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AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

PROJECT PAPER

INDIA

IRRIGATION MANAGEMENT AND TRAINING

(386-0484)

JULY 1983

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

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

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2. COUNTRY/ENTITY: India

3. PROJECT NUMBER: 386-0484

4. BUREAU/OFFICE: Asia — 04

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

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

7. ESTIMATED DATE OF OBLIGATION (Under 'B' below, enter 1, 2, 3, or 4)
A. Initial FY 83 B. Quarter 4 C. Final FY 88

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

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	13,000		13,000	51,000		51,000
(Grant)	(3,000)	( )	(3,000)	(41,000)	( )	(41,000
(Loan)	(10,000)	( )	(10,000)	(10,000)	( )	(10,000
Other U.S. 1.						
Other U.S. 2.						
Host Country		6,300	6,300		28,200	28,200
Other Donor(s)						
TOTALS	13,000	6,300	19,300	51,000	28,200	79,200

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1)	664	064	064	-	-	41,000	10,000	41,000	10,000
(2)									
(3)									
(4)									
TOTALS				-	-	41,000	10,000	41,000	10,000

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 022 | 031 | 720

11. SECONDARY PURPOSE COD: 149

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

A. Code	BR	COOP	PART	TNG
B. Amount				

13. PROJECT PURPOSE (maximum 480 characters)

To strengthen the institutional capacity of the Government of India and selected State Governments to plan, design, construct, operate, manage, and maintain efficient and productive irrigation systems.

14. SCHEDULED EVALUATIONS
Interim MM 12 YY 86 | MM YY | Final MM 12 YY 90

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

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

17. APPROVED BY
Signature: Richard Brown
Title: Richard Brown, Director(Acting), USAID/India
Date Signed MM DD YY

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

AID 1330-4 (8-79)

IRRIGATION MANAGEMENT AND TRAINING

TABLE OF CONTENTS

	Page
Acronyms	iii
Project Authorization	iv
I. Project Summary, Rationale and Description	1
A. Summary Project Description	1
B. Rationale	5
1. The Need to Increase Food Production	5
2. Relationship of this Project to India's Development Priorities	6
3. Relationship of this Project to AID's State-Specific Irrigation and Water & Land Management Projects	7
4. Relationship of this Project to the Efforts of the World Bank and Other Donors	8
C. Detailed Description	10
1. Project Goal and Purpose	10
2. Project Outputs	10
3. Project Inputs	10
II. Cost Estimate and Financial Plan	21
A. Financing Procedures	21
B. Summary Cost Estimate and Financial Plan	23
C. Preliminary Project Expenditures by Fiscal Year	24
D. Summary of Project Component Financing	25
E. Preliminary Budgets for Contracts	27
F. Preliminary Procurement List	28
G. Illustrative Budget - Action Research	29
III. Implementation Plan	30
A. Planning and Budgeting	30
1. Organizations	30
2. Start-up	32
3. On-going	33

B. AID Administrative Arrangements 34
1. Contracting for Technical Services 34
2. Procurement of Equipment and Instruments 35
3. Progress Reporting 36

C. Preliminary Calendar of Project Events 36

IV. Monitoring Plan 42

A. Monitoring Actions 42
B. Tentative Calendar of Monitoring Actions By USAID Staff 43
C. USAID Staffing Implications 47

V. Summaries of Analyses 48

A. Technical 48
B. Financial 51
C. Economic 53
1. Rationale 53
2. Comparable Returns 54
D. Social 56
E. Administrative 57

VI. Conditions and Covenants 58

A. Conditions Precedent to First Disbursement 58
B. Condition Precedent to Disbursement of Local Currency for State Activities 58
C. Covenants 59

VII. Evaluation Arrangements 59

A. Regular Evaluations 59
B. In-Depth Evaluations 60

ANNEXES

A. PID Approval Issues and Responses 62
B. Logistical Framework 66
C. Project Checklist 68
D. Request for Assistance 74
E. Project Analyses 75
1. Technical Analyses 75
2. Economic Analysis 77
3. Social Analysis 86
4. Administrative Analysis 89
F. Section 611(e) Certification 112
G. Section 612 (b) Certification 113

ACRONYMS

AND WHAT THEY STAND FOR

ARS	-	Action Research Site
ARTST	-	Action Research Technical Support Team
CADA	-	Command Area Development Authorities
CSC	-	Central Steering Committee
CWC	-	Central Water Commission
DEA	-	Department of Economic Affairs, Ministry of Finance
GOI	-	Government of India
GOM/ID	-	Government of Maharashtra, Irrigation Department
IRMIC	-	Irrigation Research & Management Improvement Cell
STC	-	State Technical Councils
STI	-	State Irrigation Management Training Institute
TAC	-	Technical Advisory Committee
T&V	-	Training & Visit System of Extension
TWG	-	Technical Working Group
VLEW	-	Village Level Extension Worker
WALMI	-	Water and Land Management Institute

PROJECT AUTHORIZATION

INDIA

Madhya Pradesh Minor
Irrigation Project
Project No. 386-0483

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Madhya Pradesh Minor Irrigation Project (the "Project") for India (the "Cooperating Country") involving planned obligations of not to exceed Forty-One Million U.S. Dollars ($41,000,000) in Loan funds and Five Million U.S. Dollars ($5,000,000) in Grant funds over a three year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the Project commencing April 1, 1983.

2. The Project is intended to improve the efficiency of surface irrigation in the State of Madhya Pradesh by the design and construction of approximately 50 minor irrigation schemes (MISs) that will be used to test and demonstrate innovations in design, construction and operation of irrigation systems involving farmer/irrigators more actively in the process. Funds hereby authorized will finance training and technical assistance in appropriate technical areas, studies related to the Project, a resident project coordinator, short term technical assistance, and a portion of the institutional and construction costs of the MISs.

The Cooperating Country will finance the remainder of such costs which are estimated to total $35,200,000 in Indian currency.

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

a. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to A.I.D. in U.S. dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of

not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in U.S. dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years, 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.

b. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the Project shall have for Grant funds, their source and origin in the Cooperating Country or the United States, and for Loan funds, the Cooperating Country or countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing. Except as A.I.D. may otherwise agree in writing, ocean shipping financed by A.I.D. under the Project shall be financed only on flag vessels of the United States or the Cooperating Country.

c. Conditions Precedent to Disbursement

Prior to first disbursement:

1. The Cooperating Country provides, or causes to be provided, evidence that a Minor Irrigation Committee and a special appraisal and supervision cell, including appraisal divisions and an implementation operation monitoring and evaluation division, have been established within the Irrigation Department of Madhya Pradesh and that they are sufficiently staffed so as to initiate project planning and implementation.

2. The Cooperating Country provides, or causes to be provided, confirmation that budgetary resources are available to the Government of Madhya Pradesh under the Sixth Five Year Development Plan which also allows for the timely start of effective implementation of the Project.

d. Covenants

1. The Cooperating Country agrees to carry out and use, or causes to be carried out and used, detailed soil and topographical surveys for planning the irrigation and drainage network.

2. The Cooperating Country agrees to establish, or causes to be established, a special Demonstration Chak Unit within the Agriculture Department of the Government of Madhya Pradesh, staffed to coordinate and manage the demonstration chaks.

3. The Cooperating Country agrees to establish, or causes to be established, an adequate number of positions within the Madhya Pradesh Irrigation and Agriculture Departments and to post, or cause to be posted, experienced, qualified staff to those positions at the field level to implement all project activities satisfactorily and in accordance with the Project schedules and budgets established for approved subproject MISs.

4. The Cooperating Country agrees to appoint, or causes to be appointed, Project Managers from either the Madhya Pradesh Irrigation Department or the Agriculture Department for the operation and management of subprojects (in groups of three or four) who will ensure timely, reliable, and equitable water deliveries.

