistan, there is only one Director for Agricultural Extension for each province.

b/ Subject-matter specialists are attached to the Office of the DDA.

c/ Four to five Markazes make up a Tehsil.

d/ Four to five Union Councils make up a Markaz.

e/ A Union Council is typically composed of 20-25 villages.

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b. On-Farm Water Management Directorate

There is considerable variation in the structure of the OFWM Directorates in the different provinces. Table 3 shows the organizational hierarchy for Punjab province.

TABLE 3

Organizational Hierarchy of Punjab OFWM Directorate

Position	Level
Secretary of Agriculture	Province
Director - General	Province
Field Directors	Region
Water Management Coordinators (WMC)	District
Water Management Specialists (WMS)	Tehsil
Field Teams	Tehsil and below

In the Punjab, a field team is composed of 16 people: one Water Management Specialist, two Water Management Officers, one Agricultural Officer, four Water Management Supervisors (sub-engineers), two Field Assistants and six Rod Men. There are 65 field teams in the Province.

Punjab is the site of the OFWM Training Institute, under a Director. The Institute trains field personnel in OFWM topics such as watercourse improvement, precision land leveling, irrigation agronomy and extension methods.

In the Sind, the OFWM Directorate is headed by a Director, assisted by six Deputies and with two Field Directors. Field teams in the Sind are composed of one Assistant Director (Team Leader), one Agricultural Officer, five Water Management Officers, one Field Assistant and a few Rod Men. There are 15 field teams in the Province.

The OFWM structure in the NWFP is similar to that in the Sind. A typical field team comprises an Assistant Director as Team Leader, one Agricultural Officer, two Water Management Officers, two Field Assistants, two Supervisors (sub-engineers) and six Rod Men. There are 19 field teams working in the NWFP.

In Baluchistan, a separate OFWM Directorate has yet to be developed. OFWM activities are implemented by a Deputy Director under the Director of Agricultural Extension.

B. Line Departments in the Sub-Project Areas

1. Punjab - Pakpattan

The Pakpattan sub-project area covers a cultivable command area (cca) of 97,000 acres, lying in the Vehari and Burewals tehsils of Vehari District in the Multan Division. At the field level, 3 Extension AOs, 15 Extension FAs and two OFWM teams are available to work with sub-project farmers.

2. Punjab - Shahkot

The Shahkot sub-project area covers a cca of 49,000 acres lying partly in the Sheikhpura and Jaranwala tehsils in Faisalabad Division. At the field level, 2 Extension AOs, 10 Extension FAs and two OFWM teams are available to work with sub-project farmers.

3. Punjab - 6R/Hakra

The 6R/Hakra sub-project area covers a cca of 104,000 acres, lying in Haroonabad tehsil in Bahawalpur Division. At the field level, 2 Extension AOs, 13 Extension FAs and one OFWM team are available to work with sub-project farmers.

4. Punjab - Niazbeg

The Niazbeg sub-project area covers a cca of 41,000 acres, lying in Chunian and Kasur tehsils in Lahore Division. At the field level, 2 Extension AOs, 8 Extension FAs and one OFWM team are available to work with sub-project farmers.

5. Sind - Sehra/Naulakhi

The Sehra/Naulakhi sub-project area is the largest of the seven, with a cca of 164,000 acres. It consists of two distinct, but contiguous units in the Kandiavo, Naushero Feroz and Moro talukas in the Hyderabad District. The area is served by an Extension Team of 8 AOs, 48 FAs, 15 Crop Reporters, one Statistical Investigator and 2 Pest Scouts. Additional staff at the District level also work in certain parts of the sub-project area. There are 3 OFWM teams operating in Sehra/Naulakhi.

6. NWFP - Warsak Lift

The Warsak Lift sub-project area covers a cca of 53,000 acres, lying in the Peshawar and Nowshera tehsils of Peshawar District. The agricultural extension activities in Warsak are handled by one AO and 6 FAs. There are currently no OFWM teams in the area.

7. Baluchistan - Las Bela

The Las Bela sub-project area covers a cca of about 12,000 acres in the Hub tehsil in the Makran Division. At the field level, there is only one Extension FA available to work with the farmers in the area.

