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DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
Washington, D.C. 20523

P2P

PROJECT PAPER

Proposal and Recommendations  
For the Review of the  
Development Loan Committee

PAKISTAN - On-Farm Water Management

AID-DLC/P-2179

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**DEPARTMENT OF STATE**  
**AGENCY FOR INTERNATIONAL DEVELOPMENT**  
WASHINGTON, D.C. 20523

UNCLASSIFIED  
AID-DLC/P-2179  
June 18, 1976

**MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE**

**SUBJECT: Pakistan - On-Farm Water Management**

Attached for your review is the recommendation for authorization of a loan to the Government of Pakistan ("Borrower") of not to exceed Seven Million, Five Hundred Thousand Dollars (\$7,500,000). The proceeds of this loan will be used to assist in financing the local currency costs associated with the establishment of an efficient on-farm water management capability in Pakistan.

This loan is scheduled for consideration by the Development Loan Staff Committee on Wednesday, June 23, 1976 at 2:30 p.m. in Room 3886 New State; please note your views are requested by close of business on Monday, June 28, 1976. If you are a voting member a poll sheet has been enclosed for your response.

Development Loan Committee  
Office of Development Program Review  
and Evaluation

Attachment:  
Summary and Recommendations  
Project Analysis  
Annexes

FROM: AFTAB AHMAD KHAN  
SECRETARY.

ANNEX H  
Page 1 of 2

GOVERNMENT OF PAKISTAN  
MINISTRY OF FINANCE, PLANNING  
AND ECONOMIC AFFAIRS  
(Economic Affairs Division)

No. 1(2)US-II/75

Islamabad, the 7th May, 1976

Dear Mr. Wheeler:

On July 1, 1976, the Government will begin a five year project aimed at improved management of irrigation water on the nation's farms. During the coming five years, it is our hope to see some 1,500 water-courses improved, some 425,000 acres of land precisely leveled, so as to minimize field water requirements, and improved crop and water management practices adopted by farmers within the areas assigned for project activities.

You will recall that at our meeting with you on January 8, 1976 we indicated our desire to proceed with project plans. We informed you that the Government wished to see the On-Farm Water Management project carried out so as to involve all of the-four provinces and to test various soil and water conditions. It was also decided that, at the provincial level, the several Agriculture Departments would be incharge with coordination-handled by the respective Planning and Development Departments.

Since that meeting in January, there have been conversations with the Punjab, Sind and Northwest Frontier provincial governments to develop detailed plans for the project. The Punjab Government is moving ahead with plans for a substantial effort to begin on July 1, 1976. Punjab budget proposal documents are not yet approved but it is expected this approval will have been obtained before that date, enabling the provincial Agriculture Department to begin fielding teams of extension workers especially trained in water management techniques on that date or very shortly thereafter. Over the five years, approximately half of the 1,500 watercourses to be improved and half of all of the acres of land for precision leveling will be implemented in the Punjab province.

Plans for starting the program in Sind province are not yet final but it is understood that about one third of the total project will be carried out in Sind. We expect the Sind province will join the project by July 1, 1977, as well Baluchistan and Northwest Frontier.

In the Government's view, a sound project will require farmer participation in planning and financing of activities. Our Government committee, working with the USAID planners, has agreed to the following principles:

1. For watercourse improvement, farmers should donate the labor needed to line the watercourses but the costs of

concrete lining, diversion structures and engineering should be met by the project.

2. For precision land leveling, the project should share with farmers, on equal basis, the cost of precisely leveling a farmer's first five acres of land.
3. Adequate staffs at provincial headquarters and teams of qualified water management and land development extension advisors should monitor project activities and elicit farmer interest.
4. Banks should provide adequate credit to enable farmers to participate in the project.
5. A major publicity and promotional campaign should begin as soon as possible.

The five year project is estimated to cost Rs. 438 million. To assist us in meeting these costs, we hereby request AID development loans as follows:-

1. a first loan, of \$7.5 million, which would help us with the first three years' expenses.
2. a second loan, of \$15.00 million, approved in the U.S. fiscal year 1978 for assistance in years four and five.

It is requested that the loans be on AID's most concessional terms: 40 year term, including ten years' grace period on repayment of principal, interest at two percent for ten years, three percent thereafter.

From our discussions with USAID planners, it is our understanding that the services of the United States Soils Conservation Service advisors may continue to be available to Pakistan on a grant basis until March 1978 and that a significant amount of the time of the Colorado State University research team's effort also be available on a grant basis.

We request your early and favorable consideration of the first loan proposal.

Sincerely yours,

(AFTAB AHMAD KHAN)  
SECRETARY.

Mr. Joseph C. Wheeler  
Minister-Councilor-Director  
USAID Mission  
ISLAMABAD.

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**Annexes**

- A - Pakistan's Agricultural Sector**
- B - Project Technical Details**

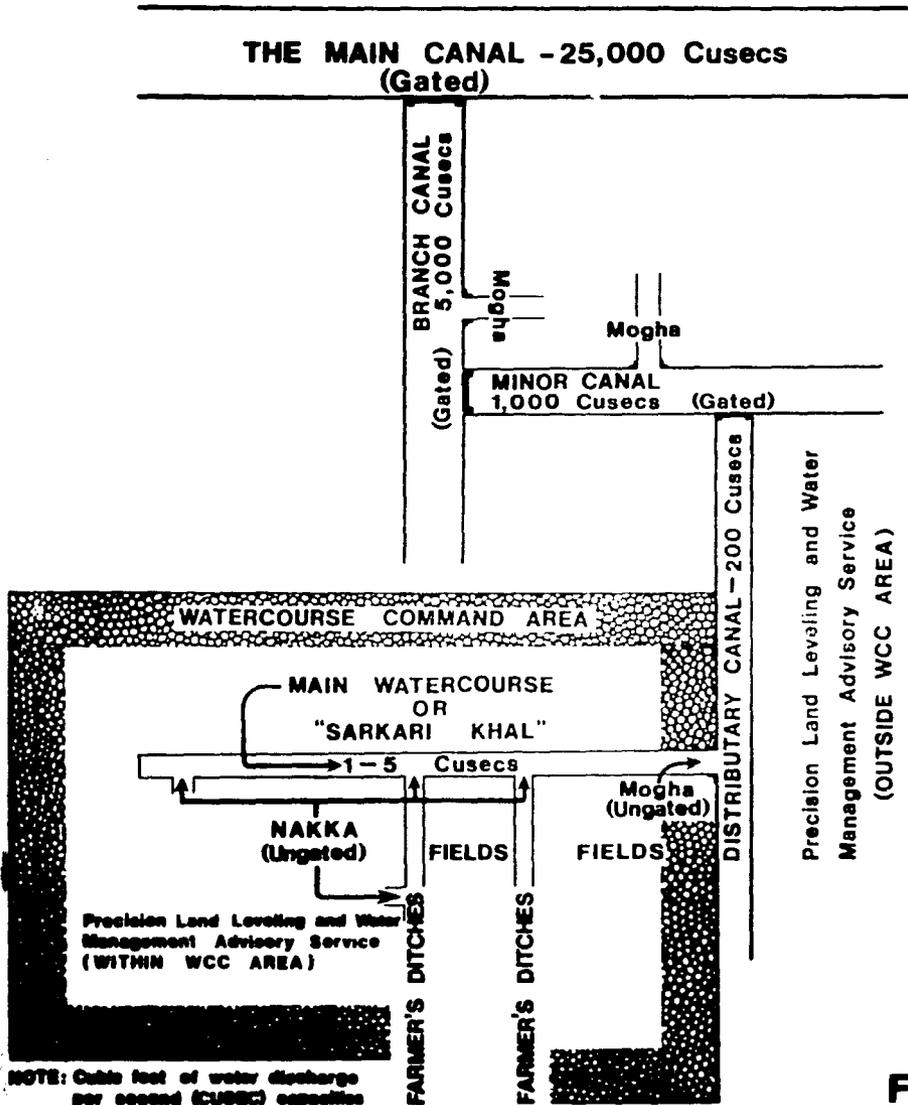
- Exhibit 1 - Detailed Technical Analysis**
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- 7 - Detailed Economic Analysis**

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- D - Logical Frame work matrix**
- E - Project Performance Tracking Network**
- F - Statutory Checklist**
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- J - Draft Loan Authorization**



# DIAGRAM OF IRRIGATION SYSTEM

# GLOSSARY OF NAMES



## DEFINITION

## CUSEC CAPACITY

(ILLUSTRATIVE)

MAIN CANAL	First offshoot from river or barrage (gated)	25,000
BRANCH CANAL	Subsidiary offshoot from Main Canal (gated)	5,000
MINOR CANAL	Subsidiary offshoot from Branch Canal (gated)	1,000
DISTRIBUTARY CANAL	Subsidiary offshoot from Minor Canal (gated)	200
WATERCOURSE OR "SARKARI KHAL"	Small offshoots from Branch, Minor or Distributary Canals (not gated)	1-5
FARMER'S DITCHES	Lateral ditches coming out of the Watercourse	
MOGHA*	An outlet from the Branch, Minor or Distributary Canals into the Watercourse or farmer's ditches. Not gated; flow controlled by water level in canal.	
NAKKA	Outlet from Watercourse into the farmers' fields or ditches	
WARA BANDI	Best defined as "Scheduling" whereby each farmer is allotted a date and span of time during which he is entitled to divert water into his fields through Nakkas. For a subsequent use he has to await his turn. There are two types of Wara Bandi, (a) Pucca, which is a formal arrangement under which a trade-off between user farmers is not possible and (b) Kacha, under which trade-offs are possible	

## JURISDICTION

The Irrigation Department of the Provincial Government has effective jurisdiction up to the point (MOGHA) where water enters the Watercourse

\* A. I. D's interest begins from this point for the current project

Figure 1

NOTE: Cubic feet of water discharge per second (CUSEC) capacities are only illustrative

## GLOSSARY

Baradr i	Kinship group.
Branch Canal	Subsidiary offshoot from Main Canal (gated).
Chowkidar	Watchman.
Distributary Canal	Subsidiary offshoot from Minor Canal (gated).
Farmer's Ditches	Lateral ditches coming out of the Watercourse.
Karah	An implement worked by a pair of bullocks and used for leveling land.
Karez	Covered Canals in hilly tracts of Baluchistan.
Kacha	Temporary.
LDO	Land Development Officers.
Main Canal	First offshoot from river or barrage (gated).
Minor Canal	Subsidiary offshoot from Branch Canal (gated).
Mogha	An outlet from the Branch, Minor or Distributary Canals into the Watercourse or farmer's ditches. Not gated; flow controlled by water level in canal.
Nakka (Nucca)	Outlet from Watercourse into the farmers' fields or ditches.
Numberdar	Village headman, appointed by Government.
Pucca	Permanent.
Punchayat	Local village assembly.
Patwari	Village revenue or irrigation official; a village accountant or registrar.
Sepy	The recipient of wages in kind (see Seyp below).
Seyp	Traditional institutional arrangement whereby village artisans, etc., are paid wages in kind at the end of crop season.
Sohaga	Wooden beam or plank worked by a pair of bullocks used for breaking clods and covering seeds.
Square (of land)	"Murabba" = 25 acres of land.
Wandara	Time keeper who sets irrigation timings.
Wara Bandi	Best defined as "scheduling" whereby each farmer is allotted a date and span of time during which he is entitled to divert water into his fields through nakkas.
Watercourse or "Sarkari Khal"	Small offshoots from Branch, Minor or Distributary Canals (not gated).

**SUMMARY AND RECOMMENDATIONS**

**B. Recommendations: Approval of the following:**

- an AID Loan of **\$ 7,500,000**  
(Terms: 40 years, 10 years grace  
2% during grace-- 3% thereafter).

**C. Description**

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

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

By the end of the project, physical accomplishments will be:

- 1,500 improved watercourses
- 425,000 acres of precisely leveled land
- improved crop and water management techniques

**D. Summary Findings**

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

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

**E. Project Issues:**

None

**USAID Project Committee**

Stanley M. Remington, Chairperson  
Richard R. Newberg  
James G. Cassanos  
Arthur S. Lezin  
Dilawar Ali Khan  
Gerald H. Zarr  
William A. Chevoor  
G. M. Khan  
Niel A. Dimick  
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**Government of Pakistan**

**Project Planning Committee**

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

S. Iftikhar Ahmad Shah  
Chief, Water Resources  
Planning Division

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

PART II

PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. Background<sup>1/</sup>

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

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

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

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

The need for a broader program of water management improvement is recognized by the Government of Pakistan, which has included the proposed AID project in its Fifth Five Year Plan, 1977-1981, and by the World Bank<sup>1/</sup> and other donors, which are planning activities related to improved water management.

B. Detailed Description

1. The Project

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

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

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

Important features of the project design include:

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

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

- Building the institutions essential for a subsequent nationwide water management program:
  - New governmental arrangements for extension services in the special field of water management;
  - New farmer organizations; and
  - New contractors entering the field of precision land leveling.
- Direct farmer involvement in planning work to be undertaken and in financing the project by contributions of labor and cash;
- Special measures to assure small (low income) farmer participation;
- Aggressive promotional efforts to elicit farmer participation generally; and
- The entrance of Pakistan financial institutions into a new field of agricultural lending.

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

## 2. The Logical Framework

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

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

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

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

### 3. Magnitude of Outputs

Five year physical accomplishments are planned as follows:

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

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

- Improved crop and water management techniques adopted on farms where precision land leveling has been carried out and watercourses improved. The judgement of success will be based on whether at least half of the 60,000 to 100,000 participating farmers will have doubled their water use efficiency, adopted improved technology and increased agricultural output by 50%.

## PART III

### PROJECT ANALYSIS

#### A. Technical Analysis Including Environmental Assessment

##### 1. Watercourse Improvement

For nearly two decades numerous master planners have prepared extensive studies covering all the existing irrigated areas of the Indus Basin within Pakistan for investments of billions of dollars. The emphasis in these studies was on combatting waterlogging and salinity problems and on increasing irrigation supplies, with the long-term objective of maximizing cropping intensities and yields. These comprehensive reports were based on detailed hydrological and meteorological measurements. Surprisingly, however, in only one or two of the studies was an attempt made to measure directly the water use efficiencies within the watercourse command areas. The loss factors in the watercourse and on the farmers' fields were based on assumptions of the amount of water received by crops relative to water received at the water-course outlet. The omission of actual measurements is critical "... because water availability trends in these reports were used to review massive development investments in surface storage and other works when small variations in assumed bases were of the same order as the additional water resources to be developed" 1/.

The 1967 Lieftinck Report 2/, which consolidated the basic strategy for water resources development in Pakistan, also used the assumptions from the various master planning reports. It adopted a water use efficiency factor of 63 percent below the watercourse outlet with watercourse conveyance losses taken as 10 percent. Since the Lieftinck Report was published, however, there has been a widespread and growing feeling in Pakistan and elsewhere that its assumptions of efficiencies in watercourse command areas might be optimistic.

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1/ "Pakistan, Special Agriculture Sector Review, Vol III, Annex on Water Management" IBRD, 1976.

2/ Lieftinck et. al. "Water and Power Resources of West Pakistan: a Study in Sector Planning", 1967.

This concern was substantiated by a Pakistani Expert Committee on Water Losses in the Irrigation System in 1972. Unfortunately, this committee also based its conclusions on assumptions rather than on actual measurements.