Signature F.B. Kimball
M. Peter McPherson
Administrator

July 26, 1983
Date

Clearances:	Date	Initial
Charles W. Greenleaf, AA/ASIA	ZH	
Richard A. Derham, GC		
John R. Bolton, AA/PPC		

GC/ASIA:HEMorris:hp:6/16/83

Irrigation Management and Training

I. Project Summary, Rationale and Description

A. Summary Project Description

The project during its seven year life will strengthen selected Indian institutions and human resources responsible for management and use of irrigation water. It will contribute to the Mission's sector goal of increasing irrigated agricultural production through improved delivery of water to desired locations and more efficient use of the water delivered. The project will also help develop skills in the planning and optimal utilization of river basin water resources. In order to do this, the full range of irrigation use, management, operation, construction and allocation of water resources must be addressed from the use and management of irrigation water by farmers for producing crops to river basin planning for multiple uses.

India has developed excellent expertise in the central function of design and construction of hydraulic structures for storing and conveying water. This project will augment development at the two ends, the optimal delivery and use of water on farmers' fields and systematic planning of river basins. Among others, the following aspects will be emphasized:

-- proper preparation of farmers' fields for maximum advantage of the water;

-- improved reliability in the delivery of water to farmers' fields at the times and in the amounts needed;

-- better management of irrigation projects;

-- effective transfer to farmers of knowledge needed to take maximum advantage of the water and other inputs being supplied.

-- effective transfer to professionals associated with irrigation and irrigated agriculture of research and development findings and new management oriented analytical techniques;

-- improved designs of main canals and distribution systems based on modern concepts and technology;

-- optimum planning of river basin development using the systems approach.

Achieving these important changes will require a massive effort in training and associated institutional development. New concepts and values which constitute the basis of the requirements of irrigated agriculture need to be conveyed to and adopted by those who are involved in irrigation. Appropriate methodologies need to be developed and put into place to make the new concepts an integral and permanent part of the responsibilities of the organizations involved in irrigated agriculture.

This project will not install additional people in government service. Rather, in-service professionals now in place or who would have been normally added will benefit from the following project elements:

(1) Large scale training efforts will be directed to those who are or will be involved in irrigated agriculture, from senior most public officials to field technicians, and farmers. A total of $24.3 million is budgeted (includes items 3 & 7 described below) under this component of the project to provide approximately 45,500 person months of direct training to about 12,000 professionals engaged in the field of irrigated agriculture. Training will be carried out in five state water and land management training institutes (Maharashtra, Madhya Pradesh, Rajasthan, Gujarat and Tamil Nadu) and at a new central training facility;

(2) An intensive attack will be mounted on the real problems of irrigation systems by detailed and comprehensive long term studies of actual operating systems. These will entail the direct, on-site participation of irrigation and agriculture personnel, behavioral scientists and farmers. U.S. $9.7 million is budgeted for four to five five-year Action Research Studies. Each involves long-term, on-site assignments of about 20 professional and technical staff members of state irrigation and agriculture departments to conduct the studies and three to four month assignments for on-site study and hands-on field work by 100 trainees annually. Corrective interventions, based on the new concepts, will be formulated and implemented by the state governments concerned in order to improve the operation of the systems studied. This type of effort is required not only to cover the widest possible variety of problems facing existing and new systems, but also to expose a major portion of the individuals associated with irrigation and receiving training under the project to real problems and to the formulation of actions to

address them. It is also required to develop expertise in monitoring and evaluating irrigation systems using the Action Research Studies and improve the system as a result of the interventions. This will not only highlight the effect of the interventions but also act as an indicator to show how the new concepts can be put into action on other systems as well;

(3) Adaptive research, as may be required, on specific problems of irrigation by faculty and trainees will be conducted by state training institutes, universities and other institutions participating in the training program. The individual state institutes will be responsible for the management of these studies. A rupee equivalent of $2.8 million is budgeted for approximately 40 studies (included in item 1);

(4) At the basin planning level, development of improved national capability in water resources planning and management will be undertaken. India has a number of major development projects under planning; the World Bank and UNDP are supporting and have plans to support these development projects which have as their components irrigation, flood control, hydroelectric power generation, municipal and industrial water supply, fisheries, navigation and recreation. The rivers and river basins where these diverse activities occur are often interstate, involving complex allocation arrangements between states as well as coordination of the frequently conflicting uses and upstream and downstream needs. Determining the optimal way to develop and operate such systems given multiple and sometimes conflicting objectives is a complex task. This component of the project will help develop improved national capabilities to investigate, plan, design and operate integrated systems utilizing computer modeling and other techniques. A central training facility linked to leading Indian and U.S. universities will be set up to provide a continuing source of personnel trained in water resources planning and management. Technical assistance, computer equipment and software will be provided. The training will include classroom studies and detailed case studies in one or more Indian river basins. An operational planning unit with computer facilities and software library required for Water Resources Planning and Management will be set up in one state. The personnel trained by the Water Resources Planning and Management Training Project at the central training facility will be given additional

hands-on training to apply their developed planning capability on a specific river basin development in the state. This would help in creating an institutional structure in the state directed towards Water Resources Planning and Management. Similar state units, based on this model can thereafter be established outside the five year term of this project component. About 200 professionals will be trained and a total of $7.8 million is budgeted for the training and for establishment of the planning unit through this five-year component of the project.

(5) Mechanisms and systems will be established for disseminating the substance of the training and the results of the action research studies and for promulgating technological and procedural innovations to all of those involved in irrigated agriculture. A new Irrigation Research and Management Improvement Cell (IRMIC) will be established in the Central Water Commission of the Ministry of Irrigation in New Delhi to arrange for training of trainers, coordinate state irrigation efforts, and to develop and disseminate training materials, technical papers, reports on improved procedures and findings of action research studies. Materials will be disseminated to professional cadres of both the Agriculture and Irrigation Departments and to farmers and others through demonstrations and workshops. Advanced educational and communication technology such as video recordings will be used. A total of $2.8 million is budgeted for this component of the project.

(6) Formulation, implementation, test and evaluation of organizational and procedural adjustments and institutionalization of the new concepts will take place to make them applicable on a much wider and lasting scale. This is a principal focus of the project and a specific responsibility of its implementing units. It will involve, for example, systematic ways to take increased advantage of the ideas and requirements of end users in system design and operation; methods to maximize coordination between the Irrigation and Agriculture Departments especially on irrigation projects and steps to ensure that agricultural, social, engineering and culturalcriteria are included in the conception, review and approval process for individual projects. There is $0.4 million budgeted for this set of activities.

(7) Under this project component, indigenous technical services including the private sector, such as consulting firms, universities and other autonomous institutes associated with irrigated agriculture will be involved. This will be done through direct involvement under contracts to the Indian agencies and organizations managing the project. Approximately $2.9 million in rupees (included in item 1) will be spent on such indigenous technical services.

The project does not directly support the design or construction of any individual irrigation or river basin systems. It will, however, provide training and the opportunity for technological collaboration to the professionals who are or will be involved in state-specific or basin-specific projects in which the new concepts could be directly applied. The training and technical, organizational and procedural innovations developed and supported through this project will be demonstrated and applied in each state. These improvements will have a positive effect on several AID and World Bank supported projects in which irrigation systems are designed, constructed and operated and for which river basin development is planned. These projects will be the vehicles through which the new approaches and practices are institutionalized in the state-level organizations responsible for irrigation.

B. Rationale

1. The Need to Increase Food Production

India must increase its total agricultural production in order to continue to feed its growing population. The principal methods of doing this are to bring more and more lands under irrigation and to increase yields through greater inputs of better seeds and fertilizers. According to the International Food Policy Research Institute[1/], almost half of the 2-1/2 percent annual growth in agriculture production in India is due solely to increased irrigation. The other half is attributed to advances in agricultural technology. Over the last decade, for example, India publicly and privately invested between $2.5 and $3.0 billion a year in irrigation development, including the rehabilitation of old systems. Over two million hectares of new irrigation command are added yearly through surface and groundwater irrigation systems. If this pace continues and quickens, as India intends it to, her ultimate irrigation potential will be fully developed early in the 21st century. After this has happened, further increases in agricultural productivity will have to be achieved entirely by technological advances.