PLANNING, DESIGN AND OPERATIONAL PLAN FOR MANAGEMENT OF IRRIGATION PROJECTS

Background

Irrigation Departments typically plan, design, operate and maintain most irrigation projects around the world. Diagnostic Analyses of irrigation projects in several countries suggest that these projects are planned to achieve one set of objectives, designed to achieve another set, and operated to achieve another entirely different set of objectives. In a number of countries, the design and operational objectives are actually contradictory.

Many projects are planned to distribute an equitable but inadequate amount of water to a large number of farmers. The projects, however, are operated to distribute an inequitable, excess amount of water to only a small number of farmers. Further, the projects were designed such that only inequitable amounts of water can be distributed.

Planning, design and operational objectives for irrigation projects are largely established by engineers. As a result, interdisciplinary planning objectives are not defined nor accomplished in the design and operational plan phases. The result is that social and organizational factors do not significantly affect either how many farmers are served by an outlet, and farmer preferences and abilities do not influence the methods and rules for water delivery. Crop needs are not realistically considered for their timing and volume requirements for water. Costs and returns to farmers are different from that assumed in the planning phase resulting in cropping patterns frequently different than planned. Last, the crops, soils and topography do not influence the type of field irrigation system assumed (commonly, no type is explicitly assumed but the choice left to the farmer) with the result that planned and designed water volumes, flow rates and durations are inappropriate. An interdisciplinary approach to planning, designing and developing operational plans for management of irrigation projects is needed.

The above factors have come to be recognized in Pakistan as the complex constraints to improved crop production. As a result the Revised Action Programme [1] suggested a Command Water Management (CWM) Programme for Pakistan. A CWM pilot project has now been planned for the integrated management of irrigated

[1] WAPDA 1979. Revised Action Programme for Irrigated Agriculture, Master Planning and Review Division, Water and Power Development Authority, Lahore (4 Volumes).

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agriculture in seven subproject areas in Pakistan. This paper describes the activities to be undertaken by the Water Management Synthesis II Project during the initial phase of the CWM pilot project.

Introduction

The Government of Pakistan, with assistance from USAID and the World Bank, is developing a number of programs in irrigation water management. An amendment to the Irrigation Systems Management Project is imminent under the title of Command Water Management (CWM). CWM has the concept of an integrated approach to increasing the productivity of irrigated agriculture on a command basis. Clyma and Sritharan [2] recently have presented concepts for the interdisciplinary planning for improvement of the management of an irrigation project. This activity will use the concepts described by Clyma and Sritharan [2] to identify needed improvements and develop an operational plan for management of one CWM subproject area. A field study of the subproject area will be conducted to identify the constraints and benefits of the present system through Diagnostic Analysis [3], the results of this study providing a basis for development of the operational plan. A methodology will then be described for applying these procedures to other subproject areas.

Objectives

The objectives of this study are as follows:

1. Identify existing practices that contribute to, and constraints that inhibit, improved crop production in a designated subproject area through Diagnostic Analysis.

2. Recommend priority physical and institutional improvements in one or two local areas (minor commands) in the subproject, most of which will be appropriate for the entire subproject area.

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[2] Clyma, W. and S. Sritharan, 1984. Planning, Design and Operational Plan for Management of Irrigation Projects. Paper prepared for the Senior Officials Workshop, January 1984, Islamabad, Pakistan

[3] Podmore, C.A. (Ed), 1984. Diagnostic Analysis of Irrigation Systems, Volume 1: Concepts and Methodology. Water Management Synthesis II Project, Colorado State Udiversity, Fort Collins, CO. 188 pp.

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3. Develop an irrigation system plan for a CWM subproject area for management of inputs and services within the organizational framework already described for CWM.

4. Develop and demonstrate a methodology that can be applied to meet the above objectives in other subproject areas.

5. Provide on-the-job training to personnel of a selected organization for development of operational plans and on-the-job experience for line department and subproject management personnel and involve them in the development of the operational plan.

Outputs

The following outputs will be produced:

1. A report describing the existing operation of the subproject area including the practices that contribute to and constraints that inhibit improved crop production as identified from Diagnostic Analysis.