In 1972, CSU, working with the Mona Reclamation Project of the Water and Power Development Authority and supported by AID, started studies, that are still ongoing, of on-farm water management. CSU produced a series of papers on present watercourse losses, irrigation practices and field application efficiencies which raised basic questions about assumptions in the master planning studies and indicated that present efficiencies are much lower than expected - no more than 50% on the average and much less in Salinity Control and Reclamation Project (SCARP) areas. The studies indicated that a quantity of water equivalent to the amount that will become available to crops from Tarbela Dam can be saved in few years, simply by improving and maintaining watercourses. They pointed out that watercourse improvements and better management of water on the farm will make more water available for plant growth than any other similarly-priced investment and will concurrently reduce the hazards of waterlogging and salinity.

CSU staff and their Pakistani cooperators have tested and priced several alternative solutions to the problems of losses in the watercourses, have studied the financial and economic implications of their results and recommendations and have addressed the vital social, legal, operational and institutional factors that are intimately related to losses in the watercourse command area.

These CSU studies form the basis for the watercourse improvements proposed in this project. The major adaptive research, was done on the Mona Project, where personnel and facilities were available. However, throughout the Punjab and Sind, further CSU studies and the Precision Land Leveling Project, indicate that the technology can be replicated elsewhere with minor adaptive efforts. This is because throughout Pakistan, water management practices within the watercourse command areas follow the same basic design principles that have changed little over the past century. This project will provide for the reconstruction of earth watercourses using the inexpensive, labor-intensive techniques now being field-tested. In some instances, concrete, brick or other hard material lining of high-capacity watercourses or of those on sandy soil may be necessary. The choice will depend on the specific site conditions and the preferences of the farmers concerned. It is expected, however, at least in the first three years, (the approximate duration of the first AID loan), that such lining will account for less than five percent (5 %) of total watercourse length. There are no physical constraints in achieving the technologies to be used in this project (see Annex B, Exhibit 1 for a detailed discussion).

## **2. Precision Land Leveling**

Leveling of farm fields to a precise degree is essential for the efficient application of farm water by gravity methods. The technology for precision land leveling has also been extensively tested in Pakistan. The tractor-drawn soil scraper was used widely in an AID-financed project in Turkey and has been adapted to Pakistani conditions by an AID agricultural engineer working with local manufacturers. Teams from SCS have taught the techniques of precision land leveling to Pakistani agricultural engineers, technicians, contractors and farmers and have field-tested the techniques in the Provinces of Punjab and Sind. SCS will begin a similar program in the North West Frontier Province in FY 77. The technology involved in precision land leveling is simple, replicable and within the capabilities of host country personnel, when properly trained and given proper tools and equipment to work with. See Annex B, Exhibit 1, for more detailed discussion).

## **3. Improved Crop and Water Management Practices**

Farmers commonly have low irrigation efficiencies and low yields. If the amount and timings of water available and the amount and timings of water needed by alternative crops are both known, the farmer's cropping pattern can be designed to optimize his production on his fixed water supply. This project will train extension personnel to assist farmers in making measurements and calculations necessary to design optimal cropping patterns.

Extension workers will provide guidance to farmers on various cultural practices which, if adopted, will result in significant increase in yield per acre and per unit of water. Illustratively, in recent experiments carried out at Mona, stands and yields of summer crops were more than doubled by planting in beds and using adjacent furrows to wet seed beds by capillarity and to provide surface drainage of excess monsoon precipitation. Under this project, extension trainees to be assigned to field teams will each personally go through the various steps involved in preparation of seed beds, planting, irrigating, pest control and measuring results to give them experience and confidence in helping farmers improve their cultural practices. (See Part IV, Implementation Arrangements and the Detailed Social Analysis continued in Annex B, Exhibit 3).

## **4. Environmental Considerations**

One of the objectives of this pilot project is to find ways to reverse the effects on the environment of decades of poor management of the irrigation system of Pakistan, particularly in the watercourse command areas under the direct control of the farmers. Poor management has resulted in extensive waterlogging and salinity which annually make thousands of acres of land unfit for cultivation. The SCARP projects of the Government are designed to correct the problem on the macro-

level after it has occurred. This project will reduce the watercourse seepage and localized overirrigation, which are the primary cause of the water logging and salinity, by improvements at the farmer's level. It will also permit more effective use of the nation's water resources for agricultural production.

Better water management techniques will retard the rate of rise in the water table, or even completely arrest it. It is estimated by CSU that improving watercourses will reduce loss from seepage and spillage, averaging about 50 percent, to less than 25 percent, and will eliminate crop damage due to seepage adjacent to these water courses. With precision land leveling, the farmer should achieve better application efficiencies on his fields. Frequently, two to three times the required amount of water is applied to fields because of unevenness. The excess water seeps into the water table thus hastening the advent of waterlogging and salinity.

In the waterlogged areas, water stands on the surface until it evaporates. Pooled waters are ideal breeding places for malaria mosquitoes. Reducing breeding areas should reduce the incidence of malaria in the villages of the watercourse command areas.

There are no adverse environmental effects from the project. The possible alternatives to the project would involve different combinations of expenditures on watercourse improvement and precision land leveling. Environmental benefits would accrue in any case. The alternative of doing nothing, however, is unacceptable because it would mean a continuing degradation of the environment. (See Annex C for a more detailed environmental assessment).

## 5. Technical Design and Costs

a. The technical elements of the project are summarized below:

### (1) Watercourse Improvements

It is proposed to improve 390 watercourses in the first three years of the project and 1,500 watercourses in five years. In general, the watercourses, which have different cross-sections depending on quantity of water carried and natural slope of the ground, will be reconstructed as compacted earthen ditches with a proper slope and alignment. The completed ditch will have at least six inches of free board. The banks will be at least 12 inches wide at the top and will have side slopes that will be stable under existing conditions. Control structures will be built at junctions, using bricks, masonry, concrete pipes, slide gates or other methods that are suitable for the particular

watercourse. These improvements are estimated to cost Rs. 19,000 per watercourse. (For purposes of computation of the illustrative FAR amounts in Table 4 of Annex B, Exhibit 2, Rs. 16,000 has been used: 80 structures costing Rs.200 each). About five percent of total watercourse length is expected to require concrete, brick or other hard material lining at an estimated cost of Rs.30 per foot.

The prorated costs of extension and management allocated to each improved watercourse will decline as the number of improved watercourses increases. See Annex B, Exhibit 2, Table 3.

(2) Precision Land Leveling

Fields will be leveled with a variation of not more than plus or minus three centimeters. It is estimated that on the average about 200 cubic meters of earth per acre will be moved at a cost of Rs. 3 per cubic meter, or about Rs. 600 per acre. Acreage to be leveled within watercourse commands will average 150 acres per command; about 133 additional acres per watercourse is expected to be leveled on land nearby but outside the watercourse command area.

b. Summary of Costs

		<u>Three Years</u>	<u>Five Years</u>
1. Team in Field		78	300
2. Watercourses Improved		.390	1,500
3. Precisely Leveled Acres		110,370	424,500
4. Watercourse Improvements	Rs.	<u>31,784,000</u>	Rs. <u>115,536,000</u>
Structures & Installation		( 7,040,000)	(27,075,000)
Concrete Lining		( 9,360,000)	(36,000,000)
Labor of Farmers		( 4,680,000)	(18,000,000)
Extension & Management <sup>1/</sup>		(10,704,000)	(34,461,000)
5. Precision Land Leveling	Rs.	<u>87,565,000</u>	Rs. <u>323,417,000</u>
Cost of Leveling		(66,222,000)	(254,700,000)
Extension & Management <sup>1/</sup>		(21,343,000)	( 68,717,000)
6. Total Cost	Rs.	119,349,000	Rs. 438,953,000

(For detailed cost breakdown see Table 3 , Annex B, Exhibit 2)

<sup>1/</sup> These costs, which together equal the total of "Provincial Overhead" and "Direct Team Costs" in Table 2 Annex B, Exhibit 2, have for this purpose been divided one third for watercourse improvement and two-thirds for precision land leveling; in fact, a good deal of the costs should be related to the third element of the project: Improved crop and water management.

These cost estimates include contingency factors but not separate, identifiable allowances for inflation. Because rates of inflation for labor intensive rural projects have not been precisely determined, the Government has preferred not to include an allowance for inflation in its budget approval document but has agreed to take care of increased costs due to inflation in its annual budgets. Since all project costs will be in local currency and the Fixed Amount Reimbursement method will be used, AID's contribution to the total project will be controlling. If the Borrower does not increase its contribution to keep up with cost escalation, there will be a reduction in the number of subprojects financed with AID resources.

## 6. Analysis

The technical design of the project is reasonable and the cost estimate is reasonably firm. Benefits and costs have been computed for this water-related project. To avoid the problems associated with the selection of appropriate discount rates for Benefit-Cost analysis, the internal economic rate of return (IRR) has been worked out (see section on Economic Analysis below and Annex B, Exhibit 7).

For the project as planned and assuming the full value of the benefits, the IRR is 45%. Even if the rate of achievement is reduced to 50% of the targeted outputs and the value of benefits is reduced by 20%, the IRR is 23%.

The project is technically and economically sound and meets the requirements of FAA Section 611(a) and (b).

## **B. Financial Analysis and Plan**

### **1. Financial Rate of Return**

In the Economic Analysis section which follows in Part III, D, the internal rates of return for the project are computed on alternative bases. The returns of the project are substantial even when very conservative assumptions are applied.

From a financial standpoint, farmers can be expected to realize an increase in income if the project yields the results in improved crop and water management as planned. It has been noted elsewhere that five-fold increases in crop production are believed achievable if watercourses are improved, land is precisely leveled and sound cultural practices are adopted by the participating farmers.

Making the project especially attractive to farmers, besides the favorable returns, are the cost-sharing measures included in project plans, to encourage broad farmer participation. For watercourse improvement, the costs of engineering, concrete diversion structures and concrete lining will be met by the project rather than the farmers. In precision land leveling, the costs of precisely leveling the first five acres of land will be shared 50-50 by the farmer and the project.

### **2. Project Financing**

The costs of the project will be met by a combination of Government of Pakistan, farmer and AID loan financing.

#### **a. Government of Pakistan**

As set forth in Table 3, Annex B, Exhibit 2, the Government will provide Rs. 382 million (before AID reimbursement) over the five years of which Rs. 268 million will be regular budget costs and Rs. 114 million in credit. This is believed within Government funding capabilities. After AID FAR reimbursement, the net Government contribution will be Rs. 160 million (\$16.2 million).

#### **b. Farmers**

The farmers' contribution to the project will be Rs. 56 million, of which Rs. 18 million will be provided as labor on watercourse improvement and Rs. 38 million in cash downpayments for

precision land leveling. The labor contribution, on an average watercourse of 16,000 ft., is assumed to be about 25 eight hour days, with 40 farmers on a watercourse and each worker's time being valued at Rs. 1.5 per hour. The work time donated by each farmer is believed within reason, farmers in XSU tests having devoted greater amounts of time to such activity.

The cash contribution involved in an illustrative ten acre case is assumed to amount to Rs. 1,125 for leveling work, and bank credit the remaining Rs. 3,375 (75 percent of the farmer's share). Such amounts are believed within farmers' cash generating and credit-qualifying and repayment capabilities.. Bank credit is discussed in Part IV.B.4.

c. AID Loan

The first loan, recommended herein, will be for \$7.5 million, disbursed over three and a fraction years, (using planning assumptions) and followed by a second loan of \$15 million in FY 1978.

The loan will be disbursed using the FAR method but a series of advance payments will be made to the Borrower to ease mobilization of Field Teams. More detail on disbursement is contained in Part IV.B.7.

The FAR payments will be associated with non-administrative costs of the Government: concrete structures, lining and engineering, for watercourses (AID will reimburse 100 percent of these cost elements) and precision land leveling earth-moving costs (75 percent of these will be financed by AID).

As set forth in the Exhibit 2 tables, the AID loans will finance 60 percent of the project's costs in the first three years and 52 percent of the total of the five year effort. The provision of Section 110(a) are expected to be more than met.

3. Project Budget

A project budget, reflecting Government, farmer and AID contributions appears in Table 3, Annex B, Exhibit 2. In summary, it

shows for the five years:

	<u>Million Rs.</u>	<u>(Million \$.)</u>
GOP, net of AID reimbursement.	160	16.2
Farmers	56	5.7
AID Loans	<u>223</u>	<u>22.5</u>
Total:	Rs.439	( \$44.4 )

The projections of Table 2 are based upon rates of implementation which have been discussed with the Government of Pakistan. Many assumptions have been made with respect to farmer acceptance, average size of farms, pace of work and commencement of provincial operations. Actual experience as the project proceeds may indicate that the project will be implemented at a faster or slower rate than the plan shown.

#### 4. Financial Viability - Summary

Financial returns to farmers, as a result of the project, are very favorable. Cost estimates have been prepared in detail for all cost elements and are reasonably firm. Funding, in the amounts shown, from non-AID sources is within the sources capabilities and is reasonably assured for a pilot project of this kind.

Financial mechanisms to carry out the project - cost-sharing, bank credit, AID's FAR system - are judged feasible.

## C. Social Analysis

### 1. Background

A detailed analysis of the social setting of the project and the project's suitability for Pakistan's rural areas is contained in Annex B, Exhibit 3.

### 2. Village Social Structure and Cooperation

A typical village in Pakistan is composed of farm and non-farm households. The number of such households generally ranges between 100 to 250. Farming households account for approximately 64 percent of these, whereas the balance is comprised of farm laborers, artisans, shopkeepers, and others.

In irrigated regions of Pakistan, the social structure has identifiable leadership patterns. The primary allegiance group is the family, then the brotherhood kinship system, followed by caste or tribe. In most irrigated regions of the Sind, Punjab, and Northwest Frontier, the Numberdar, a government appointed village leader, along with respected leaders of brotherhood kinship groups, have definite leadership roles and have influence in community decision making. These leaders can usually be identified by the size of their farm holdings but often retired civil or military officials and religious leaders also have much power and influence.

Interviews with farmers indicate that these leaders, and the village numberdars exert substantial influence in the settlement of disputes over water use, as well as in other issues important to the community.

Patterns of social cleavage exist in Pakistani villages and occasional conflicts arise concerning land ownership, water stealing, theft, issues related to women and other questions.

There are also definite patterns of cooperation for collective good, as seen in the establishment and maintenance of mosques, schools, the employment of a village watchman (chowkidar) to assist the Numberdars, and other activities. There are definite arrangements for these tasks and systems of social pressure exist for gaining compliance from community members.

### 3. Social Consequences and Benefit Incidence

The On-Farm Water Management project is expected to have beneficial effects on all groups in a village: farming households, including the women in these households (see Annex B, Exhibit 4); landless farm laborers; artisans; shopkeepers; and others.

The economic and financial returns of the project will largely, or most directly, accrue to land-owning cultivators, although tenant farmers<sup>1/</sup> and other farm laborers<sup>2/</sup> will also gain by

- a. increased cropping intensity
- b. increased crop productivity
- c. increased employment for family labor

This project will focus on the average-size or smaller farmer. For land leveling, the project will provide up to 50 percent of the costs for the first five acres for any farmer. In addition, farmers will have access to credit through banks to help finance part of their share of the costs. Special efforts will be made to insure the small farmer (average size in the area or smaller) will have equal access to credit as does the larger farmer (above average size in the area). In watercourse selection, small farmers will also be given preference. In order to insure distribution of benefits to small farmers, those watercourse command areas to be improved will be selected where at least 75 percent of the total number of farms in a watercourse command area are 25 acres or less in size. This would rule out watercourse command areas where there are only a few large land holders.