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1 Dharm Narain and Shyamal Roy, Impact of Irrigation and Labor Availability on Multiple Cropping: A Case Study of India. Research Report No. 20. International Food Policy Research Institute, Washington, D.C. 1980.

The water available for irrigation in India is not sufficient for maximally intensive agriculture on all of the country's arable land. If all irrigation potential were utilized, water supplies would be for perhaps one and a half full crops per year, while the theoretical maximum is three or more full crops a year. Thus, even in the best of irrigation systems water at critical stages of crop production will become a scarce commodity.

Even the insufficient quantity of water that is now captured by surface irrigation systems is not effectively managed and used to its fullest potential. On the average only about one-fourth of the water captured is eventually used by crops on farmers' fields. Agricultural productivity averages about 0.7 tons per hectare on unirrigated land and about 1.7 tons per hectare on irrigated land. The latter figure, however, could be increased to 4 or 5 tons per hectare. Yields of this magnitude and higher have been achieved on Indian irrigated farms where good water management and crop husbandry practices have been followed. Presently, irrigated agriculture produces about a third of its potential yields. Improving these rates of performance requires individual irrigation systems to be made more efficient by reducing losses so that a higher proportion of the water captured is eventually delivered to farmers' fields and more food is grown with each unit of water delivered. If nationwide irrigation efficiency could be increased by one percentage point, the effect would be an increased annual foodgrain production (125-128 million tons in 1982-3) of about 4 million tons. Increasing the productivity of delivered water by one percent would increase this figure by an additional 3.25 million tons.

Such increases would not only provide alternatives to bringing more unirrigated land under irrigation, but also raise the returns on the very expensive investments already made.

2. Relationship of this Project to India's Development Priorities:

The great potential for increasing the efficiency and effectiveness of irrigation is widely recognized by India's agricultural and irrigation leaders and is reflected in the Sixth Five-Year Plan which outlines a strategy for improving irrigation management. The plan emphasizes increased efforts in training and research. It notes that greater emphasis must be given to in-service training and to teaching water management subjects in universities. An urgent need for massive training in irrigation management is recognized by center and state governments as well as by agricultural and irrigation professionals. GOI and USAID have evolved this project to begin meeting the growing demand of professional development for improving efficiency of irrigation systems. This is

essentially a human resources development and institution building project which involves continuous professional development of irrigation and agricultural personnel responsible for basin planning and for the supply and use of water on farmer's fields.

3. Relationship of this Project to A.I.D.'s State-Specific Irrigation and Water and Land Management Projects:

All projects in A.I.D. India's irrigation portfolio address the twin objectives of increased system efficiency and increased productivity of water. The state-specific projects focus on the development, application and institutionalization of new technologies while this project concentrates on the development of human resources and the institutionalization of irrigation management. The objectives of both the projects are the same and the approaches are complementary. Distinctions between the two types of projects may blur at times; for example, a specific training course or specialist might appropriately be funded from either this or a state-specific project.

Achievement of the principal objectives of increased system efficiency and increased productivity of water requires large scale effort through both approaches. The A.I.D. Mission's experience in implementing the Gujarat, Rajasthan and Maharashtra projects has highlighted the need for training and professional development in the field of irrigation management, targeted to the very competent and highly motivated state and central irrigation and agriculture cadres. Action research conducted on existing systems will serve to consolidate the training with unprecedentedly intensive hands-on practical opportunities as well as to produce and test specific actions to improve the systems. These two activities, i.e., multidisciplinary training combined with action research, will provide the missing link between traditional academic training and the realities of farm-level irrigation that are necessary before widespread improvement in irrigated agriculture can be brought about. Pilot tests of institutional and technical changes, designed primarily by the recipients of training and participants in action research, will be undertaken on A.I.D. supported state-specific projects and then applied on a wide scale through each state irrigation program.

The project is directed initially to professional irrigation and agriculture cadres in the states and the Central Government and to farmers and water resources planners. Four of the five states have or shortly will have at least one A.I.D.-supported irrigation project. The fifth, Tamil Nadu, has completed development of virtually all of its irrigation potential and is now giving high priority to improving its existing irrigation infrastructure and

water use efficiency. This state is also experimenting with the use of existing academic institutions for the in-service professional development of its irrigation and agriculture cadres. These two factors make participation of Tamil Nadu an interesting addition to the project. Other states also may be added during the course of the project.

4. Relationship of the Project to the Efforts of the World Bank and Other Donors

The establishment of Water and Land Management Institute (WALMI) in Aurangabad by the World Bank in October 1981 was an important breakthrough in the adoption of the concept of water management as an integration of Irrigation and Agriculture Department functions. Its setting up and functioning represents a major achievement by the Governments of Maharashtra and India and the World Bank. WALMI's faculty is essentially in place and well qualified to provide training in irrigation management. This project will utilise the talent pool that has been developed with World Bank support at the WALMI (Maharashtra), the only state institute now fully operational, and also those that will be developed with World Bank support in Gujarat and Madhya Pradesh.

The WALMI experience will set the stage for more specific A.I.D./World Bank coordination in those states where both agencies are currently actively considering establishing training institutions. The World Bank presently is funding the organization of a training institute in Gujarat which has not become fully operational. The Bank has also earmarked some funding for an institute in Madhya Pradesh.

The Mission and the World Bank will work closely with WALMI in developing and refining additional curricula, course content, syllabi and training aids for the new and existing courses in the training institute. Likewise A.I.D.'s support for the training institutes in Gujarat and Madhya Pradesh will be worked out by a team comprising the representatives of USAID, the World Bank, the GOI and concerned states. The training institutes, in general, will follow the WALMI pattern with some variations to accommodate local differences on needs and organizational arrangements. Generally, the pattern of AID support and activities will be similar to those for Maharashtra WALMI.

The World Bank or A.I.D. could successfully support a state institute in states where specific projects are supported by either of them. Joint support, which can draw on the technical and financial resources available to both agencies, will be advantageous particularly in those states where prototype projects need

professionals with more training in irrigation management. Joint support will also greatly facilitate coordination both within and between state training programs.

In states where the World Bank and USAID are jointly supporting training programs, USAID will coordinate with the World Bank, GOI and the concerned state institute in developing programs and curricula and in the training of trainers. This will be done keeping in view the World Bank perceptions in respect of types of training needed, and the number to be trained. In general, A.I.D. will provide the financing for technical assistance, equipment and training of trainers, while the World Bank will support the financing for provision of physical infrastructure. For the establishment of the state training institutes in Maharashtra, Gujarat and Madhya Pradesh and for professional development of entry level officers the World Bank has allocated appropriately U.S.$16 million for the period 1984-90.

In respect of jointly supported training institutes, an appropriate and unified control mechanism will be set up in consultation with the World Bank, GOI and the State Governments concerned for planning, effectively overseeing the working of the program, and monitoring the physical and financial progress. Representatives of USAID and the World Bank will be members of this to ensure that proper course corrections are made during the project life and maximum benefits are realised.

The Ford Foundation has supported a number of workshops relating to irrigation water management. It is currently supporting development of a program of in-service training for irrigation and agricultural officers on a pilot basis at the Indian Institute of Management in Bangalore and a full-fledged master's degree program at the International Water Resources Training and Development Center at the University of Roorkee.