2. A report presenting recommendations for physical and institutional improvements in localized areas within a subproject area, and a plan covering management of the delivery of irrigation water, inputs, and services for the entire subproject area. This report will include the following important components:

   a. Identification of the appropriate roles for the line departments, other suppliers of inputs and services, Water Users Associations, and subproject management, including recommended roles considered necessary for implementation of the improvements and the management plan.

   b. Recommendations for the most suitable cropping patterns for the available water supplies before and after improvement.

   c. A plan for conjunctive use of surface and groundwater in the project area including public and private tubewells, and recommendations for improving the water supply.

   d. Recommendations for the organization of Water Users Associations.

   e. Recommendations for improvement of the effectiveness of extension to increase the productivity of irrigated agriculture and the income of farmers.

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f. Guidelines for applying the findings of the study to other CWM subprojects.

Implementation Plan

The best basis on which to improve an existing irrigation project is on the basis of a thorough understanding of the system operation and the system constraints. This is achieved through Diagnostic Analysis. The key to effective management of an irrigation project is an appropriate plan for management including improvements that relax priority constraints. This section describes the plan and illustrates the procedures for DA and describes how the planning of project improvements will occur.

Diagnostic Analysis

Using a field study of an irrigation project to define constraints to improved productivity and management was an approach pioneered by Pakistan and Colorado State University through USAID in the On-Farm Water Management Research Program. Since that time Colorado State University and USAID through the Water Management Synthesis Project have used Diagnostic Analysis in Egypt, India and Sri Lanka to initiate new emphases in water management. The new concepts and procedures developed will be applied in the field study of the subproject area to understand the constraints to improved crop production through an interdisciplinary study of the irrigation canal system and the on-farm system.

Diagnostic Analysis will be applied in a general strategy over the entire subproject area for water supply conditions and to select representative minor commands and within those minor commands, watercourse commands for an intensive study. Surface water and groundwater supplies will be studied for the entire subproject area and additional data also will be collected to meet specific needs of computer modelling for the planning process. The localized commands (minor (s) and watercourses) will be studied intensively through interviews and other measurements to understand how the farm system operates. Surveys of organizational personnel may extend to an appropriate administrative level.

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The intensive studies of the localized commands will be used to initiate specific CWM improvements in these areas during the implementation phase under the direction of subproject managers. The same process will also be used in extending the CWM improvements over the subproject area, although the findings of this intensive study will likely not require a complete DA in other parts of the subproject.

The DA study consists of a reconnaissance phase and a detailed study phase. The reconnaissance phase is used by the interdisciplinary team to quickly examine the entire system as it operates -- looking for both its positive and negative aspects. This is a sweeping overview of all dimensions of the irrigation system. The purpose of reconnaissance is to allow the team to identify some potential key constraints which will be more closely examined during the detailed studies phase. Based on the reconnaissance, the team may refine objectives of what will be studied, redefine problems, redraft questionnaires, and reorder priorities. Ultimately, reconnaissance permits the subsequent detailed studies phase to be planned according to the realities of the system rather than assumptions or prior experience elsewhere.

Reconnaissance also allows the selection of localized areas (one or more minor commands) and watercourses on each minor that are representative of the area for the detailed study. This results in more relevant data and the ability to generalize more for the entire subproject area based on the sample areas.

Detailed studies are directed, interdisciplinary and disciplinary studies of the operation of the system. The specific problems or positive aspects of the system are verified with field data to measure the magnitude, causes and the effects of each priority aspect of the system. Not every aspect of the system is investigated, but only the priority aspects of the operational features. Resourses also constrain the number of aspects investigated. An attempt is made to understand the interactions of the different causes of a particular priority problem. Tthe social and organizational factors influencing the lack of watercourse maintenace with the impact of losses on yield and farmer income is one example.

The detailed study considers the total project area for the water supply from canals and groundwater. The localized areas are studied by farmer interviews and with interviews of officials of organizations involved in the project area. When priority problems involve a particular organization, the interviews go up the levels of administrative responsibility until the level for resolving a particular problem is reached. Typically, irrigation department officials are interviewed from the gatekeeper to the superintending engineer responsible for the project. Village leaders who may not be farmers may also be consulted.