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1/ For a discussion of tenant farmers' benefits, see Part IV, Section B. 3.

2/ While this project deals primarily with farmers, it will also have significant impact on the landless laborers who are often able to obtain employment for only part of the year. Watercourse improvement will be scheduled primarily in these seasons when these extremely poor people need employment. Enumeration by CSU - Mona staff of workers in the first pilot watercourse improvement project showed that most of them were landless laborers. Identifying manual improvement and maintenance of watercourses as a good investment for farmers will provide a continuing source of employment for these landless laborers during periods when their services are not otherwise needed.

#### 4. Spread Effects - Diffusion

The reasons why farmers have not given more attention to cleaning and maintenance of their watercourses and to precision land leveling are several: a lack of knowledge of the magnitude of water losses; relatively few incentives and assistance provided by the Irrigation and Agriculture Departments; ignorance of the technology required to reduce many types of losses; and an absence of government attempts to organize farmers for the required improvements.

There is much evidence to support the view that farmers will respond positively to the program. First, farmers in the irrigated regions have responded to the high yielding grain varieties and the use of fertilizer. Secondly, private farmers have installed over 127,000 tubewells to supplement their short canal supplies. Thirdly, over 70 percent of farmers interviewed in five districts reported water as one of the major constraints to increasing crop production. On watercourses with no tubewells, about 85 percent of the farmers gave this report. Fourthly, farmers report their expected increases in cropping intensities give a doubling of their canal water supplies. Fifthly, where several experimental watercourses have been constructed, farmers have contributed labor and supplies. On one watercourse which was rehabilitated, farmers rebuilt over 30,000 feet of earthen channels and groups of farmers who came to observe the work requested technical assistance. Sixth, the AID-assisted precision land leveling project in Pakistan had over a thousand contacts with farmers in the last quarter of 1975 and about 700 made requests for land leveling services. By December of 1975, acreage leveled had reached 3369 acres on 550 farms. Farmers in Pakistan have purchased about 250 soil scrapers produced by local fabricators. Lastly, the technologies of land leveling and watercourse rehabilitation are highly visible and farmers easily see and understand benefits. Where experimental watercourses have been improved, farmers have quickly seen the doubling of water supplies at the tail positions of watercourses. Where land has been leveled farmers have seen that they can irrigate a given area in half the time, thereby saving water. These visible improvements are also combined with a package of practices which will double or triple yields of most crops.

## 5. Water Users' Associations

A requirement for farmers on a watercourse to participate in the program is that they organize formally or informally to request help and carry out the work. Through these organizations, farmers will participate in the planning, implementation, and evaluation of all improvement activities. Specific responsibilities are: planning, arrangement and supervision of labor, agreements with contractors and artisans, purchase of supplies, assessments of cash, arrangements for cooperative use of equipment, settlement of disputes, plus the establishment of a routine maintenance program.

The Social Analysis Annex discusses formal and informal organizations. For this pilot effort, it is likely that associations of farmers on watercourses will be informal and based on existing patterns of organizations. However, the effectiveness of these informal organizations is to be carefully evaluated during the first year of the project. A judgement will be reached whether to continue with informal associations or to seek the development of more formal watercourse entities. Testing of several models of formal water user organizations under both the Cooperative Act and the Companies Act will be carried out as a research effort under the project.

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(The impact of the project on population growth and the project's relationship to the role of women are discussed in Annex B, Exhibits 4 and 5.)

D. Economic Analysis

1. Project Economic Analysis

a. Introduction

The economic justification for this proposed project and for the supporting U.S. loan rests upon four major bases.

First the priority position of agriculture in Pakistan's development plans, particularly over the next five years covered in the Draft Fifth Five Year Plan 1977-81, recently made available to the Aid to Pakistan Consortium, of which the U.S. is a member. Within the agricultural sector, water is a major constraint to increased productivity and output.

Second, the income redistribution impact of the proposed project, which will disproportionately favor the low income farmers in the irrigated areas.

Third, the high rate of return to Pakistan's economy from the resources used to implement and maintain this project, which compare favorably with those from alternative uses of the resources required.

Fourth, the supporting loan is essential because Pakistan's economy cannot concurrently implement this project and other activities essential to the achievement of the targets of its development programs without external assistance.

b. Development Priority of the Project

Widespread use of HYV, fertilizer, and tubewell irrigation have greatly improved agricultural productivity in Pakistan. Further two to five fold improvement is possible through effective on-farm water management. A.I.D. sponsored research efforts, though limited in geographic coverage, have amply demonstrated that control of delivery losses, precision land leveling of fields, and improved crop and water-use practices not only have high economic pay-offs but also offer real possibilities for diverse farm groups, including low income farmers to profitably participate in agricultural modernisation. This pilot project, building upon these A.I.D. assisted research efforts, will test the groundwork for a still larger scale replication.

This is directly in line with the priorities of the Draft Plan, which expects "Value added in agriculture will grow at a rate (over the five years) of 6.5 percent and will contribute

23 percent of the increase in Gross Domestic Product (GDP). . . ."  
The increase in irrigation water from Tarbela Dam; doubling of fertilizer use; and enhanced use of improved seed varieties, etc., will account for this increase. This project will increase irrigation water availabilities, as well as add to its more effective use. The Government's 1976-77 Memorandum for the Pakistan Consortium states ". . . . efforts will be simultaneously made to bring about basic improvements in agricultural organization and support services . . . , seed industry, water management, and agricultural credit."

c. Income Redistribution

Income redistribution is also identified in the Draft Five Year Plan as a major objective. While not excluding the larger farmer, this project will focus on the average and smaller farmer. The project will provide up to 50 percent of the costs of precision land leveling for the first five acres of any farmer's land in the project areas. In addition, farmers will have access to credit through Agricultural Development Bank (ADB), commercial and possibly cooperative banks, to help finance part of their share of the costs. Special efforts will be made to insure the smaller farmer will have equal access to credit. In the selection of watercourses and therefore of project areas, small farmers will be given positive preference. These watercourses command areas to be improved will be selected from those where at least 75 percent of the farmers have holdings of 25 acres or less. This will completely rule out for watercourse improvement command areas dominated by a few large land holders.

Perhaps most importantly, the project's impact upon the farmers on a given watercourse will be greatest for those at the tail, who are nearly always those with the lowest farm income. The income differential between farms of comparable size, but alternatively located near the head or the tail of the same watercourse, is currently estimated to lie in the range of 26 to 38 percent. The water savings projected in the project areas will narrow this to only 8-10 percent.

d. Economic Rate of Return<sup>1/</sup>

The economic analysis of this project is developed around five typical watercourse environments. Three technologies: (1) earth reconstruction with concrete junctions and diversion structures; (2) lining with soil cement blocks; and (3) concrete lining, (already field tested by the Colorado State University team in Pakistan) are expected to be used. The parameters describing typical watercourses and those improvement

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<sup>1/</sup> The basis for the calculations in this section is set forth in Annex B, Exhibit 7.

technologies are shown below:

	Watercourse Type			With tubewell Pumping <u>1/</u> (SCARP areas)	
	Case I	Case II	Case III	Case IV <u>2/</u>	Case V <u>3/</u>
Duty (Acres/cfs)	350	350	265	150	150
Command Area (Acres)	400	700	530	550	550
Annual Water Supply (Acre/Feet)	800	1400	1400	2076	1698
Annual Losses:					
Spillage (AF)	120	258	258	482	364
Seepage (AF)	80	162	162	292	224
Total (AF)	200	420	420	774	588
Annual Savings of Irrigation Water:					
Earth reconstructed with concrete structures (AF)	90	189	189	232	176
Lining with soil cement blocks (AF)	89	187	187	346	262
Concrete Lining (AF)	94	199	199	366	277

The water saved has been assigned its scarcity value as ascertained in recent studies, particularly one that models Pakistani farming systems. Assuming various water delivery and application efficiencies, various levels of capital constraints on farmers, and a steady improvement in farmers use of available technology (improved extension is built into the project), water saved in the non-SCARP watercourses is valued at Rs. 22 per acre inch on unlevelled fields. In the SCARP cases an acre inch of water saved is valued at Rs. 13/-.

1/ Salinity Control and Reclamation Project (SCARP) watercourses utilize tubewells.

2/ Tubewell (supplementing main canal discharge into the watercourse) operated at 65 percent of capacity.

3/ Tubewell operated at 40 percent of capacity.

The benefits of precision land leveling, attributable to better germination, reduced fertilizer loss through leaching, increased tillable acreage, and lower delivery losses, are estimated as in the first year and in each of the subsequent years.

The benefit/cost analysis combined these watercourse on a conservative weighted basis.

In calculating the economic costs of the project, all the financial costs (as shown in the financial Section, (III. B) of this paper) were included. In addition, resources that will be used in connection with this project, but which are not charged to the financial cost of the project, were added to the costs for the purpose of the economic benefit/cost analysis. No inputs were shadow priced, all were valued at their 1976 market prices. The real resource costs added included certain technical assistance inputs, the maintenance of precision leveled fields and improved watercourses, repetition of the earthen watercourse improvement work, and the continuance of the specialized, more intensive extension effort in project areas after water management teams have moved on to other areas, even after the five year project term.

On these bases, the internal economic rate of return from the project is presented below, together with its sensitivity to changes in certain critical project assumptions.

Internal Economic Rates of Return

	<u>Value of benefits</u>		
	<u>Full Value</u>	<u>Reduced by</u>	
		<u>10%</u>	<u>20%</u>
<b>A. Base Case (Project as planned):</b>			
5 year replacement of earth channel	45%	39%	33%
7 year replacement of earth channel	45%	39%	33%
<b>B. Rate of achievements reduced to:</b>			
90% of targets	43%	37%	31%
80% of targets	42%	36%	30%
50% of targets	33%	28%	23%
<b>C. Water savings reduced to 50%</b>	26%	22%	19%

e. Resource Constraint

A fourth major justification for this loan is that despite the high anticipated returns from the project, it is beyond the capacity of the Government of Pakistan alone to finance completely without foregoing other high return, high priority projects or expenditures. (The alternative expenditures include some from which a high return is anticipated because they are essential to complete and begin generating benefits from projects already underway even though the overall project benefit/cost ratios will be less than from this project). A model presented in the World Bank's March 1, 1976 report to the Aid to Pakistan Consortium: Pakistan: Recent Trends and Development Prospects (Report # 1023 - PAK), indicated that about 37 percent of fixed investment expenditures (as shown in the Government of Pakistan's Draft Five Year 1977-81 Development Plan) in the next five years will have to be financed from external resources. This model assumed significant improvements in the rate of growth of output, production, exports, and savings, and if these assumed improvements do not materialize, the need for foreign resources will be even greater. This project will make a significant contribution to improved output in agriculture, the most important resource of value added for Pakistan's economy.

Most of the improvements and the resulting increases will have to come (in the words of the World Bank report) "... largely from agriculture during the first five years (of the decade covered by the model)". This loan project will directly increase productivity and output in this critical sector.

The Government has taken a number of steps to accelerate exports and domestic resource mobilization over the last year, some in the last few months. It has increased the profitability and self-financing capacity of public utilities and nationalized industries by increasing prices and eliminating subsidies to consumers of their output and services. It has announced new agricultural support price policies and other measures to increase farmer incentives to invest in fertilizer, high yield varieties and other inputs. It has announced the end of certain export limitations, and liberalized the distribution of fertilizer, and improved the distribution system for fertilizer, certified seed, and other farm inputs. It is continuing to improve the rural credit system, and making large credit allocations to the farm sector. These self-help measures are essential, but they can only reduce, not eliminate the need for continued foreign aid.

## **2. Pakistan's Economic Performance and Repayment Capacity**

### **a. Pakistan's General Economic Performance:**

During fiscal year 1976, Pakistan continued to suffer from the impact of the worldwide recession. But its performance, while falling short of the targets set in the Government's annual planning and budgetary exercise, considerably improved over the previous year.

Agricultural production led the increase in output and income, paced by a remarkable increase in wheat production, to over 8.0 million tons by official estimates. The target of 8.4 million tons may even have been met, despite the delay for the second successive year in the availability of irrigation water from Tarbela dam. Good weather conditions offset much of this problem, and permitted reaching of the production targets for sugarcane and a sizeable increase in rice output. Liberalization of fertilizer distribution accompanied (and largely made possible) by adequate in-country fertilizer supplies, progress toward achievement of a better balance between phosphatic and nitrogen fertilizer use, continuing initiatives in the provision of farm credit, the initiation of a price support policy, and movement toward a ratio between farm input and output that will enhance farmer production and investment incentives all contributed to this result. These actions were all part of the A. I. D.-assisted Agricultural Inputs Project. With World Bank assistance, a new, more effective system for the distribution of certified seeds is being installed. Recently, the Government has announced that the farm price support program will be extended to cotton, maize, and certain vegetables. An oilseed support program, aimed directly at utilizing Pakistan's comparative advantage to substitute domestic production for imports of edible oil is under intensive discussion in the Government.

Large scale industrial production continued to lag, largely because of the general recession and consequent decline in the demand for yarn and other textile products. Private investment in industry has been minimal, except for a few Government joint ventures, and some expansion of existing foreign private investment. There is evidence that private investment in non-industrial sectors (tourism), in small scale industry and particularly in construction was sizeable and still growing.

Domestic savings rates improved somewhat, although they are still estimated to have reached only about 8.4 percent of GDP.

(This compares with approximately 17.4 percent in the U.S.). Inflation abated considerably under the influence of better food, grain availabilities, sharply reduced import price increases, and the holding of credit expansion pretty much within IMF credit ceiling, although no standby agreement was in force during most of the year.

Pakistan's public savings performance should increase markedly in fiscal year 1977 and throughout the five year plan period, due to steps initiated earlier. The government courageously increased issue prices for wheat, edible oil petroleum products and other consumer items, despite significant political reaction. To place nationalized industries and utilities on a more business like basis, able to finance more of their own needed expansion their rates and prices were increased. Income tax collection efforts were intensified. The heavy dependence of overall government revenues upon the foreign trade sector was reflected in overall government revenues as export earnings fell below targets, even though new import duties were imposed.

b. Balance of Payments and Repayment Prospects

(1) Introduction

Pakistan is a poor country. Its ability to finance its development requirements is severely constrained by a shortage of resources, (one of the important justifications for this proposed loan) and this resource shortage is clearly reflected in the balance of payments. External resources, principally foreign aid, have been financing a large proportion of Pakistan's development investments, but this proportion has been and should continue to decline.

**External Financing of Pakistan's Investments**  
(Fiscal Years: % of Investments)

<u>Estimated</u>		<u>Projected</u>	<u>Planned</u>
1974/75	1975/76	1976/77	1976-81
63	52	47	33

This decline of foreign investment and aid as a proportion of development financing, however, does not imply a decline in the gross value of aid flows. Instead it is the result of a planned continuing increase in Pakistan's savings, with the steady increase

in marginal savings applied to new investments. These will provide the means for Pakistan's continued development investments, not only to assure a higher standard of living for Pakistan's poor as they benefit from the increasingly self sustaining process of economic growth and improved income distribution, but also to assure the repayment of the loan proposed here and Pakistan's other debt service obligations.