The Ford Foundation is also funding a number of small scale field research studies in India: a small tank project by Anna University near Madras; a similar project by Tamil Nadu Agricultural University at Coimbatore; an intensive study of a lateral of the Ganges canal near Meerut in U.P.; and one by the Indian Institute of Science at Bangalore on the Malaprahaba project, a major irrigation project in northern Karnataka. Ford is also financing a study by the Agricultural Finance Corporation in Madhya Pradesh in which ways to improve farmers' access to credit are being studied and tested. In this study, experiments are being supported to place field level, land development technicians in banks enabling them to interact directly with farmers and help arrange the necessary credit for water course and field channel construction and land levelling, and then to

help the banks supervise the loans. These field research studies are proving to be an exciting and successful method to undergird the training of irrigation and agriculture professionals and develop sound analyses of and improvements on actual irrigation systems. The concept of action research in irrigation management being supported in this project is focussed on similar objectives and stems from the Water Management Projects in Egypt and Pakistan.

C. Detailed Description

1. Project Goal and Purpose

The sector goal to which this project contributes is increased agricultural productivity and rural incomes. Specifically, the project seeks to increase irrigated agricultural production through improved efficiency of irrigation systems and improved productivity of water delivered through irrigation systems to farmers' fields.

The project's purpose is the strengthening of the institutional capability to plan, design, construct, operate, manage and maintain efficient and productive irrigation systems. This strengthening capability includes expanding the emphasis from design of dams and canals to include all aspects of and requirements for optimal irrigated agricultural production. Simply put, irrigation systems should be designed and operated with a principal focus on the needs of the client farmers.

2. Project Outputs

Outputs contributing to the achievement of the stated purpose include upgraded professional skills in all phases of irrigation systems; organization and procedure changes reflecting a shift in management focus from "administering" water to "meeting" farmers' needs and adoption of a systems approach which considers the interactive effects of engineering, agronomic and social components; reduced water losses within individual irrigation systems; development of more effective water distribution systems; increased participation of farmers in the location of canal outlets, location and size of water courses and field channels; and in the operation and maintenance of the system. National and state capability also will be developed to plan and manage the water resources of major basins as integrated systems.

3. Project Inputs:

a. Training and Professional Development in Irrigation Management:

Examples of the kinds of training the Project will support include:

i. A series of seminars of approximately two to three days each will be conducted at the state irrigation management training institutes (STIs) and at the training facility of the central Irrigation Research and Management Improvement Cell (IRMIC). These seminars will be attended by senior professionals in the fields of irrigation and agriculture and specialists such as rural sociologists, community development experts, behavioural scientists, agronomists, hydrologists and water management specialists. The objective of the seminars will be for senior officials to have an enhanced appreciation of the interdisciplinary and interdepartmental nature of the problems constraining the effective utilization of irrigation systems including policy changes, procedures, allocation of resources, training and assignment of personnel and the coordination necessary for maximizing the output. Another important purpose will be to benefit from continual monitoring and evaluation of the performance of irrigation systems to determine methods for improving the system efficiencies.

Roughly 1,700 individuals from the five states and the Center will attend these seminars during the life of the project. This represents virtually 100 percent of the senior level officials now in position, and that are expected to enter during the life of the project.

Turnover is relatively high at these senior levels and three or four complete changes of incumbents will probably occur during the project. Nevertheless, it is sufficiently important to achieve and maintain understanding and support at these levels, hence full coverage is necessary. Cost per seminar participant will be approximately $100.00.

ii. Training courses will be held for mid-level Officers in state irrigation and agriculture departments such as Superintending and Executive Engineers, Joint and Deputy Directors of Agriculture, subject matter specialists, etc. i.e., the key managerial personnel responsible for design, construction, operation and maintenance of irrigation systems and for providing services and inputs for irrigated agriculture.

Six to eight week courses at STIs or the training facility of the Irrigation Management Improvement Cell will cover, among other subjects, the following topics:

-- review of irrigation principles, policy and management practices;

-- use of system approach to the design of irrigation systems;

-- orientation in engineering, agronomic, economic and social aspects of irrigated agriculture & economic evaluation of projects - socio-economic benefit cost analysis of projects;

-- rural sociology with special relation to interaction with farmers and farmer organizations - motivation, attitudes, organization and behavioral sciences;

-- monitoring and evaluation of performance of irrigation systems

-- engineering, agronomic and social problems on actual irrigation systems through diagnostic analysis and action research studies being conducted by STIs.

Approximately 4,000 mid-level officers will attend these courses during the project. As with senior level officers, this represents nearly 100 percent coverage of this professional stratum. Full coverage is important because of the key managerial functions performed at this level. Rotational assignments every three to four years provide an opportunity to spread the concept and make training new entrants necessary. The cost per trainee will be roughly $500.

iii. Courses will be carried out for junior officers such as Assistant and Deputy Engineers, Assistant Directors, Technical Officers and Assistants, Agricultural Extension Officers, i.e., professional personnel who are or will be responsible at the site for construction, supervision and operation of completed systems:

Full time courses will range from eight months to one year at the STIs, covering with a much higher degree of intensity and level of detail the topics just described above for mid-level professionals. Approximately 2,000 individuals at this working level will be trained. Classroom study will be augmented by field assignments of up to four months at action research sites. These assignments will provide the hands-on experience essential to give meaning and practical applicability to classroom theory. Roughly 25 percent of the junior level professionals in the five states will have received this intensive, long-term training during the project. Ideally a higher proportion would need to be trained; however, the need to limit the number of front-line officers "out of commission" at any given time plus the need to limit each class to about 30 students to maximize effectiveness necessarily limits the coverage of this very large cadre.

The cost per trainee for this long-term training is estimated to be $2000.

iv. Courses will be held for field level personnel such as land development and irrigation management personnel whose responsibilities are to provide technical guidance to land development technicians and to village level extension workers who deal directly with farmers.

Training will consist of one to six month courses at STIs on special topics and techniques. For example, land development personnel will receive training in field channel planning, design and construction, surveying, small irrigation structures, land leveling and proper use of equipment. These personnel will each provide continuous guidance to an average subdivision of six land development technicians whose jobs are to survey and lay out field channels and drains within individual chaks, to survey, layout and supervise levelling operations and construction of irrigation ditches and drains on farmers' fields undertaken by state land development units or by private contractors.

Irrigation management extension personnel will also be given training in the key aspects and special requirements of crop production under irrigated agriculture, including which crops are best suited to irrigation, what these crops need and techniques to improve farm-level management of water. The training will include to take advantage of an irrigation system and thus how to help farmers adjust their practices and cropping patterns to maximize their productivity and incomes. Each irrigation management personnel will be responsible for providing technical guidance to 20 Village Level Extension Workers (VLEWs), who are responsible for individual farmer contact under the Training and Visit (T&V) system of extension.

Approximately 450 land development and 500 irrigation management personnel will be trained. They in turn will be expected to apply their newly acquired skills and knowledge as they provide day-to-day technical supervision to 2,400 land development technicians and 10,000 VLEWs. The cost per specialist will be on the order of $1000.

v. Farmers and Farmer Organizations:

Special workshops, field days, demonstrations and short training sessions will be held in villages located in the vicinity of and within the command of irrigation projects, lasting one to three days. They will be arranged collaboratively by the STI and the state extension service and conducted by extension workers, institute trainees and members of action research teams. These

sessions conducted with the help of audio-visual aids, videos, etc., will cover such topics as the crops best suited for irrigation, tilling, planting, watering, application of fertilizer and pesticides, weed control and harvesting requirements and methods for growing such crops. Demonstrations on land leveling and field ditches will be given; how to organize with neighbors to plan, dig, operate and maintain watercourses and field channels from outlets to individual farms; methods of irrigation, e.g., basin, border strip, furrow, etc.; methods of water distribution and rotation within a chak. Farmer workshops will also be held at the sites of action research studies to demonstrate findings and to outline procedures to apply them.