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Other measurements obtained include the physical and biological aspects of system operation. Water budgets for each level of the system from the canal to the field and including the groundwater are obtained to some degree of accuracy. Yields for different crops are obtained from farmer interviews as well as biological measurements when possible. In this study, additional data are necessary to provide a base for modelling of the system during the planning phase. As a result, data on L-sections, X-sections, structural characteristics, groundwater data including salinity and aquifer characteristics will be needed.

Data collection during the detailed study is planned by the interdisciplinary team and collected jointly or by a particular discipline. Examples of the types of data collected and the responsibility for the collection of each type of data are given in Table 1. The actual data collected depends on the priority problems or other aspects identified to be investigated during the detailed study.

Data analysis and synthesis of the results of the study will be conducted during the study and completed upon the teams return to CSU. This analysis and synthesis will result in a report that documents the operation of the system and the definition of constraints and positive aspects of the system. Improvements must deal with the causes of the priority problems through changing the structure or management of the system. The planning process will build on the results of the DA to accomplish these changes.

Line Department personnel and subproject management staff will be involved in the DA study and the evaluation of alternative improvements and components of the management plan. Personnel may participate depending on their identification for participation and their availability. The goal is to provide an understanding of the concepts of DA and an insight into the appropriateness of the management plan developed. Necessary training for subsequent implementation of these activities will come from the CWM training programs. In many instances the level of knowledge needed is not that of responsibility for implementation but ability to use the results.

Management Plan

Once the operation of the system has been defined and the constraints identified, the development of the plans for improvement and the operational plan for management will be conducted by the interdisciplinary team. The plans for improvement will first be discussed and then the detailed plan for management reviewed.

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Table 1. Interdisciplinary Sharing of Data

Primarily Collected By:	Used By:	Types of Data
Sociologists	Sociologists Engineers Agronomist	Farmers' perceptions about night and day irrigation, major water problems inhibiting increased yields, solutions to major water problems.
Sociologists Economists	Engineers Agronomists Sociologists Economists	Farmer decision-making processes related to crop production, when to irrigate a given crop, when to stop irrigation, water lift methods, who applies water at given irrigation?
Sociologists	Engineers Agronomists Sociologists	Farmers' estimations of infiltration depth of water, depth of the crop's root penetration, crop water requirements, critical water demand periods and stages of growth, sources of major losses, magnitudes of losses, waterlogging.
Sociologists	Engineers Economists Sociologists	Tendency of farmers to cooperate in water lifting, trading of irrigation turns, farm implements and machinery sharing, sharing of workload, patterns of both formal and non-formal cooperation.
Agronomists	Economists Engineers Agronomists	Farm management practices: cropping patterns and intensities, seedbed preparation, levels of farm technologies, seed rates, quality and seeding methods, fertilizer inputs, timing, amount and placement methods, harvest methods, storage methods, crop water requirements, soil characteristics, problem soils.
Sociologists Economists	Agronomists Sociologists	Adoption of improved technologies; rate of adoption, information sources used at each stage in the process, characteristics of the innovation, farmers trust in information sources.
Economists	Engineers Economists	Economic returns and costs, lifting water (alternative methods), various crop mixes, storage systems, transportation, marketing.
Sociologists Economists	Economists Agronomists Sociologists	Legal and organizational factors, delivery of water to command area, distribution of water, pricing of water, settlement of disputes--formally and informally, farmers' interaction with irrigation officials, use of incentives.
Engineers	Agronomists Engineers	Water supply and removal, conveyance efficiency, field application efficiency, water quality, consumptive use, return flow, field topography.
Economists Sociologists	Engineers Economists Sociologists	Information used for farm-level decision-making: marketing and irrigation schedules, closures, extension, quality and quantity of information.

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Improvement Plan:

Improvements include physical or biological, and organizational or management aspects. The improvements will be selected on the basis of relaxing priority constraints and/or because they permit improved management with expected improved system performance. Within the resource constraints for planning, alternative improvements will be considered.

The final selection of improvements will be accomplished through an in-country phase where appropriate personnel (officials and farmers) will be involved in selecting alternatives and accepting recommended improvements. In some instances, when time permits, a particular improvement may be installed in the field such as a trial system for allocating water to farmers or a water measurement structure. Line departments and subproject management are important to selecting the final improvements. Specific recommendations for the final improvements will be provided with role/responsibilities defined for each. The operational plan for management will assume these improvements are implemented.