## (2) Trade Balance

Pakistan's balance of payments has been under severe pressure in recent years. The economy's external terms of trade have deteriorated badly. First, there was a sharp increase in the price of essential imports: petroleum and its products, fertilizer, insecticides, wheat, edible oil, and capital goods and raw materials. Later, although prices stopped their climb or even dropped, the prices of Pakistan's exports: cotton, yarn, textiles, and rice dropped sharply. Fortunately one of Pakistan's major export-factor services -- in the form of emigrant laborers' services (primarily to the Gulf States and the Middle East) has grown steadily in value. There has also been substantial assistance from the OPEC countries, although much of it has been lending with relatively short repayment periods.

Pakistan has maintained and broadened the liberal import policy it adopted (with the active support of the IMF and the Consortium) as part of the 1972 reform (including devaluation) of its foreign exchange regime. It is now considering measures that will further liberalize imports, although implementation of the steps necessarily depends upon the continued availability of aid.

Pakistan's Balance of Payments  
(U.S. \$ Millions)  
(Pakistan Fiscal Years: July 1 - June 30)

	<u>FY 1975</u> <u>actuals</u>	<u>FY 1976</u>	<u>FY 1977</u> <u>Projected</u>	<u>FY 1978</u>
Exports	978	1100	1320	1550
Imports	2163	2200	2500	2800
Trade balance	-1185	-1100	-1180	-1250
<hr/>				
Net Invisibles	69	90	66	108
Debt servicing	249	419	364	468
To be financed	1365	1429	1478	1610
<hr/>				
Aid utilization	1135	1300	1250	1250
IMF and short-term borrowings	316	195	200	} 360
Errors and Omissions				
Changes in Reserves (Negative=increase)	-93	-66	-28	
(Reserve Position)	(460)	(526)	(498)	

**(3) Repayment Prospects**

Pakistan has recently completed debt relief agreements with the members of the Consortium and with certain non-consortium countries, that dealt particularly with the debt obligations effected by the 1971 partition of the country and the creation of Bangladesh. These arrangements have brought down the country's debt service obligations to manageable levels. Recent changes in IMF regulations covering eligibility for the IMF Compensatory Financing facility have led to intensive IMF-Government of Pakistan consultations about the use of certain other IMF facilities which Pakistan has not previously used. (The country has used the Standby facilities and CIL facility, but not the entire range of traditional and new services available.)

There are also discussions of additional OPEC financing, possibly involving guarantees of short term borrowing that will meet the large gap still to be financed in FY 1978.

In the longer run, Pakistan's exports should improve markedly. Import substitution investments, being made in the next few years, plus this increase in export earnings combine to indicate that the repayment prospects for this loan, if made on A. I. D.'s softest terms, are reasonable.

PART IV

IMPLEMENTATION ARRANGEMENTS

A. Analysis of Recipient's and AID's Administrative Arrangements.

1. Recipient - Negotiating Status

The Government of Pakistan has assigned overall coordination and program responsibility for the project to its Ministry of Food and Agriculture. The Ministry's Agricultural Development Commissioner chaired the committee working with the USAID Mission in designing the project. The Commissioner also coordinated provincial and federal government views and preparation of budget documents. The responsibility for project management will impose a heavy burden on the Ministry because of the project's complexity, the experimental features and its implementation in all four provinces. The Agricultural Development Commissioner may require additional staff in his office to monitor the project day by day.

More direct supervision of project activities will be the responsibility of the provincial Agriculture Departments. Provincial supervisory staffs are expected to be organized along the lines indicated in Annex B, Exhibit 2, Table 5. These staffs, under a provincial Project Director, will be expected to perform all of the administrative, technical advice and support and training supervision functions necessary to deploy, support and monitor the Field Teams which will work directly with farmer organizations. (The role of the Field Teams is described in Part IV, B. 1., below).

Governmental coordination, at the provincial level, will be the responsibility of each province's Planning and Development Department. Coordinative functions will probably include assistance in obtaining other departments' approvals as may be necessary, as well as budget review and funding plan endorsements. It will be the Planning and Development Departments' responsibility to coordinate project plans with the planning of the Irrigation Departments, which have responsibility for irrigation facilities from the water source to the "mogha" outlet point, where the purview of this project begins.

Plans for execution of the project have been discussed by AID with the provinces of Punjab, Sind and Northwest Frontier but have not yet been discussed in any detail with the Government

of Baluchistan province. The program will not begin in Baluchistan until July 1, 1977 and will be limited in scope, as compared with other provinces because of the smaller amount of irrigated agriculture in the province.

The Punjab provincial government has, in an advanced stage of Government approval, a budget proposal which will authorize implementation of the project over the five years. Punjab will have a provincial supervisory staff generally following the suggestions made by the AID Mission. The AID suggestions have been accepted in principle by the central government's project planning committee.

Staffing of the provincial organizations with officials of adequately senior rank, is seen as a crucial feature of the project design. Sufficient budgeted resources to compensate these officials, equip them with vehicles, vehicle fuel and the supplies they will need, is similarly essential.

Evidence that provincial staffs have been sanctioned, have received recommended budgeted funds and that the positions are encumbered with qualified personnel will be included as conditions precedent to disbursement of AID loan funds for each province. While it is anticipated that the Punjab province will act in time to begin its portion of the project on July 1, 1976, early decisions by other provinces would make it possible for these provinces to begin work, meet AID conditions precedent and benefit from project disbursements, sooner than the July 1, 1977 starting date for these provinces reflected in the financial tables (Annex B, Exhibit 2). It is expected, moreover, that the Sind province program will begin at an earlier date than the tables show although Sind planning has been somewhat slower than in Punjab. The Northwest Frontier province has indicated to AID it wishes to continue an ongoing precision land leveling project before joining the new program in 1977.

While the proposed project is innovative, and therefore does not have the advantage of clear administrative precedents, knowledge of the activities to be undertaken - watercourse improvement, precision land leveling and improved crop and water management techniques - is widespread among Pakistan's agricultural planners and administrators. Thus, the expectation that the proposed plans will be followed appears reasonable.

2. A.I.D.

The monitoring role for the AID Mission will be a more difficult one than for projects with narrower geographic scope, fewer work sites and less experimental administrative arrangements.

There will be several aspects to the monitoring. Among these will be:

a. Technical Advice

Governmental units will require, from time to time, AID-provided management advice - on organizational matters, training, farmer organizations, publicity and farmer motivation, and research activities.

With respect to training, the services of eight U. S. Soil Conservation Service advisors, who have provided advice under the grant Precision Land Leveling Project, will continue to be available until March 1978, under AID grant funding already programmed. The AID centrally-funded contract with the Colorado State University 1/ will be called upon for assistance in planning of agricultural extension worker training and for planning of project-related research.

Other advice to Government units, as, for example, banks, communications media, will be provided on an as-needed basis by existing AID Mission direct hire staff in various Mission technical divisions.

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1/ The CSU research activity was recently evaluated by an AID/Washington team. The team recommended that a new PP be submitted, extending the project for five years, with about two man years per year devoted to research on Pakistan location-specific technology and development and testing of methods of applying the research, i. e. development, testing and refinement of technology transfer models, including training of personnel. This input from the CSU will reinforce the project. Research carried out under the AID-supported Agricultural Research Loan and PL 480 funded research also will be supportive of the goals of this project.

b. Overall Project Monitoring

An additional AID direct-hire agricultural engineering staff member may be required to assist the present AID Water Resources Advisor. This new agricultural engineer will supervise one to four Pakistani monitor inspectors, whose services will be obtained on a personal service, or engineering firm, contract basis. The SCS team may be needed to train these monitors. The monitors will be required to inspect work sites for verification of work completion, in connection with the Fixed Amount Reimbursement (FAR) method of disbursing the AID loan. (The FAR system is discussed below).

B. Project Implementation

1. Basic Implementation Unit - The Field Team

The key element of plans for implementation of the project is the formation and deployment of Water Management Teams in each province. The Teams, comprised of specially trained technicians, will work directly with farmers and farmer associations in all aspects of project implementation. The role of the Teams is described in the section "Sequencing of Technical Components on Watercourse Command Areas", below.

Each Water Management Team will be responsible for the rehabilitation of a cluster of five watercourse commands per year, the Team's work to include the renovation and improvement of the watercourse and precise leveling of approximately 150 acres of adjoining land in each command area and approximately 133 acres of land elsewhere in the provincial project area. Precision land leveling will vary from place to place and watercourse command to command but on the average these amounts of work are believed representative and feasible for achievement by the Team and the involved farmer group.

It is planned that a Team will be comprised of ten members as follows:

- 1 - Team Leader
- 2 - Watercourse Engineers
- 5 - Land Development Officers (LDO's)
- 1 - Agricultural Officer (water management)
- 1 - Field Assistant

The training necessary to prepare Team members for their water management assignments is described in Section IV. B. 5, below.

The number of Field Teams in operation during the five year program will increase from three in the first year, 1977, to 138 in 1981. A schedule of the Team deployment, work to be accomplished and costs, is shown in Annex B, Exhibit 2, Tables 1 and 3.

Adequate transport will be provided for every Team to assure that Team members have the capability of carrying out their active assignments with speed and precision.

The Team composition and method of deployment described above represent AID's best judgement of the professional requirements in implementing the three major elements in the program. The project will experiment with various combinations of professional skills and methods of deployment of the Teams over areas of various sizes. Costs and benefits of alternatives will be evaluated, and a set of guidelines developed for staffing and staff operations for different sets of condition encountered in Pakistan. Based on these, appropriate changes will be made in the manner of operation of the pilot project.

2. Sequencing of Technical Components in Watercourse Command Areas.

The first step in providing the services to farmers -- watercourse renovation, precision land leveling, and crop and water management advisory service -- will be the selection of a cluster of about five watercourses in a target area sufficiently small so that good logistical support is possible and personnel can reach work sites without excess difficulty. Generally, the area will have a radius of less than five miles. Activities of the Field Team will be phased so that work within the cluster is efficiently distributed among several tasks and concentrated in other activities. Watercourse improvement will be on the selected watercourses, but precision land leveling and water use and crop management extension will be made available on a demand basis to the whole provincial project area.

a. Publicity

A crucial first step will be a campaign of publicity, employing radio, television, simple diagrammatic printed materials, and instructions to field team workers, to arouse farmer interest in the project. This will begin as soon as possible with the assistance of radio, television and Information Ministry officials.

b. Promotional Activities by Field Teams

A team leader and water management advisor will be posted to a selected target area. They will work with local extension service personnel and radio stations and newspapers, providing them with basic information and program outlines designed to make farmers aware of the low delivery and application efficiencies and to disseminate general information on potential benefits of the project.

As interest is stimulated, direct contact with farmer leaders will be made by the project personnel or on site extension service personnel who have been given an extended briefing on the program.

They will deliver, to the leader of each community in each watercourse command area, an outline of the watercourse improvement and precision land leveling program printed in

basic Urdu. It will explain:

- (1) the improvements to be made and how much water is saved, on the average, by such improvements, and the potential for increased crop production that can be achieved following these improvements,
- (2) the commitments and work required from the farmers,
- (3) the services and structures provided by the government,
- (4) where application forms for this program can be obtained, how and to whom application can be made for this program, and when the cutoff date will be for applications, and how selection will be made from the applicants,
- (5) precision land leveling and water and crop management concepts.

c. Application Forms

The application will include a questionnaire that must be filled out, giving information on:

- (1) number of farmers on the watercourse and number of acres in the command area,
- (2) time required to irrigate acres of land at the head, middle and at the tail of the watercourse,
- (3) current cropping intensity (last 2 seasons),
- (4) number of man hours currently spent/year in watercourse cleaning and maintenance and whether the farmers all participate willingly,
- (5) times of year when farmers could invest the number of man hours required to complete the job,
- (6) specific location of watercourse and designation of the mogha and tubewell and specific location of watercourse (including an outline map showing squares involved),

**(7) precision land leveling assistance needed.**

The Team leader and water management advisors, assisted as needed by local extension personnel, will provide application forms, accept applications and provide further information and assistance to farmers groups which express interest in the program. They will also make measurements of water loss, cropping intensity, check with patwari (local registrar) records etc. to determine the accuracy of information on the applications.

d. Watercourse Command Selection

With advice from local extension agents and in accordance with published criteria for selection, the Team leader, his supervisor (Water Management Counsellor at the Divisional Headquarters - See Annex B, Exhibit 2, Table-5) and the water management advisor will review the applications and develop a tentative priority list of watercourses for improvement.

When there are sufficient strong applications for the improvement program, the supervisor will post a watercourse engineer and field assistant to help evaluate the watercourse.

The watercourse engineer, water management advisor, and the field assistant will work with the Team leader to obtain detailed information, on the top ten watercourses, required to decide which will be the first watercourse to be improved and the priority of the other watercourses. When this information is available the supervisor will join the team in making those decisions (according to Criteria for Selection of Watercourse Commands, section IV. B.3, below).

e. Organization, Planning and Commitment Phase

The selection decisions will then be reported to the farmers. A topographic survey will begin on the first priority watercourse commands and meetings will be held with water users on the top five watercourse commands. Each group will be asked to organize to at least the level of appointing an executive committee which has authority to represent them in planning and in the operational decisions that will be involved. (Where desirable, more formal organization patterns designed to facilitate the program will be suggested). At this meeting the farmers and the team members will go over the plan and the commitments of both sides and will sign an implementation agreement including the schedule for improvement.

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It will be stressed that if farmers fail to provide the committed labor on schedule, the team will move on to the next watercourse on the priority list.

On the basis of this plan and signed agreement funds will be obligated by the Department of Agriculture for the pucca structures in the plan.

f. Posting of Land Development Officers - Initiation of Precision Land Leveling

If prospects are sufficiently favorable in the area, arrangements will be made with a bank to handle the funds, Land Development Officers will be posted in the cluster area and will begin precision leveling work on a demand basis both in the selected watercourse command areas and outside.

g. Construction of Watercourses

Team watercourse engineers will set alignment and levels for the farmers, who will themselves do all the earth moving and packing. When the earthen improvements meet the design specifications, the pucca structures will be installed under the supervision of the engineers, using labor provided by the farmers. The executive committee of farmers will work with the watercourse engineer to plan the daily schedules and work assignments.

h. Demonstration of Water and Crop Management

The Agricultural Officer, the Land Development Officer and the Field Assistant will select farms for plots to demonstrate the benefits of precision land leveling and a package of better-suited cultural practices. (It is anticipated there would be one to three such demonstrations per watercourse command.) These plots will be laid out as soon as possible in all watercourse commands as a means of quickly building creditability with farmers. The Agricultural Officer and the Field Assistant will work on all watercourses, teaching farmers soil-water-plant relationships, improved irrigation methods, how, when, and how much to irrigate, and encouraging farmers to take advantage of precision land leveling services. They will utilize the farmers' watercourse command committees as teaching cells and work with farmers individually to improve their cultural practices. Field days, to publicize the benefits and discuss costs with other farmers, will be held.

i. Team Moves to New Areas

When the demand for precision land leveling and watercourse improvement has been met, the team will move its headquarters to a new location from which it can serve the developing needs. One Field Assistant (water management) will be left behind to assist farmers on a permanent basis. The Field Assistant will have been trained on the job for one year by the team and will continue to obtain guidance through normal extension channels and frequent contact with the Agricultural Officer.

j. Continuing Technical Help

Through the Field Assistant, contacts will be maintained with farmers on the completed watercourse commands, to provide guidance on touch-up work on precisely leveled fields and water-courses improved. The Agricultural Officers (water management) will return periodically to the completed cluster area to supervise and guide the Field Assistant.

k. Research, Technical Assistance and Evaluation

A strong research evaluation and redesign component will be provided, with research and evaluation conducted both at national and provincial levels. At the provincial level, it will be largely the responsibility of the Department of Agriculture, with the assistance of the Planning and Development Departments and advisory aid from the CSU water management team and, until March 1978, the SCS teams.