These programs will provide opportunities not only for direct transfer of technology to farmers but also for first-hand exposure for irrigation professionals to farmers' feedback. Roughly 17,000 farmers will be directly exposed to these programs; equally importantly, between 500 and 1,000 members of the irrigation and agriculture departments will be directly exposed to farmers. The cost is estimated at $50 per farmer.

vi. Training in the field of irrigation management will be provided for existing and prospective faculty members for the STIs. Most of this training will take place during the initial two to three years of the project; however, continuous upgrading will be provided to allow for attrition and to maintain currency in the state of the art. Training will be arranged at the STIs, the central training facility, at academic institutions in India, in the United States and at other institutes as found appropriate. Approximately 100 faculty members will receive training. These faculty members will in turn be responsible for carrying out the training of various levels of professionals described above.

vii. There have been major technological advances in the fields of water resources planning and management, surface and ground water hydrology, conveyance system operation, on farm development works, irrigation management, agricultural practices and inputs, etc. In addition there is a great need for appropriate interaction between the irrigation engineer and agronomist on the one hand and the farmer on the other. This calls for a study of social sciences and an understanding of honour relations and behaviour. Improved education and training in these areas will enhance the performance of the irrigation engineer and agronomist and can have a great impact on water use efficiencies.

Efforts will have to be made, therefore, to determine if courses on the interdisciplinary sciences viz., engineering, agronomy and the humanities, could be introduced in the curriculum of the

Engineering and Agricultural Universities. Such integrated programs, if introduced, would result in the production of technical personnel with substantial knowledge of the science and practice of irrigation water management. This would improve the common weakness prevalent today in the quality and content of education and training of irrigation engineers, agronomists and agricultural engineers.

A provision of $5.3 million has been alloted for "technical and professional development" towards the technical assistance, training of faculty, development of academic curricula and introduction of new courses at engineering and agricultural universities. These academic programs will serve to prepare professionals for careers in irrigation management. The introduction of educational programs will be carried out gradually in a limited number of engineering and agricultural universities after obtaining the necessary clearances from the University of Education and other appropriate organizations.

b. Action Research

The concept of action research involves essentially a long-term, on-site case study of an irrigated area sufficiently large to be representative of a complete system. Action research studies result in identification of problems constraining optimal irrigated agricultural production on the system being examined, the formulation and implementation of corrective actions, the monitoring evaluation of their impact and potential for broader application, and the preparation of analyses reporting these findings and the holding of on-site demonstrations, seminars and workshops.

The importance of these studies stems from the systematic introduction of several factors;

(i) intensive on-site examination and analysis of problems facing real systems by an interdisciplinary team of irrigation, agriculture and other professionals. Three benefits are derived by and through this examination;

(a) More thorough and accurate understanding of actual irrigation problems will be achieved;

(b) The personnel assigned to the study will develop a sounder and more comprehensive understanding of irrigated agriculture and the problems facing functioning irrigation systems, thus will be in a much better position to make more informed decisions and higher quality professional contributions.

(c) Farmers living in and near the study areas will benefit directly and immediately from system improvements,and from new technologies and procedures.

(ii) Formulation of site specific corrective actions that, if effective, can be adapted for broader application on other systems. Types of recommendations that might result in such an exercise include: rehabilitation or relocation of water courses; changes in cropping patterns or practices; creation or reorganization of water users' associations; more effective ways to integrate planning for seed, fertilizer, pesticides and water.

(iii) The use of study sites for shorter term field work by technicians and professionals receiving training at STIs. This will serve to retain through practice on real systems the concepts introduced in the classroom.

(iv) The preparation of case-specific reports and articles and the holding of on-site demonstrations and workshops to begin the process of technology transfer. Findings and analyses will also be distributed throughout the state irrigation and agriculture departments, including the extension service, and to the central training facility and STIs for widespread, systematic dissemination.

Each action research study is estimated to cost roughly $2.0 million over its five year life. These costs include construction of temporary on-site office and dormitory facilities, scientific and technical equipment and salaries and support costs for personnel assigned to the study. Actual costs will vary with the sites selected. An illustrative budget for a typical action research study is shown in Section II, G.

c. Systems for Transfer of Technology

The project will support a set of communication channels for disseminating information throughout Indian water resources, irrigation and agriculture circles. The Irrigation Research and Management Improvement Cell (IRMIC) will begin operating the system. A major source of material will be the action research studies and the river basin planning exercise. These studies will be analysis of irrigation projects as integral components of agricultural systems, and thus the main source of information. The main channels will be distribution of printed reports and videotaped programs.

Reports and analyses prepared by action research study teams and the river basin planning group will be forwarded by each study director to the STI and to the IRMIC in New Delhi. The STI will use the materials as appropriate in its training courses, especially for trainees who will be assigned to the action research

study site. The IRMIC will draw from these reports information of general interest and compiled with similar information received from the other action research studies will publish a regular newsletter. This will be distributed to all concerned agencies and institutions dealing with irrigation management.

The material included in the publication will be specific and detailed enough to be used in preparation for workshops, seminars and demonstrations by the STIs, agricultural extension services and other units. Although the action research study teams are expected to be a main source of material for the publication, contributions from other sources such as STI faculty members, state irrigation or agriculture department staff members, international experts and others will be solicited and encouraged. The publication will be issued in all applicable languages monthly or quarterly and is hoped to become an authoritative and useful vehicle for professional communication among practitioners of irrigated agriculture. Careful and active editing will assure that all material published will be of direct and practical use to its targeted readers. A total of $0.2 million is budgeted under the project for phased contribution to the establishment and operation of the publication and for technical assistance for start up. Project support will be phased out over the project life so that the publication will be fully funded by the GOI upon completion of the project.

The IRMIC will also arrange for the preparation of video cassette programs to be distributed to all STIs, state irrigation and agriculture departments and to selected irrigation and agriculture universities. Programs will be prepared and taped mainly by the STIs and the IRMIC. The IRMIC will be responsible for duplication and distribution.

Video programs will be prepared in all applicable languages to supplement published articles with audio-visual and rural demonstrations. They will also be prepared as self-contained training modules for professional staff, including land development technicians and VLEWs, and for irrigation farmers.

Video equipment and materials will be provided through the project. A total of $0.2 million is budgeted for up to six sets of equipment. Wherever available, the required equipment will be purchased in India to facilitate maintenance and replacement.

Professional production services will be contracted commercially for scripting, studio and field recording and for duplication. These costs will be covered under the project on a declining basis over the project life.

d. Organizational and Procedural Changes

The project will develop guidelines for changes in organizational structure and in procedures needed to accomodate new technologies and new operational concepts. Such changes are likely to arise through the training and conduct of the action research and, to be most effective, should be generated indigenously from within the organizations themselves. Project resources may be used for pilot tests, operational research, management consultants, equipment and similar assistance. The kinds of organizational and procedural alterations that might be considered include:

i. Chak level organization for the operation and maintenance of watercourses and control structures.

In many states at the chak or village level the Patwari or equivalent official serves as principal contact between farmers and the Irrigation Department's patrol or canal inspector. The Patwari is usually a respected villager, in some cases the village head. Considering that water distribution below the outlet is the responsibility of the farmers, the Patwari could be a key person to improve chak level operations. At present farmer organizations and technical know how are not in place for water distribution below the outlet. The Patwari could be helped to understand how watercourses should be constructed, operated and maintained, how to schedule water, how to maintain watercourses and field channels and perhaps most importantly how to organize farmers for operating and maintaining the community and private facilities below the outlet and to mobilize credit for the construction of community water distribution facilities. One possible intervention would be to put into place a water distribution training specialist within the Irrigation Department operations structure who could provide technical guidance and assistance to Patwaris. A specialist would be responsible for approximately 20 Patwaris, comparable to the Agriculture Department's T&V extension specialist who has continuing contacts with VLEWs. Pilot level training programs for Patwaris and the new level of specialists can be supported under the project.

ii. In most projects and states the operation and maintenance of irrigation systems are the direct responsibility of irrigation departments up to canal outlets each serving about 40 ha. Below outlets, facilities are the responsibility of the farmers. A typical chak contains both communal water courses serving several farmers and private channels serving individual farms. A major weak link in the operation of irrigation systems has proven to be these communal facilities. Therefore an important function of an effective water users' organization will be to arrange for the operation and maintenance of common facilities with equitable sharing of costs.