Detailed Plan:

The detailed plan will be developed from the knowledge available from DA and the specific additional data required for the computer models. The planning process will use the concepts and computer models developed by Sritharan [4/] as adapted by the interdisciplinary team. The computer models will be used to evaluate various alternative improvements and plans.

The management plan will contain a plan for each priority activity. The responsibility for each activity will be established as well as the resources required. This provides information to the subproject management on what is necessary for a line department to accomplish its particular goal as well as what that goal is. The monitoring program will then be tied to these key performance indicators for each activity. In addition, farmers will be monitored for their constraints as well as the accomplishment of expected production targets. New constraints are expected to be identified from the subsequent monitoring and evaluation effort on outputs. Subproject management will need to focus on seeing that corrections to the on-going program are accomplished as the evaluation data become available.

[4/] Sritharan, S. 1984. Synthesis of Design, Operation and Management of Surface Irrigation Conveyance Systems. Unpublished Ph.D. Dissertation, Colorato State University Library, Fort Collins, Colorado.

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The management plan for delivery of irrigation water will include necessary system improvements and a plan for equitable, dependable and adequate delivery of water within constraints. Both canal and tubewell water will be considered. The plan will specify, for example, the discharges at each diversion on the canal system. This information is then used in the monitoring and evaluation program to define whether the system is operating at an acceptable level of performance.

The DA study will provide insight on how farmers can and will be willing to organize to participate in the management of the system to improve performance. This information will be used to train personnel in how to organize farmers and to define the roles farmers are expected to develop. Since these are not fixed, the monitoring program must adjust these roles as appropriate. Key in this effort is the need for flexibility in the farmer participation activities.

Roles/responsibilities of various organizations will come from the planning process since each activity must be assigned as the responsibility of a particular organization. Specific rules will have to be given which results in operational criteria for specific management decisions. In those instances where new responsibilities are developed, these will be assigned to the obvious organization. During the evaluation of alternatives of the plan, final decisions on each responsibility will be made.

The planning will take place at Colorado State University after completion of the DA study report. The alternative improvements and alternative management objectives will be evaluated with the host country team and selected personnel from the line departments of the province. Some field evaluations will be conducted as time and resources permit. The plan for improvements and the operational management plan will be completed at CSU with the host country team's assistance.

The key members of the host country team will travel to CSU after the evaluation of alternatives to complete the final report. At that time further training in the development of operational plans for management will be conducted and experience in the various aspects will be given the host country team. They will then have the primary responsibility to assist other provinces in developing operational plans for management in each subproject area. They will also assist line departments and the subproject management staff in implementing the improvement and management plan.

After developing the plan and selective testing, a report will be prepared providing documentation of the process and presenting the results of the plan. Necessary information for implementing an improvement will be provided but the detailed design for specific structures at particular locations, for example, generally will not be provided. Suggested training programs for extension may be suggested but the detailed plans for the program will not be presented. The plan will provide a

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basis for the improvement and management of the subproject area to increase the productivity of irrigated agriculture.

Methodology for Management Planning in Subproject Areas

Implementation of all aspects of the management plan cannot be accomplished in all the areas of the subproject simultaneously. Therefore, a strategy of minor by minor improvement is suggested. The implementation for a minor must be within the constraints of the overall plan for the subproject area. The suggestion is that the minor or minors selected for detailed study during DA also be selected as the first minors for implementation of improvements and the management plan at the minor watercourse levels. This would provide the basis for specific plans for improvements and data for the more specific planning. Further minors can be developed after more careful studies of these minors have been made. The detailed studies of the initial DA will not be necessary on most of all remaining minors. Specific data for each minor to allow the development of specific plans will be necessary.

Other subproject areas can be developed through the assistance provided by the host country organization. In some instances additional, but limited, technical assistance may be necessary. The subproject management staff for monitoring and evaluation should have increased responsibility. Eventually, they should take on most of the responsibility for developing plans for improvements and management. If subproject areas are to be improved in a simultaneous fashion, then perhaps a formal training program should be provided. Software for the computer modelling will be available, but hardware will need to be provided directly to each organization. Improvements in the planning process should also be developed both in the modelling capability, but also in the capability of the staff to do a better job with reduced resources and time. Experience and knowledge in dealing with key constraints should also make new options for improvement available. Accelerated improvement of irrigated agriculture in Pakistan should be the result.