3. Beneficiaries of Project - Criteria for Selection of Watercourse Command Areas

a. Beneficiaries

(1) The Small Farmer

The 1972 Pakistan Census of Agriculture shows the number and acres of farms classified according to operational size. According to the Census, 89 percent of the total number of farms are 25 acres or less (57 percent of total

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farm area) and 68 percent of the farms are 12.4 acres or less (30 percent of the total farm area). In the Punjab, a similar relationship holds, with 65 percent of the farms under 12.4 acres (30 percent of total farm area), but in the Northwest Frontier the relationship is more adverse, with 84 percent of total farms under 12.4 acres (36 percent of farm area).

This project will seek to identify the small farmer as the Criteria for Selection of Watercourse Command Areas (section 3.b., below)

The cost sharing arrangement for precision land leveling (government grants of 50% of the cost for up to five acres) is intended to promote small farmer participation in the program.

Whether experience shows that small farmers are in fact participating - as a result of the weight given to small farms in the watercourse selection process or the cost sharing arrangements - will be examined in the annual evaluations.

## (2) Tenant Farmers

Less information is available as to the extent and kinds of tenant farming in Pakistan. It is understood that many tenant farmers have a substantial degree of security in remaining on the land on which they farm, reflecting both actual practice and existing legislation aimed at assuring such security. Under the AID precision land leveling grant project, landlords have paid for land leveling and tenants have shared in the benefits. In some circumstances, tenants also benefit from landowners' greater access to credit and technology. Very often tenants have incentive crop-sharing arrangements with owners. In cases of this type, tenant farmers will clearly benefit from this project.

## (3) Other Beneficiaries

Participation in project activities cannot feasibly be limited to small farmers because farm size varies along a single watercourse. Farmers with larger holdings will, of necessity, be involved in particular areas.

b. Criteria for Selection of Watercourse Commands

Almost all watercourse command areas in Pakistan are in need of some improvement. The pilot project activity will be limited to those watercourse commands with a high probability of success by virtue of existing or prospective organizations and potential benefits relative to costs while at the same time ensuring that the benefits will go mainly to small farmers. The screening process must be done objectively if the project is to make an important and lasting contribution to the rural development of Pakistan. The goal of the criteria outlined below is to identify as closely as possible those command areas which have the most potential for a significant success.

These criteria will include:

(1) Farmer interest - To be included in the development program, farmers on a watercourse command must agree to participate in program activities and meet specific conditions. If some farmers are reluctant to participate, the group will either try to persuade them to join the others, or propose a plan whereby the non-participation of the farmers will not be a problem. Farmers will have to select their own leaders, agree to support decisions of those leaders, do the earth work, participate in the planning processes, make arrangements for masons and transport supplies from central points of delivery to installation sites, sign agreements with contractors and the development team, arrange for use of any equipment which may be made available for farmers, provide for settlement of disputes, and establish a system to insure continued maintenance of the watercourses. Farmer willingness to accept these responsibilities will be an indication of their level of interest in the program. Farmer interest will be a key requirement for further assistance.

(2) Potential for increased Irrigated Acreage - Watercourse command areas where farmers can increase their irrigated acreage should be given high priority in the selection. There are areas on many watercourse commands which presently cannot be cultivated due to shortage of water or topographical problems. With increased supplies of water resulting from reorganization and improvements of watercourses to reduce losses and precision land leveling, both cropping intensities and irrigated acreage can be increased.

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(3) Availability of Credit and Inputs - In project areas it will be essential that inputs, such as fertilizer and insecticides are readily available and that credit be available to the extent needed. The Government through the banking institutions, will make arrangements for necessary credit with the rapidly expanding numbers of fertilizer distributors. Farmers will be able to arrange jointly, if necessary, for delivery of inputs to the village.

(4) Conveyance Efficiency - Conveyance efficiency to the lower part of the watercourse is generally less than 40%. This can be measured by placing a flume at the mogha outlet and at the lower part of the watercourse. Pilot research projects have shown that earthen improvements can increase conveyance efficiencies to the end of most watercourses to over 60% with an increase in water to the field, increasing from less than 50% to over 75% of mogha and tubewell supply.

(5) Farm Size - In order to insure distribution of benefits to small farmers, those watercourse command areas will be selected where at least 75 percent of the farmers have holdings under 25 acres. This would rule out watercourse command areas where there are only a few large land holders. Information of this type is available from Land Revenue records and can be provided by the village Numberdar. Also the following two guidelines will be tested during the first years of the project: (1) 50% of the farms be of 12.5 acres or less and (2) 50% of the acreage in a water command be on farms of 12.5 acres or less. Although the Government will give emphasis to water command areas which meet the guidelines, under the first loan they will only be tested. The criteria will be modified, as appropriate, and made requirements under succeeding loans to this project.

#### 4. Banks and Credit Arrangements

It is expected that most farmers, particularly those with small holdings and low incomes will require credit to meet a substantial amount of the costs of precision land leveling. This need was discussed by AID with the Pakistan Banking Council and the Council has written AID agreeing in principle to participation in the project scheme. The banks would, in addition to making loans to qualified farmer groups or water user associations, play a role in monitoring the project, examining loan applications before work begins and checking on work which has been completed, and handling Government cost-sharing funds. Participating bankers will be eligible to receive training in project-related fields, at project expense.

5. Training

a. Agricultural Workers

Staff training and development of institutional capability are basic requirements of the project. Adequate training programs must be established to provide the field staffs with adequate knowledge, skills and expertise to carry out the program. The training facilities established by the Precision Land Leveling Project in the Department of Agriculture in Punjab and Sind and currently being established in NWFP will assist in providing Land Development Officer and other personnel training. It is envisioned that all Team members of the project technical field personnel, except the Field Assistant, be required to go through one month formal "core training", similar to the training being provided under the present precision land leveling training program. The Team members will be Land Development Officers, Watercourse Engineers, Agricultural Officers (water management) and a Field Assistant. The Field Assistant will receive only on-the-job training in addition to some extension short courses. A Team leader will be selected from already trained officers who have done well in the field.

Principal participants in the training will be agricultural and agricultural engineering graduates, scheduled to be Team members. However, this core training will also be open to non-government personnel who have a sufficient educational background and a desire to enter into aspects of the business of water management.

After core training, the Land Development Officers will continue their studies for two months of on-the-job training involving applications of engineering principles in precision land leveling operations. Upon completion of their class-room and on-the-job training, about 30% or 40% will receive additional training to qualify to do watercourse engineering.

The Watercourse Engineers will receive two months training in engineering and construction techniques for watercourse construction and maintenance at the project's training facilities. They will then participate as apprentice watercourse engineers in the improvement of at least one watercourse, under the direction of an experienced watercourse engineer.

A vital element of the training will be for the Agricultural Officer (water management). Agricultural officers will be trained in water management extension techniques at a university where university staff may be utilized for training. This will involve five months of training at the university followed by six months of on-the-job training. The CSU technical staff will assist the university while developing this training program.

The Field Assistants will work closely with and be trained, on-the-job, by a trained agricultural officer for one year. He will receive no formal training except for short-courses on relevant aspects of the program.

b. Others

There will be a need to provide training, as requested, to participating bank officials and contractor personnel. Funds will be budgeted by the Government and provinces to expand training facilities to include such individuals on a demand basis.

6.	<u>Loan Implementation Schedule</u>	
		<u>1976</u>
	First AID Loan Authorized	June 30
	Loan Agreement negotiated	July 1 -
	Agreement signed	August 15
	Conditions precedent met for initial advance	Sept. 15
		<u>1977</u>
	Annual evaluation	April 1
		<u>1978</u>
	Annual evaluation	April 1
	Second AID loan authorized	Sept. 1
		<u>1979</u>
	First advance from second loan	Nov. 1
		<u>1981</u>
	Five year project ends	Sept. 30.

## 7. Fixed Amount Reimbursement

A system of FAR payments, based on the completion of physical units of work, will be used in the disbursement of the loan. While total AID disbursements will vary from watercourse command to command, because watercourses will vary in length, require differing amounts of concrete or other hard material structures and lining and call for varying amounts of precision land leveling, FAR payments will be based on numbers of units of work as follows:

### Watercourse Improvement

Diversion structures at	Rs. 200 ea.
Buffalo wallows at	Rs. 2,000 ea.
Concrete lining at	Rs. 30 per ft.
Engineering cost, length of watercourse at	Rs. 1 per ft.

### Precision Land Leveling

Earthmoving	Rs. 3 per cu.m.
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Certificates of completion of work, indicating that a watercourse of a particular length has been improved, concrete lining and structures provided in certain quantities, or that a number of acres of land have been precisely leveled, will determine the FAR amounts disbursed.

A system of advances of loan funds will also be used during the three year loan period, the advances triggered by the deployment of Field Teams. As indicated earlier, progress of the project is seen as closely keyed to the operation of the Field Teams, since the Teams promote farmer participation and provide farmers with necessary engineering and management advice. The advances are intended to encourage undertaking of the organizational and training effort necessary to put Field Teams in place. The amount of an advance is related to the first year cost of a Team's operation and its provincial government backstopping, an estimated \$50,000. Advances will be liquidated within each year through the FAR payments by disbursing half the FAR amount to which the borrower is entitled and charging the other half to liquidation of the advance. Thus, the loan is entirely disbursed against completed civil construction work.

A particular FAR system question in Pakistan is the fiscal relationship of the federal and provincial governments. Efforts are now underway to devise a system or systems which will relate the AID FAR foreign exchange payments method to the budgeted fund release systems now used by the Government of Pakistan in turning over funds to provincial governments. A plan to deal with this question will be required under a condition precedent.

### C. Program Evaluation

Two important requirements for success in the Water Management Improvement Program are continuous monitoring of the various activities and systematized feed-back to enable effective and objective evaluation. Two types of regular evaluations are necessary. First, a built-in monitoring and internal evaluative processes to provide adequate feedback for program improvement in all program activities, such as precision land leveling, water-course improvements, water-users associations, training, and on-farm advisory services. For example, in each training program each trainee's progress will be evaluated in terms of training objectives during the training period, at the conclusion of the formal training and during and at the end of the on-the-job training. Field work including water course improvement will be monitored regularly by project staff, by fiscal agents and, on a spot check basis, by the AID Mission staff.

Secondly, the overall on-farm water management program will be formally evaluated each year by a combination of internal and external evaluation staff. This responsibility will be shared by the Government and AID. These periodic evaluations will cover each activity, including physical improvements, training programs, and institutional development. The evaluation team will include experienced engineers, an economist, and a sociologist who have been given training in the evaluation of on-farm water management program.

As a prerequisite for evaluation, each program component will have a set of clear and specific measurable objectives and targets which will be revised as appropriate after each evaluation. Most of the project activities, including precision land leveling, watercourse improvements, training and water management advisory services, will lend themselves to this type of evaluation. The water course feasibility data collection step will provide a bench mark against which benefits can be measured after the work is completed.

#### 1. Watercourse Improvements

##### Objectives

- a. To collect benchmark data on each watercourse to be improved according to the implementation plans.

**Measure - The number of watercourses for which benchmark data are collected.**

**b. To construct lined watercourses and improved earth watercourses for the reduction of delivery losses.**

**Measure - (1) The actual feet of lined and improved earthen watercourses completed per year plus the number of nakkas, junction bodes, etc., installed.**

**(2) Conveyance efficiencies before and after improvements. (water loss before and after)**

**(3) Costs of construction per foot compared with estimates.**

**c. To gain maximum participation of watercourse members in the watercourse improvements.**

**Measure - Number of mandays of farmers participating in excavation work, hauling materials, supervision of supplies, monetary contributions, etc.**

## **2. Precision Land Leveling**

### **Objectives**

**a. To provide (number) trained and experienced precision land leveling engineers for work on and outside of watercourse command clusters.**

**Measure - Number trained, Number retrained on the project.**

**b. To motivate farmers for precision land leveling.**

**Measure - Number of farmers who have precision land leveling work done and acreage.**

**c. To provide precision leveled fields for farmer clients with fields of adequate size for improved efficiency in irrigation.**

**Measure - Before and after topographical surveys - review of fields by checking elevations and evaluations of design for cost. Ascertain if farmers require more assistance.**

**d. To encourage private entrepreneurs to manufacture precision land leveling and support equipment and private contractors for land leveling.**

**Measure - The numbers involved and quality and quantity of their output.**

### 3. Water Users' Associations

#### Objectives

a. To organize formal or informal effective water users associations on each watercourse command for the improvement and maintenance of delivery systems.

Measure - Number of associations established; man-days of members given to watercourse rehabilitation work; number of associations which have appointed ditch tenders, number of associations which have established regular cleaning schedules.

b. To encourage water users associations to develop a system of irrigation scheduling on selected water-courses for experimental purposes.

Measure - Number of experiments conducted and outcome in terms of water use efficiency.

### 4. On-Farm Water Management Advisors

#### Objectives

a. To provide (number) trained advisors for (number) watercourse command clusters per year.

Measure - Numbers provided.

b. To demonstrate to farmers the importance of improved water management practices for increased yields by demonstration plots on each watercourse command.

Measure - Number of maximum yield plots/worker and yield results by crop cutting methods.

c. To motivate farmers to adopt improved cultural and irrigation practices for increased per acre crop production.

Measure - Percentage of farmers in sample areas who have adopted the following: precision land leveling, furrow irrigation for row crops, recommended seedbed preparation, seeding methods, seed rates, fertilizer rates. (Information on adoption rates for these practices are to be compared with these in the benchmark survey.)

## 5. Evaluation of Total Impact of Improvement Activities

The evaluative data collected for all separate program activities, except the training programs, could be combined with additional information for the evaluation of changes over time in a watercourse command cluster.

### Objectives

To increase crop production for small operators through improved water supplies, efficient distribution of water, increased application efficiencies and the provision of on-farm water management advisory services.

- Measure (1) Numbers of small farmers involved in program
- (2) Changes in conveyance efficiencies
  - (3) Changes in application efficiencies
  - (4) Changes in cropping intensities and acreage irrigated
  - (5) Changes in yields for selected crops

## 6. Training Programs

Three types of training are required, which are on-farm Water Management advisors, Engineers for watercourse improvements, and Land Development Officers for precision land leveling. Each training program will need to be evaluated separately in terms of number trained and adequacy of training. The first level of evaluation is the number of training personnel provided for the water management programs. Secondly, several ways to evaluate the effectiveness of training for each program are provided below.

### Objectives

- a. To provide training facilities and instructors for the training programs.
- b. To provide (numbers) of farm advisors, precision land leveling and watercourse engineers per year for the program.