iii. Various forms of water user organizations may be village-based, chak-based, or at the level of distributaries or minors. Ways to facilitate interactions between these organizations and the state and block service organizations will be explored. Variations in functional responsibilities and organizational complexity for water user organizations will be tried. In some, responsibilities will be limited to allocation of water and operation and maintenance of watercourses and control structures; in others, the needs for water as well as for other inputs will be worked out, quantified and communicated to the responsible higher authorities as an integrated inputs package.

iv. Adjustment to the areas of responsibility of Village Level Extension Workers in command areas to coincide with one or more chaks rather than with village boundaries. The purpose of these experiments will be to make the areas of responsibility for both the irrigation and agriculture departments the same at the local level, and to test whether doing so improves coordination sufficiently to warrant wider application;

v. Establishment of Command Area Development Authorities (CADA) in medium projects. The CADAs are currently only on selected major irrigation projects, except within the state of Kerala. CADAs have been restricted to larger projects to ensure that they are large enough to encompass one or more complete districts. Agricultural support services provided by the district can thus be suborned to the CADA. Medium projects ordinarily command only a portion of one or two districts. The district agricultural units therefore have other responsibilities besides the irrigated project areas and cannot be brought under the full control of the CADA. Ways might be found to overcome the difficulty of scale by exploring other organizational arrangements for providing integrated rural development on these small commands. For example, CADAs for medium projects might involve block level units of state government departments instead of district level; new administrative jurisdictions coinciding with the command areas of medium projects might be established for all applicable departments of the state government;

vi. Improved coordination of budgeting and personnel sanctioning between the state irrigation and agriculture departments, centering in both cases upon the command areas of irrigation systems. For example, giving a permanent status to the CADAs or establishing permanent water management and land development wings in the CADAs might be explored. State level units for policy guidance of all CADAs and for assuring interdepartmental coordination could be considered.

vii. Participation in the conduct of organizational and procedural experiments by irrigation system users and their village hierarchies, as well as by state and central authorities.

Oversight of the entire process will be provided by the Irrigation Research and Management Improvement Cell in CWC and by the states. The IRMIC and USAID will work out appropriate interventions to be financed under the project.

e. Training in Water Resources Planning and Management

Approximately 200 individuals will participate in classroom and field studies to analyze systematically large scale groupings of water projects within individual river basins. An important thrust of this component will be the use of computers in the analysis and integration of various basin development activities into a unified system. A computer and packages of software will be provided for this training and a training facility for this discipline will be established by the Government of India at the center where project-supported training will be undertaken. The center will provide continuous specialized training, function as a point of coordination for the integrated development of river basins and help coordinate the efforts of the various states involved in a given basin. Initially the IRMIC will be responsible for the activities. The unit will draw on Indian universities, the Government and the private sector for its training faculty and professional staff. In addition specialized assistance will be provide by a U.S. institution in collaboration with a water resources planning consultant. An advanced course curriculum of about nine months will cover such matters as physical system modeling, computer programming and its application to water resources planning and management and basin development, probability and statistics, project evaluation, microeconomics and system analysis. Approximately 30 to 50 students per year from state and central units will participate in the training. Highly specialized training in certain disciplines will be provided by sending a few candidates to U.S. institutions for six months to a year. A detailed case study on applying the techniques to an Indian river system will be carried out in one selected state. The project will establish and equip a planning unit in that state and provide technical assistance during the initial stages of model development and operation. The comprehensive work plan and details for this component are under examination by GOI and USAID.

II. Cost Estimate and Financial Plan

A. Financing Procedures

Grant financing will be provided for all contracted expatriate and Indian technical assistance, procurement of imported experimental and test equipment and instruments, the water resources planning and management component and project evaluations.

Rupee costs of training and field action research and for systems for technology transfer and organizational and procedural adjustments will be partially loan and partially grant financed in accordance with the following criteria (standard local currency reimbursement procedures will be used for such costs):

> Ordinary and on-going costs such as salaries of permanent employees in in-service training or on assignment to an action research study may be defrayed with project funds during the periods of their training or assignment to an action research study. Such costs, however, will be covered with loan funds and on a declining scale over the life of the project. Thus in the first project year 100 percent of the salaries of trainees, both short-term as well as long-term may be loan-financed; in the second year 85% of the salaries of all trainees may be financed; 70% in the third, and so on.
>
> Extraordinary costs associated with project operations such as for travel and perdiem during training, operational costs of research activities and experiments, indigenous equipment, seminars and workshops will be fully grant financed throughout the project.

Financing for rupee costs will be provided by USAID through established Government of India (GOI) channels. To facilitate project operations, the Ministry of Irrigation will establish an operating account to cover all project costs not otherwise provided for in the budgets of the state or central government. AID will initially release sufficient funds to finance the rupee costs of the first three months of such costs. The dollar equivalent of these projected rupee costs will be deposited in the account of the Reserve Bank of India in New York. The equivalent rupees will then be released by the Reserve Bank, upon instruction from DEA, to the Ministry of Irrigation. Approximately three weeks before the end of the three month period, the Ministry of Irrigation will forward to A.I.D., with a copy to DEA, a report indicating the amount of funds expended during the period together with an estimate of the requirements for the next three-month period. A.I.D. will thereafter release adequate funds, upon instructions from the DEA, to cover project expenditures for the next three-month period.

Under these procedures individual project entities will prepare periodic requests for reimbursement for agreed project expenditures such as specified in-service training costs, procurement of agreed items of equipment and expenditures on action research. These project entities will include individual state training institutes and the Central Irrigation Research and Management Improvement Cell for costs incurred in in-service training; Indian universities and institutes for certain specified costs incurred in the development of agreed academic programs, as and when agreed upon; state irrigation and agriculture departments for costs incurred in the conduct of action research studies; and the central organization set up for water resources planning and management. Each of these entities will follow a subproject workplan and budget to be prepared in consultation with IRMIC and other appropriate authorities and approved for project financing by the Ministry of Irrigation and USAID. Requests for reimbursement will be supported by narrative and tabular data describing expenditures made and the resulting work done and progress achieved. Formats for these requests will be worked out in conjunction with the workplans and budgets.

Financing for dollar-funded training, technical assistance, etc. will be provided directly by A.I.D., through letters of commitment and by direct payments. Payment will be made by USAID on advice from the Ministry of Irrigation.

B. Summary Cost Estimate and Financial Plan
($000)

Project Elements		Source of Funds and Other Resources			
		GOI/ States	A.I.D. Loan	A.I.D. Grant	A.I.D. Total
1.	Training and Prof. Development				
	FX	-		14,930	14,930
	LC	15,660	5,030	4,310	9,340
	TOTAL	15,660	5,030	19,240	24,270 1/
2.	Action Research Studies				
	FX	-	-	7,650	7,650
	LC	5,400	1,800	250	2,050
	TOTAL	5,400	1,800	7,900	9,700
3.	Systems for Tech. Transfer				
	FX	-	-	600	600
	LC	1,100	1,100	1,100	2,200
	TOTAL	1,100	1,100	1,700	2,800
4.	Organizational and Procedural Changes				
	FX	-	-	140	140
	LC	100	200	60	260
	TOTAL	100	200	200	400
5.	Water Res. Plan & Mgt.				
	FX	-	-	7,400	7,400
	LC	2,300	400	-	400
	TOTAL	2,300	400	7,400	7,800
6.	Project Evaluation				
	FX	-	-	70	70
	LC	-	-	30	30
	TOTAL	-	-	100	100
7.	Contingency (15%)				
	FX	-	-	3,820	3,820
	LC	3,640	1,470	640	2,110
	TOTAL	3,640	1,470	4,460	5,930
8.	Total				
	FX	-	-	34,610	34,610
	LC	28,200	10,000	6,390	16,390
	TOTAL	28,200	10,000	41,000	51,000

1/ Includes $2.8 million for adaptive research conducted as part of the training programs, $2.9 million for supporting programs and $5. million towards introduction of induction courses.