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Technical Assistance

Expatriate Team

The expatriate team will work closely with the host country team in conducting the diagnostic analysis studies and implementing the action research program for the management plan. The team will do the planning for system improvement and develop the operational plan. The alternatives of the improvements and operational plan for management will be evaluated in discussions with officials and farmers if time and resources permit. The team members and their responsibilities are as follows:

Team Leader - Selects and schedules personnel; develops specific plans for each phase of the activity; provides leadership during the DA study; assists in establishing the in-country organizational arrangements and developing the plans for the DA and the development of the management plan and has overall responsibility for the activity (4.5 ppm).

Agricultural Economist - Develops plans for collection and analysis of farm management data for DA; collects supplementary data for alternate activities at the farm level; provides technical input for planning and evaluating alternative technologies for system improvements and the development of the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis (12 ppm).

Irrigation Agronomist - Develops plans for collection and analysis of crop production constraints and yield estimates for DA; assists in establishing yield levels, constraint reduction in yield levels and constraint removal increases in yield levels for planning system improvement alternatives; provides technical input for planning and evaluating alternative technologies for system improvement and the development of the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis (6 ppm).

Agricultural Engineer - Provides knowledge of Pakistan organizations, personnel and programs; provides knowledge of water management problems and needs; provides local language capability; develops plans for collection and analysis of on-farm water management constraints and values from DA; assists in establishing performance levels of watercourses and field systems for traditional and improved conditions; provides technical input for planning and evaluating alternative technologies in the development of improvements and the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis (12 ppm).

Irrigation Engineer - Provides knowledge of the concepts, principles and computer models for the management planning; develops plans for the collection and analysis of data on irrigation distribution system constraints and values for DA; assists in identifying appropriate technologies for management improvement including the level of performance of the existing and improved system; provides technical input for planning and evaluating alternative technologies program including the critical improvements needed; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis (12 ppm).

Sociologist - Develops plans for collection and analysis of data on farmer decision making, farmer perceptions of priority problems and farmer willingness and interest in participation in management; defines nature of organizational involvement with farmers including irrigation, agriculture and other inputs or services; provides basis for testing or evaluating alternative organizational approaches in developing recommendations for improvements and in finalizing the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis (12 ppm).

Groundwater Hydrologist - Provides knowledge of the concepts and principles of groundwater hydrology to evaluate the field conditions and recommend alternate public and private tubewell programs to supplement canal water supplies considering salinity conditions; provides technical input for identifying groundwater constraints on the management of the system and recommends alternative imrovements and assists in the development and the management plan and provides technical knowledge for interdisciplinary team planning, analysis and synthesis.

Additional Engineering - Provides additional expertise to revise computer programs to portable personal computer; revise programs for analysis of actual field data for the distribution system; and develop new programs to assist in the planning and evaluating of improvement alternatives.

Graduate Research Assistants - The field data collection and analysis, and the development of computer models to evaluate the alternative improvements provides an unusual opportunity for graduate student research where they serve both an educational and economical assistant alternative. Pakistani graduate research assistants will be used to the maximum extent available.

Secretarial - The reports to be generated from DA, the management plan and the action research will require significant secretarial support. Routine administrative support and some secretarial support are provided by WMS II administration. This provides the significant extra support needed in this activity.

The program will need strong host country support. The host country team should consist of the disciplines of agricultural economics, agronomy, agricultural engineering, irrigation engineering, and sociology or water management extension. The team should be available for most of the period for the field research, data analysis and report preparation.

Host Country Team

Team Leader - Works with the expatriate team leader and during in-country activities; provides leadership to the host country team; acts as coordinator with line departments and subproject management staff involved from all provinces; and participates with the host country team in conducting of field studies, review and finalization of reports, development of plans and finalization of recommendations.

Agricultural Economist - Assists the expatriate economist to develop plans for collection and analysis of farm management data for DA and implements the plan; collects supplementary data for alternate activities at the farm level; provides technical input for planning and evaluating alternative technologies for system improvement and the development of the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis.