Measure - The establishment of the facilities, staff, and the output per year of trained manpower.

c. To train personnel who have adequate technical skills to perform specified tasks for each program.

Measure - (1) Numbers and percentage of water-courses and acres of land which meet standard.

(2) Percentage of farmers sampled who use reasonably good crop and water management techniques.

#### 7. The Beneficiary Objectives

A major objective of the project is to improve the lives of the small farmers and to do this, the project must reach the small farmer. Criteria for selecting water courses and a subsidy system for land leveling are intended to provide a project emphasis that favors the small farmer but at the same time it is recognized that in any given watercourse there potentially exists medium and large farmers which will also participate in the project.

To assess project impact over time on the target population, as well as to enable project modification as required, information such as the following will be of particular importance for evaluation:

1. Crop production per unit of:
  - a. labor
  - b. land
  - c. water
2. Value of production per unit of:
  - a. land
  - b. labor
  - c. water
3. Distribution of returns to:
  - a. land
  - b. labor
  - c. water
4. Costs of Inputs
5. Land Tenure and associated arrangements
6. Government and village institutional arrangements for water-course operation and arrangement.

In the implementation of the project this information will be initially collected as baseline/bench mark data using standard statistical procedures or other procedures, as appropriate.

D. Conditions, Covenants and Exceptions

1. Conditions and Covenants

The following are illustrative of the Conditions Precedent and Covenants that the AID Mission will attempt to negotiate with the Government of Pakistan. Although it is understood the Government is generally in accord with these, the final text of the CPs and Covenants cannot be determined until the loan is firmly negotiated after project authorization.

CONDITIONS PRECEDENT

Conditions Precedent to Initial Advance. Prior to the initial disbursement of the Loan (which shall consist of an advance of not more than \$ \_\_\_\_\_ the Borrower shall, except as A.I.D. may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

- (1) Legal Opinion
- (2) Designation of Borrower's authorized representative.
- (3) Evidence that firm federal and provincial budget allocations have been made of all funds necessary to carry out the project in at least one province in Pakistan fiscal year 1976-77.
- (4) Evidence that the project director has been appointed, and provincial staff to implement the project have been sanctioned, for at least one province.
- (5) Procedures for periodic review of the project (as provided for by Covenant).
- (6) Evidence that it has made arrangements to permit financing of project activities through credit institutions, including the provision of adequate re-discounting or other liquidity facilities to these institutions.
- (7) Procedures for release for Federal Government funds to the Provinces.

Conditions Precedent for Additional Advances. AID may authorize additional advances in amounts specified by AID to assist in the implementation of the project in all four provinces of Pakistan. Before an advance is made for the first time to a specific province under this section, the following conditions precedent should be satisfied for each such province:

- (1) The necessary provincial budget approval document has been adopted, providing for that province's participation in the project.

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- (2) Evidence that firm budget allocations have been made of all necessary funds to carry out the project in the province for the year covered by the advance.
- (3) Evidence that provincial staff to implement the project have been sanctioned and that positions are filled with qualified personnel.
- (4) Evidence that appropriate training programs have been established in the province to provide all field staff with adequate knowledge, skills and expertise to carry out the project.
- (5) Criteria, procedures and standards relating to credit and cost-sharing for use in both the watercourse improvement and land leveling aspects of the project.
- (6) A plan to assure that adequate numbers of private contractors will be available in the province to carry out land leveling activities under the project.

Conditions Precedent for Fixed Amount Reimbursements. Advances will be liquidated by partial Fixed Amount Reimbursement payments by AID, as the watercourse improvements and land leveling activities are completed. Completed work will be eligible only if the provincial project director has certified that the watercourse improvements and land leveling met the following criteria:

A. Watercourse Improvements

- (1) The watercourse command cluster is located within the approved project area and was selected on the basis of the agreed watercourse command selection criteria.
- (2) The improvement program was based on adequate planning by a well trained project team, which illustratively included a team leader and one or more Land Development Officers, Watercourse Engineers, Agricultural Officers (water management) and Field Assistants. The improvements were made in accordance with the plan and they met project specifications.
- (3) Financial arrangements for the watercourse improvements were satisfactorily implemented including the cost-sharing.

- (4) The team leader certified that watercourse improvements were satisfactorily completed, and the water users' association (as defined in 5 below) agrees with the certification.
- (5) An acceptable form of water users or farmers association or organization ("water users' association") has been organized (though not necessarily as a legal entity) and functions effectively in carrying out watercourse improvements.
- (6) The water users' association has agreed to maintain the completed watercourse.
- (7) Agricultural inputs, including seed, fertilizer and pesticides, and agricultural credit, if necessary, are available to farmers served by the improved watercourse.
- (8) Water management field demonstrations have been established in watercourse cluster areas.

**B. Precision Land Leveling**

- (1) The land leveled was in the project area and met criteria for inclusion.
- (2) The initial leveling plan was properly prepared by qualified project staff, estimates of earth to be moved were properly made; the field, when leveling was completed, met project specifications and the Team has provided the farmer with guidance on improved irrigation and farming practices.
- (3) The Team leader certified that land leveling work was satisfactorily completed.
- (4) The cooperating farmer has agreed to keep his land leveled, and that the Team will provide technical assistance in the maintenance phase.

**COVENANTS**

(1) The Government of Pakistan has embarked on a program to improve water management efficiency within the watercourse command area and to ensure water is used more effectively to improve agricultural production. Many long range solutions are expected to result from the recommendations of a comprehensive watercourse command study that will be carried out by the Government with World Bank assistance. However, the Government is prepared to formulate

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and to carry out an immediate action program that can be implemented without having to make fundamental changes in the system. The immediate action program will contain the following elements:

- (a) A farmer education program to assure that all farmers know the Government wants water to be managed and used efficiently, aimed particularly at village councils and leaders, rural cooperatives and water users' associations.
- (b) A more vigorous enforcement of the Canal and Drainage Act and regulations which require (i) farmers to operate and maintain watercourse to the standards established by law and (ii) provincial irrigation departments to provide current irrigation information to farmers about canal closures for rationing, repairs and maintenance and seasonal forecasts of expected availability of canal water.

(2) The Government will carry out periodic reviews of policies and programs relating to improved on-farm water management. The Government will hold quarterly meeting with AID to evaluate the progress of the project including physical improvements, training programs, the performance of field staff and institutional development. Representatives from the provinces shall be included. An external review meeting will be held annually to evaluate the progress of the AID and World Bank assisted On-Farm Water Management projects and decide upon future strategy.

(3) The Government agrees to maintain trained water management personnel in the positions for which they were trained, and to assign additional personnel for the project as it expands.

(4) The Government recognizes that the creation of viable water users' associations is a key objective of the project. During the pilot phase of the project different forms of water users associations will be experimented with, in an effort to arrive at a model that can be replicated widely. The Government agrees to consider for possible adoption such legal and institutional changes as may facilitate the development and wider use of water users associations.

2. Exceptions

The following exceptions to usual AID procedures are recommended:

a. Source/Origin/Componentry

It is proposed that only Pakistan "source" requirements should apply to this local cost financing FAR project, and that origin and componentry requirements will not be applicable. The result of this rule is that as long as the commodities were purchased in Pakistan, the projects into which they are incorporated will be eligible for AID reimbursement. AID will not inquire into the country of manufacture or imported items.

This approach is recommended because of the small amount of imported commodities to be used on the project and the practical impossibility of enforcing origin and componentry requirements for this type of project. The watercourse improvements and land leveling will be labor intensive. No commodities will be specially imported for the project, but are brought in to meet a general demand in the country. These items will be purchased for project use from usual sources of local supply.

This means that some of the imported commodities used on the project may be from Communist-bloc countries or contain components from such countries, but this is expected to be minimal.

b. "Non-financed" Bloc Goods and Services

A related question to the above is presented by a provision in the standard loan agreement for capital assistance (M. O. 1262. 1.1.). Section 6.04 of the agreement requires that all goods and services "procured for the project, but not financed under the loan" shall be of free world source and origin. For the reasons described above, it would not be feasible to use this clause in this project loan agreement.

In addition, Section 105 of the Appropriations Act is not applicable. AID financing for each watercourse improvement

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would be far less than \$100,000. From a policy point of view, as well, AID has no desire to get involved in the approval of these extremely small scale contracts between individual farmers and local contractors. Thus, AID approval of contracts and contractors will not be required.

ANNEXES

- A - Pakistan's Agricultural Sector \*
- B - Project Technical Details

- Exhibit 1 - Detailed Technical Analysis \*
- 2 - Financial Tables
- 3 - Detailed Social Analysis\*
- 4 - The Role of Women \*
- 5 - Population Impact \*
- 6 - Water Codes and Regulations \*
- 7 - Detailed Economic Analysis \*

- C. - Environmental Assessment \*
- D - Logical Frame work matrix
- E - Project Performance Tracking Network
- F - Statutory Checklist \*
- G - Director's Certification
- H - Loan Application
- I - Draft Project Description for Loan Agreement \*
- J - Draft Loan Authorization

\* Annexes marked with an asterisk (\*) are not included in this paper but are available from ASIA/PD/SA. Call Thomas Rishoi, 235-8910.

**Table 1--ON-FARM WATER MANAGEMENT - IMPLEMENTATION PLAN  
PROVINCE-WISE BREAKDOWN**

	FY 1976-77 1st Year	FY 1977-78 2nd Year	FY 1978-79 3rd Year	3 Year Total (Team Years)	FY 1979-80 4th Year	4 Year Total (Team Years)	FY 1980-81 5th Year	5 Year Total (Team Years)
<b>A. <u>Field Teams Operating</u></b>								
Punjab	3	12	24	( 39 )	42	( 81 )	69	( 150 )
Sind	-	10	13	23	28	54	46	100
NWFP	-	4	6	10	10	20	16	36
Baluchistan	-	1	2	3	4	7	7	14
<b>Total:</b>	<b>3</b>	<b>27</b>	<b>48</b>	<b>( 78 )</b>	<b>84</b>	<b>( 162 )</b>	<b>138</b>	<b>( 300 )</b>
<b>B. <u>Watercourses Improved</u></b>								
Punjab	15	50	120	( 185 )	210	( 405 )	345	( 750 )
Sind	-	50	80	130	140	270	230	500
NWFP	-	20	30	50	50	100	80	180
Baluchistan	-	5	10	15	20	35	35	70
<b>Total:</b>	<b>15</b>	<b>135</b>	<b>240</b>	<b>( 390 )</b>	<b>420</b>	<b>( 810 )</b>	<b>690</b>	<b>( 1,500 )</b>
<b>C. <u>Acres of Precision Land Leveling</u></b>								
Punjab	4,245	16,980	33,950	( 55,185 )	59,430	( 114,615 )	97,535	( 212,250 )
Sind	-	14,150	22,640	36,790	39,620	76,410	55,990	141,500
NWFP	-	5,660	8,490	14,150	14,150	28,300	22,640	50,940
Baluchistan	-	1,415	2,830	4,245	5,660	9,905	9,905	19,810
<b>Total:</b>	<b>4,245</b>	<b>38,205</b>	<b>67,920</b>	<b>(110,370)</b>	<b>118,860</b>	<b>( 229,230 )</b>	<b>195,270</b>	<b>( 424,500 )</b>

Table 2 - ON-FARM WATER MANAGEMENT - GOVERNMENT OF PAKISTAN BUDGET  
(in 1990's Rupees)

	<u>FY 77</u> <u>1st Year -</u> <u>3 Teams</u>	<u>FY 78</u> <u>2nd Year -</u> <u>27 Teams</u>	<u>FY 79</u> <u>3rd Year -</u> <u>48 Teams</u>	<u>(3 Year</u> <u>Total</u> <u>78 Teams)</u>	<u>FY 80</u> <u>4th Year -</u> <u>84 Teams</u>	<u>(4 Year</u> <u>Total</u> <u>162 Teams)</u>	<u>FY 81</u> <u>5th Year -</u> <u>138 Teams</u>	<u>(5 Year</u> <u>Total</u> <u>300 Teams)</u>
<b><u>I. Provincial Overhead:</u></b>	<u>763</u>	<u>2,447</u>	<u>1,114</u>	<u>( 4,324 )</u>	<u>1,117</u>	<u>( 5,441 )</u>	<u>1,120</u>	<u>( 6,561 )</u>
Staff	281	1,268	779	2,328	782	3,110	785	3,895
Consumables	482	1,179	335	1,996	335	2,331	335	2,666
<b><u>II. Direct Team Cost:</u></b>	<u>1,343</u>	<u>10,692</u>	<u>16,000</u>	<u>( 28,035 )</u>	<u>26,749</u>	<u>( 54,784 )</u>	<u>42,944</u>	<u>( 97,728 )</u>
Personnel	422	3,831	6,928	11,181	12,277	23,458	20,372	43,830
Training	59	699	816	1,614	1,236	2,850	1,866	4,716
Transportation	627	4,683	6,192	11,502	9,876	21,378	15,402	36,780
Pickup Truck	(240)	(1,680)	(1,920)	(3,840)	(2,880)	(6,720)	(4,320)	(11,040)
Motorcycles	(240)	(1,680)	(1,920)	(3,840)	(2,880)	(6,720)	(4,320)	(11,040)
Bicycles	( 3)	( 27)	( 48)	( 78)	( 84)	( 162)	( 138)	( 300)
PCL	(120)	(1,080)	(1,920)	(3,120)	(3,360)	(6,480)	(5,520)	(12,000)
Maintenance	( 24)	( 216)	( 384)	( 624)	( 672)	(1,296)	(1,104)	( 2,400)
Equipment	126	894	1,056	2,076	1,608	3,684	2,436	6,120
Surveying Kits	( 72)	( 504)	( 576)	(1,152)	( 864)	(2,016)	(1,296)	( 3,312)
Support	( 48)	( 336)	( 384)	( 768)	( 576)	(1,344)	( 864)	( 2,208)
Annual Support Supplies	( 6)	( 54)	( 96)	( 156)	( 168)	( 324)	( 276)	( 600)
Office Rent	60	540	960	1,560	1,680	3,240	2,760	6,000
Training for bankers and contractors	9	45	48	102	72	174	108	282

**ON-FARM WATER MANAGEMENT - GOVERNMENT OF PAKISTAN BUDGET**

Page 2 of 2

(in 000's Rupees)

	<u>FY 77</u> <u>1st Year -</u> <u>3 Teams</u>	<u>FY 78</u> <u>2nd Year -</u> <u>27 Teams</u>	<u>FY 79</u> <u>3rd Year -</u> <u>48 Teams</u>	<u>(3 Year</u> <u>Total</u> <u>78 Teams)</u>	<u>FY 80</u> <u>4th Year</u> <u>84 Teams</u>	<u>(4 Year</u> <u>Total</u> <u>162 Teams)</u>	<u>FY 81</u> <u>5th Year -</u> <u>138 Teams</u>	<u>(5 Year</u> <u>Total</u> <u>300 Teams)</u>
<b>III. <u>Cost Varying with</u></b>								
<u>Achievements:</u>	<u>1,649</u>	<u>14,749</u>	<u>26,220</u>	<u>(42,608)</u>	<u>45,885</u>	<u>( 88,493 )</u>	<u>75,382</u>	<u>( 163,875 )</u>
Watercourse Structures	271	2,437	4,332	7,040	7,581	14,621	12,454	27,075
- Concrete Lining	360	3,240	5,760	9,360	10,080	19,440	16,560	36,000
PLL - Cost Sharing								
Grants*	1,018	9,072	16,128	26,208	28,224	54,432	46,368	100,800
<b>Overall Totals:</b>	<u>3,785</u>	<u>27,888</u>	<u>43,334</u>	<u>(74,967)</u>	<u>73,751</u>	<u>( 148,718 )</u>	<u>119,446</u>	<u>( 268,164 )</u>

\* Grant for 1st 5 acres of  
Rs. 1,500 per farm x No. of  
farms expected to benefit.