C. Preliminary Project Expenditures by Fiscal Year

($000)

Fiscal Year	GOI/States	A.I.D. Loan	A.I.D. Grant	A.I.D. Total
1984	2,400	750	3,000	3,750
1985	3,400	1,250	5,000	6,250
1986	4,300	1,400	8,000	9,400
1987	5,300	2,000	8,500	10,500
1988	5,200	1,850	7,500	9,350
1989	3,800	1,500	5,000	6,500
1990	3,800	1,250	4,000	5,250
T O T A L	28,200	10,000	41,000	51,000

D. Summary of Project Component Financing
$ (000)

	A.I.D. Loan	A.I.D. Grant	Total
1. Training and Professional Development			
A. Technical Assistance	700	3,700	4,400
B. Equipment and materials	1,300	2,750	4,050
C. Training	2,500	8,700	11,200
D. Other Costs	530	4,090	4,620
E. Total	5,030	19,240	24,270
2. Field Action Research			
A. Technical Assistance (ARTST)	1,270	5,590	6,860
B. Equipment and materials	220	980	1,200
C. Training	130	560	690
D. Other Costs	180	770	950
E. Total	1,800	7,900	9,700
3. Systems for Technology Transfer			
A. Technical Assistance	400	400	800
B. Equipment and Materials	200	180	380
C. Training	300	700	1,000
D. Other Costs	200	420	620
E. Total	1,100	1,700	2,800
4. Organizational and Procedural Changes			
A. Technical Assistance	50	50	100
B. Equipment	-	-	-
C. Training	100	100	200
D. Other Costs	50	50	100
E. Total	200	200	400
5. Water Resources Planning and Management			
A. Technical Assistance	-	4,100	4,100
B. Equipment and Materials	200	1,000	1,200
C. Training	-	1,000	1,000
D. Other Costs	200	1,300	1,500
E. Total	400	7,400	7,800
6. Project Evaluation			
A. Technical Assistance	-	100	100
B. Equipment and Materials	-	-	-
C. Training	-	-	-
D. Other Costs	-	-	-
E. Total	-	100	100

	A.I.D. Loan	A.I.D. Grant	Total
7. Total			
A. Technical Assistance	2,420	13,940	16,360
B. Equipment and Materials	1,920	4,910	6,830
C. Training	3,030	11,110	14,140
D. Other Costs	1,160	6,580	7,740
SUBTOTAL	8,530	36,540	45,070
CONTINGENCY	1,470	4,460	5,930
8. GRAND TOTAL	10,000	41,000	51,000

E. Preliminary Budgets for Contracts
($ 000)

1. Resident Specialist Team, Including ARTST and Support:

A. Expatriates:	7,540
B. Indian Specialists:	4,745
C. Total	12,285

2. Water Resources Planning and Management

A. Expatriates:	4,400
B. Indian Specialists:	400
C. Support Staff and Facilities	3,600
D. Total	8,400[1/]

3. Short Term Assistance

A. Expatriate
463 Workmonths @ $15,000 per month = 6,950

B. Indian
385 Workmonths @ $3,000 per month = 1,155

4. Grand Total of contracts financed under this project including local support = 27,790,000

1/ $7,800,000 is provided in this project. An additional $1,000,000 grant is provided in Maharashtra Irrigation Technology and Management Project 386-0481.

F. Preliminary Procurement List

1.	Imported Equipment - $	Est. Cost
	A. For Training & Prof. Development:	273,000
	B. For Action Research	600,000
	C. For Technology Transfer	224,000
	D. For Water Resources Planning & Management	1,300,000
	E. Total	2,397,000
2.	Indigenous Equipment - Rs	
	A. For Training & Prof. Development	2,015,000
	B. For Action Research	650,000
	C. For Technology Transfer	317,000
	D. For Water Resources Planning	-
	E. Total	2,982,000

G. ILLUSTRATIVE BUDGET - TYPICAL ACTION RESEARCH STUDY

	I T E M	STATE GOVT. Rs.(000)	A. I. D. Rs.(000)	A. I. D. $(000)
1.	Infrastructure Modification (including land levelling, water courses, drainage, roads etc.)	7,800	-	-
2.	Staff Salaries including Field Allowances	3,000	-	-
3.	Equipment, Indigenous & Imported	-	500	120
4.	Action Research Tech.Support Team			
	Expatriates - 15/5 person years	-	-	560
	Indians - 18/5 person years	-	1,000	-
	Travel, office support etc. for the team		300	-
5.	Temporary Buildings, Hostels, Furnitures	-	800	-
6.	Short term U.S. Consultants (216 person months)	-	-	700
7.	Short term local consultants, local travel etc.	-	600	-
8.	U.S. Training & Study Tours	-	-	200
9.	Workshops, Documentation, Publications	-	400	-
	T O T A L	10,800	3,600	1,580

Total U.S. Contribution/Action Study - $ 2,000

III. Implementation Plan

A. Planning and Budgeting

1. Organizations

This project requires

- New activities not now being done;
- Participation of several departments at national and state level;
- A planning process that is iterative between State and Center;
- Integration of the project components into a mutually reinforcing whole;
- A clear line of responsibility for implementation.

The organization and implementation plans have been designed with these requirements in mind.

a. Government of India/State Governments.

The detailed organizational set up, including membership requirements and responsibilities for implementation of the project has been furnished in Annex E.4.c. The following provides a brief summary of the organizational set up.

A high level Inter-Ministerial Central Steering Committee (CSC) which will be established to look after broad aspects of policy, planning and financing. The chairman of this committee will be the Secretary, Ministry of Irrigation, GOI and the membership will include representatives of the Ministries of Irrigation, Agriculture and Finance, the Central Water Commission, and the Secretaries of appropriate Departments of the concerned State Governments. The Joint Secretary, Ministry of Irrigation will be the Member-Secretary of this Committee. Representatives of USAID and the World Bank will be available to attend the Central Steering Committee meetings as needed.

Detailed planning of the technical aspects of the project will be the responsibility of an irrigation management Technical Advisory Committee (TAC) chaired by member, Central Water Commission, with representatives of the Ministries of Irrigation, Agriculture, Command Area Development Authority (CADA), the

Secretaries of the State Irrigation and Agriculture Departments, Director of the State Training Center for the participating states, and representatives of USAID and the World Bank. Staff support will be provided by a full time permanent Irrigation Research and Management Improvement Cell (IRMIC) set up in CWC. IRMIC will be chaired by Member, Water Resources of CWC, and consist of a Chief Project Coordinator, three Directors and six Deputy Directors.

At the state level, state technical councils (STC) will be set up, chaired by the Secretary of the Irrigation Department with members from Finance, Agriculture, CADA, Cooperation Departments, Land Development Corporation, ARTST[1/], Resident Specialist team, World Bank, Universities, State Training Center, and CWC. The STC will be supported by a technical working group (TWG) including Chief Engineer, Irrigation, Director of Agriculture, CADA Commissioner, the Director State Training Center, representatives of ARTST and officer of the state Govt. in charge of the action research program.

Line responsibility will be vested in the Ministry of Irrigation, GOI, and the state irrigation departments. The Ministry, through its Joint Secretary for International Programs, is responsible for budgetary and financial control while CWC handles technical matters. An important function of the GOI Ministry of Irrigation is the support for sanction of needed budgets and personnel positions within the concerned states and agencies.

The State training institute (STI) at WALMI has a governing board made up of representatives of the agencies concerned and financially supported through the state irrigation department. A similar set-up could be considered for the training institutes in the other states. For carrying out approved action research studies, a multidisciplinary on-site team will be established under a separate officer in charge at an appropriately senior level. The entities on the firing line will thus be, in addition to IRMIC which will organize some training courses and be responsible for technology transfer; (a) State training institutes for in-service training, (b) Four to five state irrigation departments for action research,(c) The extension service in a district or CADA for irrigation water management extension, (d) Private and cooperative credit banks under State Production Credit and Land Development Banks, (e) District agricultural officers for production input supply and logistics, and markets which are developed by local committees under State Agriculture Produce and Marketing agencies; (f) Land Development Divisions of state agricultural department or CADAs for watercourses and on farm land development below outlets. All are charged with the responsibility for technology transfer.