Irrigation Agronomist - Assists with the expatriate agronomist to develop plans for collection and analysis of crop production constraints and yield estimates for DA and implements the plan; assists in establishing yield levels, constraint reduction in yield levels and constraint removal increases in yield levels for planning system improvement alternatives; provides technical input for planning and evaluating alternative technologies for system improvement and the development of the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis.

Agricultural Engineer - Assists the expatriate agricultural engineer in developing plans for the collection and analysis of data on the on-farm water management constraints and values and implement the plans in DA; assist in the establishing of performance levels of watercourses and field systems for traditional and improved conditions; provides technical input for planning and evaluating alternative technologies in the development of improvements and the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis.

Irrigation Engineer - Assists the expatriate irrigation engineer in providing knowledge of the concepts, principles and computer models for the management planning; develops plans for the collection and analysis of data on the irrigation distribution system constraints and values and implements the plans for DA; assists in identifying appropriate technologies for management improvement including the level of performance of the existing and improved system; provides technical input for planning and evaluating alternative technologies including the critical improvements needed; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis.

Sociologist - Assists the expatriate sociologist to develop plans for collection and analysis of data on farmer decision making, farmer perceptions of priority problems and farmer willingness and interest in participation in management; defines nature of organizational involvement with farmers including irrigation, agriculture and other inputs or services; provides basis for testing or evaluating alternative organizational approaches in developing recommendations for improvements and in finalizing the management plan; and provides technical knowledge for the interdisciplinary team planning, analysis and synthesis.

Groundwater Hydrologist - Assists the expatriate groundwater hydrologist to develop plans for collection and analysis of data on groundwater management constraints and benefits and implements the plans for DA; assists in providing knowledge of concepts and principles of groundwater hydrology to evaluate the field conditions and recommend alternate public and private tubewell programs to supplement canal water supplies considering salinity conditions; provides technical input for identifying groundwater constraints on the management of the system; and recommends alternative improvements and assists in the development and management plan and provides technical knowledge for interdisciplinary team planning analysis and synthesis.

Additional assistants in each professional category including technicians and laborers are needed to implement the programme.

Schedule

1984			1985	
Aug. Sept. Oct. Nov. Dec.		Jan. Feb. Mar.	Apr. May June	July Aug. Sept.
Planning	Pakistan DA Study	Analysis & Develop Project Plan	Testing & Revision of Plans - Pakistan	Final Report & Actions

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In-Country Support

The in-country program will need the following logistical support:

Transportation - At least fifteen field vehicles will be needed during the intensive field studies during the DA phase and the supplemental field data collection. Some access to transportation will be needed during the intervening intervals.

Per Diem - Financial support for the expatriate and host country personnel during the field studies phases will be needed. Approximately six months out of the twelve months will be in travel status doing the field studies.

Office/Facilities - Office space is needed to house the expatriate and host country team members together for the period. There will need to be secretarial, administrative and budget support personnel provided also. In addition there will need to be office equipment such as typewriters, copiers and other support for the office. Access to funds for payment of bills to provide this support must be arranged.

Equipment/Supplies - The field studies will require surveying equipment, water measurement equipment, map preparation, soils analyses, water analyses, crop analyses, computer analyses of data and a number of other types of equipment and supplies. An organization already with this equipment/supplies would obviously be of considerable advantage. However, funds to purchase these for this specific effort will need to be made available in order to implement the field studies.

ACTIVITY	MONTH														REMARKS
	Aug 1	Sept 2	Oct 3	Nov 4	Dec 5	Jan 6	Feb 7	Mar 8	Apr 9	May 10	June 11	July 12	Aug 13	Sept 14	
1. Initial planning of activities															
2. Development of DA study plans															
3. Site selection and initial preparation in Pakistan															
4. Diagnostic Analysis study in Pakistan															
5. Diagnostic Analysis report preparation															DA Report complete
6. Collection of specific data for developing operational plans															
7. Preparation of operational plans and transfer to Pakistan															Improvements and Operational Plans Report (Draft)
8. Preparation of report on operational plans															
9. Development and assessment of solutions															
10. Evaluation of improvements and operational plan															
11. Preparation of final reports with imp. & oper. plans															
12. Training of Pakistan Team															