Table 3

**ON-FARM WATER MANAGEMENT  
PROGRAM ACHIEVEMENTS, COSTS & SOURCES OF FUNDING**

	1977 1st Year	1978 2nd Year	1979 3rd Year	(3 Year Total)	1980 4th Year	(4 Year Total)	1981 5th Year	(5 Year Total)
<b>I. Teams in field</b>	3	27	48	( 78)	84	( 162)	138	( 300)
<b>II. Watercourse (WC) Improved (No)</b>	15	135	240	390	420	810	690	1,500
<b>III. Precisely Leveled Acres</b>	4,245	38,205	67,520	(110,370)	118,860	(225,230)	195,270	(424,500)
283 acres per WC (150 acres per WC directly adjacent/ 133 acres per WC off WC)								
<b>IV. Costs of Program (in 000's Rupees)</b>	<b>Direct Costs, Extension and Management.</b>							
WCI - Structures & Install.	271	2,437	4,332	( 7,040)	7,581	( 14,621)	12,454	( 27,075)
Concrete Lining	360	3,240	5,760	9,360	10,080	19,440	16,560	36,000
Labor of Farmers	180	1,620	2,880	4,680	5,040	9,720	8,280	18,000
Extension & Mgmt. <u>1/</u>	700	4,356	5,648	10,704	9,206	19,910	14,551	34,461
PLL - Cost @ Rs. 600/Acre	2,547	22,523	40,752	66,222	71,316	137,538	117,162	254,700
Extension & Mgmt. <u>1/</u>	1,395	8,685	11,263	21,343	18,358	39,701	29,016	68,717
<b>Total:</b>	<b>5,453</b>	<b>43,261</b>	<b>70,635</b>	<b>(119,349)</b>	<b>121,581</b>	<b>(240,930)</b>	<b>198,023</b>	<b>(438,553)</b>

1/ These costs, which together equal the total of "Provincial Overhead" and Direct Team Costs" in Table 2, have, for this breakdown, been divided 1/3 WCI and 2/3 PLL; in fact, a good deal, but undeterminable amount, of these costs should be related to the third element of the project: Improved Crop and Water Management.

Table 3

Page 2 of 2

	1977 1st Year	1978 2nd Year	1979 3rd Year	(3 Year Total)	1980 4th Year	(4 Year Total)	1981 5th Year	(5 Year Total)
<b>V. Costs of Program (in 000's Rupees) - to Pakistani participants</b>								
Government Budget - Mgmt.	3,745	27,888	43,334	( 74,967)	73,751	(148,718)	119,446	(268,164)
- Credit	1,146	10,315	18,316	29,777	32,093	61,870	52,723	114,593
<b>Farmers:</b>								
1. Labor - WC	180	1,620	2,880	4,680	5,040	9,720	8,280	18,000
2. Cash Contribution for PLL	382	3,438	6,105	9,925	10,697	20,622	17,574	38,196
Total:	5,453	43,261	70,635	(119,349)	121,581	(240,930)	198,023	(438,953)
<b>VI. AID Disbursement Plan - Fixed Amount Reimbursements (in 000's Rupees)</b>								
WCI - Structures	270 <u>1/</u>	2,430	4,320	( 7,020)	7,560	( 14,580)	12,420	( 27,000)
Concrete Lining	360 <u>2/</u>	3,240	5,760	9,360	10,080	20,440	16,560	37,000
Installation	240 <u>3/</u>	2,160	3,840	6,240	6,720	12,960	11,040	24,000
PLL - Earthmoving	1,910 <u>4/</u>	17,192	30,564	49,666	53,487	103,153	87,853	191,006
Total FAR entitlement	2,780	25,022	44,484	( 72,286)	77,847	(151,133)	(279,006) <u>7/</u>	(2,9,006) <u>1/</u>
Advances to GOP - 1st Loan <u>5/</u>	1,500	12,000	10,500	( 24,000)	-	( 24,000)	-	( 24,000)
FAR Payts. less Adv. Liq.	1,280 <u>6/</u>	13,022 <u>6/</u>	33,984 <u>6/</u>	48,286	1,964 <u>6/</u>	50,250	-	50,250
1st Loan Disbursement	2,780	25,022	44,484	( 72,286)	1,964	( 74,250)	-	( 74,250)
2nd Loan - FAR Payts	-	-	-	-	75,883	( 75,883)	72,617	(148,500)
Total Loan Disbursements	<u>2,780</u>	<u>25,022</u>	<u>44,484</u>	<u>( 72,286)</u>	<u>77,847</u>	<u>(150,133)</u>	<u>72,617</u>	<u>(222,750)</u>

**Footnotes**

- 1/ @ Rs. 200 per divers. struc. with approx. 80 per WC; buffalo wallow, one per WC, at Rs. 2,000  
2/ @ Rs. 30 per ft. (No. of WC x 16,000 ft x 5% x 30 Rs.)  
3/ Engineering; @ one rupee per ft. of earth lined WC  
4/ @ Rs. 450 per acre (75% x 200 m<sup>3</sup> x Rs. x no. of acres)  
5/ @ Rs. 500,000 per Field Team  
6/ Balances of FAR payments after advances liquidated  
7/ Loan funds will be exhausted in 5th year, at Rs. 222,750,000 (equiv. \$22.5 million, total of the 2 loans)

**Table 4**

ON-FARM WATER MANAGEMENT  
FIXED AMOUNT REIMBURSEMENT (FAR)

	<u>FY 1977</u> <u>1st Year</u>	<u>FY 1978</u> <u>2nd Year</u>	<u>FY 1979</u> <u>3rd Year</u>	<u>(3 Year</u> <u>Total)</u>	<u>FY 1980</u> <u>4th Year</u>	<u>(4 Year</u> <u>Total)</u>	<u>FY 1981</u> <u>5th Year</u>	<u>(5 Year</u> <u>Total)</u>
I. Teams in field	3	27	48 (	78)	84 (	162)	138 (	300)
II. Watercourses (WC) Improved No.	15	135	240 (	390)	420 (	810)	690 (	1,500)
III. Precisely Leveled Acres	4,245	38,205	67,920 (	110,370)	118,860	(229,230)	195,230 (	424,500)
IV. <u>Fixed Amount Reimbursement (in Rupees)</u>								
Watercourse - typical: 16,000 feet in length at Rs. 1/ft, 80 diversion structures @ Rs. 200, concrete lining Rs. 24,000.								
Unit Cost 1/	58,000							
FAR @ 100%	58,000	(\$5,858)						
Yearly total FAR	870,000							
PLL - Rs. 3x200M <sup>3</sup> = Rs. 600/acre								
Unit Cost per acre 1/	600							
FAR @ 75%	450	(\$45)						
Yearly total FAR	1,910,000							
Total FAR (WC + PLL)	2,780,000							
Advance to GOP	1,500,000							
Total FAR $\frac{1}{2}$	1,390,000							
Less adv. overpayt.	20,000							
AID Disbursement:	<u>2,780,000</u>	<u>25,022,000</u>	<u>44,484,000</u>	<u>( 72,286,000)</u>	<u>77,849,000</u>	<u>(150,133,000)</u>	<u>72,617,000</u>	<u>(222,750,000)</u>

1/ Typical "unit cost". In actuality, costs of particular works and the FAR will vary according to length of watercourse, number of structures, and amount of earthmoved.

Annex D

FD-704

LOGICAL FRAMEWORK  
FOR  
SUMMARIZING PROJECT DESIGN

Est. Project Completion Date: JUNE 1981  
Date of this Summary: APRIL 22, 1978

Project Title: On-Farm Water Management (Pakistan)

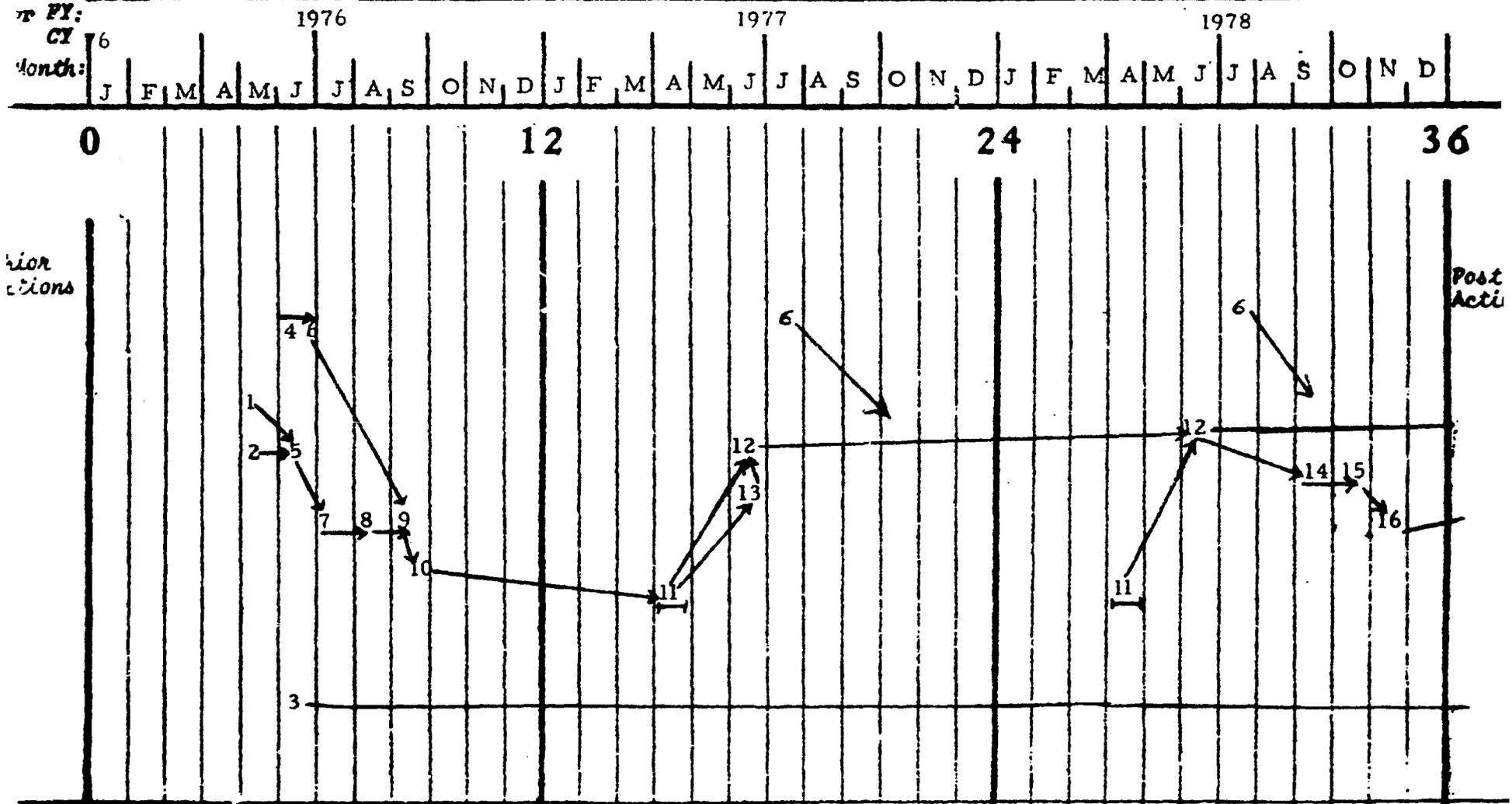
DEVELOPMENT HYPOTHESES

MANAGEABLE INTEREST

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p><b>Program Goal:</b> The broader objective to which this project contributes:</p> <p>Increased agricultural production and improved income for the low income farmers in Pakistan.</p> <p><b>Sub-Goal:</b> On-Farm Water Management concept is fully appreciated and taken account of by the Government of Pakistan in agricultural planning and the project is replicated.</p>	<p><b>Measure of Goal Achievement:</b></p> <ol style="list-style-type: none"> <li>Less dependence on imported food grains; increase in agricultural exports.</li> <li>Increased income.</li> <li>Better health</li> </ol>	<ul style="list-style-type: none"> <li>Increased demand for improved agricultural inputs.</li> <li>Food department records</li> <li>Income surveys</li> <li>Health department records</li> <li>GOP planning documents and other records.</li> <li>Project replicated</li> </ul>	<p>Concerning long term value of program/project:</p> <ul style="list-style-type: none"> <li>GOP will continue to pursue its policy of trying to help benefit the rural poor.</li> <li>On-farm water management will increase water availability.</li> <li>Government procurement policies will favor agricultural production.</li> <li>Improvements in PLL and watercourses will be competitive with alternative public and private investments in other sectors.</li> </ul>
<p><b>Project Purpose:</b></p> <p>Public and private sector capability is established to plan and deliver on-farm water management services to farmers at economic costs.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ol style="list-style-type: none"> <li>Integration of water management services within provincial Agriculture Departments and re-orientation of extension services.</li> <li>On-farm water management strategies tested during the five years being implemented as part of the next five year plan (1981-1985).</li> <li>Estimated annual growth rate of 10% in the number and size of private contractor operation beginning after five year program.</li> </ol>	<ul style="list-style-type: none"> <li>Re-organisation of Agriculture Departments.</li> <li>GOP PC-1 and budget approval documents for continuation of activities after five year program.</li> <li>Contractor registration records and field surveys.</li> </ul>	<p>Affecting purpose-to-goal link:</p> <ul style="list-style-type: none"> <li>Cost/benefit ratio of investment in PLL and watercourse improvements will continue to be favorable.</li> <li>Agricultural inputs will continue to be available at reasonable prices.</li> <li>The experience gained from the pilot project will be utilisable for expanded program</li> <li>Major service personnel needs for water management program can be met through re-organisation/re-orientation of line agencies within Agriculture Departments.</li> </ul>
<p><b>Purpose:</b></p> <ol style="list-style-type: none"> <li>Personnel trained</li> <li>Teams operating in the field</li> <li>Credit mechanism established for farmers.</li> <li>Contractors identified.</li> <li>Publicity program being executed.</li> <li>Data feed-back system</li> </ol>	<p>Magnitude of Outputs necessary and sufficient to achieve purpose.</p> <ol style="list-style-type: none"> <li>1,380 Government workers and 188 bankers, contractors and farmers.</li> <li> <ol style="list-style-type: none"> <li>See Financial Tables.</li> <li>Accomplishment within five years: 1,500 watercourses improved; 225,000 acres leveled on watercourse commands in project areas; 200,000 acres leveled outside watercourse commands</li> </ol> </li> <li>Minimum of one branch of the participating bank operating in each of the project areas.</li> <li>Private service organisations meeting farmers' demand for PLL on a competitive basis.</li> <li>Use of radio and newspapers and organized "Field Days".</li> <li>Strategies designed and tested for a follow-on program reflecting:                             <ol style="list-style-type: none"> <li>Additional economies i. Improvement works through field experience.</li> <li>Ways to increase private sector share of the cost of improvements.</li> <li>Continued utilisation of project resources and maximising accomplishments.</li> </ol> </li> </ol>	<ul style="list-style-type: none"> <li>Agriculture Department and project records.</li> <li>Disbursements on cost sharing</li> <li>Designation of particular branches for project accounting.</li> <li>Field plans compared with actual PLL work under taken</li> <li>Number of registered private contractors in the project area.</li> <li>Number of applications being received by the project from farmers in diverse locations.</li> <li>Adequacy of data feed back system and area analytical reports by project staff and advisors.</li> </ul>	<p>Affecting output-to-purpose link:</p> <ul style="list-style-type: none"> <li>Government field workers adequately trained, equipped and motivated.</li> <li>Pilot demonstration results, combined with incentives, will motivate farmers.</li> <li>Special consideration will be given to low income farmers desiring to participate in this program.</li> <li>Incentives, such as credit facilities, and tractors as well as return on investment will attract entrepreneurs to engage in PLL custom service operations.</li> <li>Adequate facilities exist or will be created to meet equipment needs of the project.</li> <li>Program publicity will be aimed at low income farmers.</li> <li>Reliable data will be collected.</li> </ul>
<p><b>Inputs: Activities and Types of Resources</b></p> <ol style="list-style-type: none"> <li><b>Government of Pakistan (GOP)</b> <ol style="list-style-type: none"> <li>Annual Budget approvals</li> <li>Sanctioning of project positions.</li> <li>Recruitment, placement of personnel.</li> <li>Notification (selection) of project areas by province, district and tehsil.</li> <li>Designation of bank for handling cost sharing.</li> <li>Education/publicity campaign.</li> <li>Notification of qualifying standards and operational procedures for the service contractors.</li> </ol> </li> <li><b>USAID</b> <ol style="list-style-type: none"> <li>Technical Assistance</li> </ol> </li> <li><b>Dollar Loan Fund</b></li> <li><b>Farmers</b> <ul style="list-style-type: none"> <li>Labor</li> <li>Cash</li> </ul> </li> <li><b>Banks</b> <ul style="list-style-type: none"> <li>Credit</li> </ul> </li> <li><b>Private Sector</b> <ul style="list-style-type: none"> <li>Investments</li> </ul> </li> </ol>	<p>Level of Effort/Expenditure for each activity</p> <ol style="list-style-type: none"> <li>See Financial Tables.</li> <li>See Financial Tables.</li> <li>See Financial Tables.</li> <li>See criteria for selection of project areas.</li> <li>Accounting procedures. Training requirements of the banks personnel and coordination mechanism between teams and bank.</li> <li>A package for publicity campaign: extension workers apprised, printed material, radio and TV coverage scheduled.</li> <li>Printed rules and procedures available including the eligibility for credit for the potential contractors.</li> </ol>	<ul style="list-style-type: none"> <li>Approved PC-1s</li> <li>Provincial ADPs.</li> <li>Federal and Provincial Action documents.</li> <li>AID approvals and project agreements.</li> <li>Agreement signed</li> <li>Project records</li> <li>Bank record</li> <li>Approximate volume of business.</li> </ul>	<p>Affecting input-to-output link:</p> <ul style="list-style-type: none"> <li>Budget, personnel and facilities will be made available on a timely basis by the Provincial Governments.</li> </ul>

PPT FORM  
(may be Expanded as Appropriate)

<b>Country:</b> PAKISTAN	<b>Project No:</b> 391-4130	<b>Project Title:</b> ON-FARM WATER MANAGEMENT	<b>Date:</b> 4/30/76	<input checked="" type="checkbox"/> Original <input type="checkbox"/> Revision #	<b>PPT app:</b> W
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Financial Plan:  
Evaluation Plan:

PROJECT PERFORMANCE NETWORK

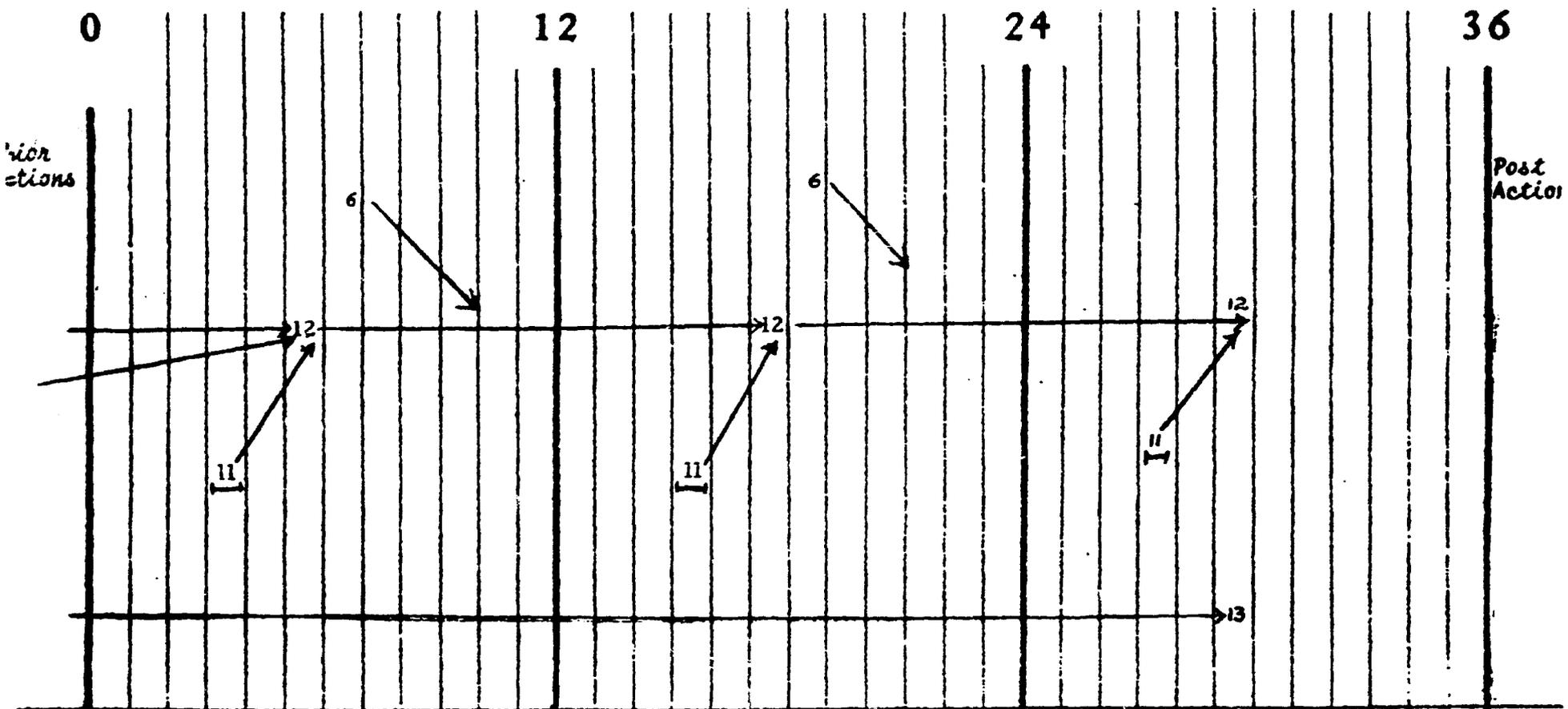
PPT FORM

Country: PAKISTAN	Project No: 391-4130	Project Title: ON-FARM WATER MANAGEMENT	Date: 4/30/76	/X/ Original / / Revision #	Apprvd: <i>[Signature]</i>
<u>CPI DESCRIPTION</u>					
<u>Event</u>	<u>Date</u>				
1.	5/4/76	Loan application from GOP to USAID			
2.	5/5/76	PP goes to Washington			
3.	6/1/76	Begin mass communication			
4.	6/15/76	PC-1 (Punjab) approved			
5.	6/30/76	Loan authorized			
6.	6/30/76	Provincial funds allocated, positions sanctioned			
7.	7/1/76	Loan agreement negotiation begins			
8.	8/15/76	Loan agreement signed			
9.	9/15/76	CP's met for advance of funds			
10.	9/30/76	AID advances funds			
11.	4/1/77	Annual evaluation			
12.	6/77	Evaluation of implementation			
13.	6/30/77	PC-1's for other Provinces			

**PPT FORM**  
(may be Expanded as Appropriate)

<b>Country:</b> PAKISTAN	<b>Project No:</b> 391-4130	<b>Project Title:</b> ON-FARM WATER MANAGEMENT	<b>Date:</b> 4/30/76	<input checked="" type="checkbox"/> / Original <input type="checkbox"/> / Revision #	<b>PPT Appr:</b> CW
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FY: 1979 1980 1981  
 Month: J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D



Financial Plan:  
 Evaluation Plan:

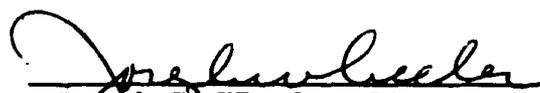
PROJECT PERFORMANCE NETWORK



ANNEX G

PAKISTAN - ON-FARM WATER MANAGEMENT  
CERTIFICATION PURSUANT TO SECTION 611(e) OF  
THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Joseph C. Wheeler, principal officer of the Agency for International Development in Pakistan, having taken into account among other things the maintenance and utilization of projects in Pakistan previously financed or assisted by the U.S. and the commitment of the Government of Pakistan to carry out an effective On-Farm Water Management program, do hereby certify that in my judgment Pakistan has the financial and human resources capability to implement, maintain and utilize effectively the subject capital assistance project for On-Farm Water Management.

  
\_\_\_\_\_  
Joseph C. Wheeler, Director  
USAID/Pakistan

May 6, 1976  
Date

ANNEX J

DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

CAPITAL ASSISTANCE LOAN AUTHORIZATION

Provided from: Food and Nutrition  
(Pakistan: On-Farm Water Management)

Pursuant to the authority vested in me as Assistant Administrator, Bureau for Asia, Agency for International Development ("A.I.D."), by the Foreign Assistance Act of 1961, as amended, (the "Act") and the Delegations of Authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter I, Section 103 and Chapter 2, Title I, the Development Loan Fund, to the Government of Pakistan ("Borrower") of not to exceed Seven Million, Five Hundred Thousand Dollars (\$7,500,000). The proceeds of this loan will be used to assist in financing the local currency costs associated with the establishment of an efficient on-farm water management capability in Pakistan.

1. Interest Rate and Terms of Repayment

The Borrower shall repay the loan to A.I.D. in United States dollars within forty (40) years after the date of first disbursement under the loan, including a grace period of not to exceed ten (10) years. The Borrower shall pay to A.I.D. in United States dollars interest from the date of first disbursement at the rate of (a) two percent (2%) per annum during the grace period, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the loan and on any due and unpaid interest accrued thereon.

2. Other Terms and Conditions

A. Unless A.I.D. otherwise agrees in writing,

(a) Goods and services financed under the loan shall be procured in countries included in A.I.D. Geographic Code 941 or Pakistan.

(b) The loan agreement shall provide that,

(1) Prior to the initial advance of loan proceeds, the Borrower shall submit, or cause to be submitted in form and substance satisfactory to A.I.D., documentation covering assurance of adequate budget, federal fund releases to the provinces, agricultural credit releases, sanctioning of adequate staff for at least one province, and procedures for periodic project review.

(2) Prior to additional documentation shall be submitted to A.I.D. to ensure that adequate budget, staff, training programs, credit facilities and contractors are available to carry out the project activities.

(3) As the Borrower completes watercourse improvements and precision land levelling activities that meet agreed criteria, the Borrower shall be entitled to fixed amount reimbursement payments from time to time, of which fifty percent will liquidate outstanding advances and the remaining fifty percent shall be paid to the Borrower.

(c) The loan agreement will include appropriate covenants requiring the Borrower (1) to hold regular meetings with A.I.D. to evaluate the progress of the project and (2) to assure that adequate personnel are assigned to the project as it expands.

(d) The loan agreement shall contain such other terms and conditions as A.I.D. may deem advisable.

\_\_\_\_\_  
Assistant Administrator  
Bureau for Asia

\_\_\_\_\_  
Date

391-0413

DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

A.I.D. Loan No. 391-T-172

CAPITAL ASSISTANCE LOAN AUTHORIZATION

Provided from: Food and Nutrition  
(Pakistan: On-Farm Water Management)

Pursuant to the authority vested in me as Assistant Administrator, Bureau for Asia, Agency for International Development ("A.I.D."), by the Foreign Assistance Act of 1961, as amended, (the "Act") and the Delegations of Authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 1, Section 103 and Chapter 2, Title I, the Development Loan Fund, to the Government of Pakistan ("Borrower") of not to exceed Seven Million, Five Hundred Thousand Dollars (\$7,500,000). The proceeds of this loan will be used to assist in financing the local currency costs associated with water course improvement, land leveling, and improved crop and water management techniques as part of the establishment of an efficient on-farm water management capability in Pakistan.

1. Interest Rate and Terms of Repayment

The Borrower shall repay the loan to A.I.D. in United States dollars within forty (40) years after the date of first disbursement under the loan, including a grace period of not to exceed ten (10) years. The Borrower shall pay to A.I.D. in United States dollars interest from the date of first disbursement at the rate of (a) two percent (2%) per annum during the grace period, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the loan and on any due and unpaid interest accrued thereon.

2. Other Terms and Conditions

A. Unless A.I.D. otherwise agrees in writing,

(a) Goods and services financed under the loan shall have their source and origin in countries included in A.I.D. Geographic Code 941 and Pakistan.

(b) The loan agreement shall provide that,

(1) Prior to the initial advance of loan proceeds, the Borrower shall submit, or cause to be submitted, in form and substance satisfactory to A.I.D., documentation covering assurances of adequate budget, federal fund releases to the provinces, agricultural credit releases, sanctioning of adequate staff for at least one province, and procedures for periodic project review.

(2) Prior to additional advances, documentation shall be submitted to A.I.D. to ensure that adequate budget, staff, training programs, credit facilities and contractors are available to carry out the project activities.

(c) The loan agreement will include appropriate covenants requiring the Borrower (1) to hold regular meetings with A.I.D. to evaluate the progress of the project and (2) to assure that adequate personnel are assigned to the project as it expands.

B. The loan agreement shall contain such other terms and conditions as A.I.D. may deem advisable.

*[Handwritten Signature]*

Assistant Administrator, Bureau for Asia

                      
Date

Clearances:

- GC/Asia:Herbert Morris                      Date 6/28/76
- Asia/PD:Alexander Love                      Date 6/28/76
- SER/ENGR:James Sloan                      Date 6/28/76
- PPC/DPRE:Arthur Handly                      Date
- Asia/SA:Daniel Leaty                      Date 6/28/76
- Asia/DP:Donald Cohen                      Date 6/28/76
- SER/FM:Thomas Blacka                      Date 6/28/76
- DAA/Asia:Michael H.B. Adler                      Date 6/28/76

- GC:Charles L. Gladson                      Date 6/28/76
- Asia/SA:Robert Blackman                      Date 6/28/76

GC/Asia:PB:com:hp:6/17/76