1/Action Research Technical Support Team.

b. A.I.D.

USAID/India has designated a Project Officer who will be responsible for all facets of implementation on the USAID side. In addition, a U.S. technical specialist and a full time foreign service national (FSN) technical specialist will be assigned to the project. These officers will be supported by a USAID Project Committee. The cost of these services will not be charged to the project.

In addition A.I.D. will contract on behalf of and in consultation with the GOI for a team of resident specialists consisting of four expatriates and six to eight highly qualified Indian specialists. Besides providing logistic support for procurement of ex-country short-term specialists and equipment, the resident specialist team will participate continuously in the planning process. Within the overall team, a full-time Action Research Technical Support Team (ARTST) consisting of five specialists (Indian and U.S) will be formed. ARTST's first concern will be the design and implementation of action research studies and the bulk of its time will be spent in the field. Additional short term consultants, from within and outside India may be contracted for, direct by the USAID in consultation with the GOI.

A separate contract, with expatriate specialists in residence, will be procured for the Water Resource Planning and Development component of this project. This assistance will consist of the services of one or more U.S. educational institutions and water resources consultants along with Indian institutions and private consultants.

2. Start-Up

Implementation will be sequential, i.e., not all STIs and action research studies will be started in the first year. Start up will require first, initiation of dialogues among the representatives of the Technical Advisory Committee, State Technical Council technical working groups, State Training Institutes, if organized and the A.I.D. resident specialist team under the general guidance of the CSC and STCs. In this process, IRMIC and the resident specialist team will have a major catalytic role. In some states, e.g., Maharashtra, the in-service training program has already been fairly well defined. In others, this process is less advanced. Start up will require a considerable effort in orientation about project objectives and resources.

Since training in irrigation management is being introduced for the first time in the country, the most important and urgent task is to select the right type of personnel with the required background

and experience, both from the center and the states, to be trained as trainers in recognized institutions in India and in the United States. Special tailor made courses may have to be worked out in consultation with U.S. universities to enable the training of the trainers not only in the interdesciplinary sources such as engineering, agriculture and humanities but also in teaching methods and preparation of case studies, etc. Use of audio visual aids for creating the necessary impact in the trainees should be maximized. After the training, the individuals will be posted as trainers at the various state level institutes as well as at the central facility. Since training is a time consuming activity, it would be desirable to commence this program at an early date so that adequate numbers of trainers are available for starting the training programs at the various state institutes and at the central facility.

Continuing dialogues are needed between the Central and State governments involving the World Bank and A.I.D. leading to the emergence of long-range general plans for the training activities of IRMIC and for each of the State Training Institutes. Likewise plans will have to be developed regarding action research studies and scheduled carefully to support training programs. In planning the action research studies, the ARTST will play a principal role as catalyst and technical resource. After concurrence by CSC, STCs and State and GOI Irrigation Ministries, detailed annual workplans for each activity will be prepared and sanctioned.

Needed long-term student academic programs in Irrigation Management on a national basis will be considered by the CSC. Support of curriculum and course development will be provided at a selected number of universities (engineering & agriculture) and institutions (e.g. Indian Institute of Management) under the project. Universities and institutes are autonomous organizations with their own faculty and external governance mechanisms. They are funded through state Departments of Education and the University Grants Commission. A.I.D. support will be planned in detail and implemented in consultation with the GOI Ministry of Irrigation and the concerned university governing bodies, the state government, the Central University Grants Commission, the concerned STI and CSC.

3. On-going

Once an activity is underway, development of work plans will follow a similar pattern to that described above. Project support will include provision for internal monitoring and evaluations. For action research studies the costs relating to activities of monitoring, evaluation and extension of results will be supported by this project and the costs of infrastructure changes and other interventions will be borne by the concerned state government.

B. A.I.D. Administrative Arrangements

1. Contracting for Technical Services

a. Contracting Mode

Resident and short-term technical specialists to support the project will be contracted from a U.S. university or consortium or other organization with established capabilities in the field of irrigation management, and separately in the field of water resources planning and management (WRPM). A.I.D. will negotiate and execute the contracts on behalf of and in consultation with the GOI. The contractors will be selected competitively through technical proposals evaluated jointly by the GOI and USAID. Contracting procedures will be carried out by A.I.D.'s Area Contracting Officer resident in New Delhi. The technical assistance for this project, except for that required for the WRPM component, may be available through the existing Water Management Synthesis II Project. This possibility will be investigated.

b. Contract Supervision

The Central Steering Committee will oversee the contracts on behalf of the GOI. At the state level, State Technical Advisory Councils will review the contractor's performance, the work plan for the next quarter and contract expenditures at least once each quarter. Results of reviews will be forwarded to the Central Steering Committee and the central Technical Advisory Committee for information and necessary action.

c. Contract Voucher Review and Processing

Review of the contractors' vouchers will be done in the Ministry of Irrigation. The contractors will submit vouchers simultaneously to the Ministry and to USAID . Within twenty one days after submission, the Ministry of Irrigation may examine the voucher and raise any question or objection concerning it, consider recommendations made by the Central Steering Committee or the report of the State Technical Advisory Council on the contractors' performance. If no objections are raised within the twenty one day period, USAID will process the voucher for full payment. If objections are raised, the amount to be paid will be reduced by the amount under objection until such time as the objection has been satisfied, when a final adjustment will be made.

d. Logistic Support

The contractors will be responsible for office and residential facilities, domestic and international transportation of personnel and goods. The contractor budgets will include the costs

of these and all other items of support. USAID is, however, exploring the possibility of arranging for a local Indian firm to be responsible for providing these services in accordance with U.S. Government standards. Such a firm would operate on a cost-plus fee subcontract basis responsible directly to each contractor. The advantage of having an experienced firm performing these functions would be that "down time" while contractor's employees look for housing or handle maintenance and repairs would be reduced or eliminated, and a facility would be in place which could support other units as well.

e. Local Staff

The contractors, besides providing long term expatriate specialists to be resident in India, will also provide several full time Indian specialists and non technical support staff. In addition, short term specialized services will be provided as needed.

f. Subcontracting and Other Contracting

Both long term and short term technical assistance will be acquired within India under the Project. The contractors will be authorized to hire Indian specialists and to subcontract for specialized services within India. Project implementing authorities such as the Irrigation Management Improvement Cell and various state government departments and training institutes will also be able to contract for services to be financed under the project. Standard procedures outlined in A.I.D. Handbook 11 and 14 will be followed.

In addition, USAID may procure short term technical specialists through other existing A.I.D. contracting mechanisms such as the Water Management Synthesis II Project or through direct A.I.D. contracting or Participating Agency Service Agreements with other departments of the U.S. Government.

g. Project Resources

The amounts budgeted in the project for technical services are summarized in Section II Part E.

2. Procurement of Equipment and Instruments

Goods will be procured both within India and from the United States, by both the host country project authorities and by USAID on behalf of the project.

a. Indigenous Equipment and Material

Equipment to be procured locally includes scientific and engineering devices such as surveying instruments, water measuring meters and recorders, video equipment, computers, software, audio-visual teaching and demonstration materials, office furniture and library equipment and materials. Some of these items will be procured by the resident specialist team, using standard Handbook 14 procurement procedures; some will be by state training institutes, state irrigation and agriculture departments and the Central IRMIC using Handbook 11 procedures.

b. Imported Equipment

Equipment to be procured from foreign sources consists primarily of specialized computer components and related software, measuring devices and sensors and recording equipment for measuring water, soil and climatic factors. This equipment will be procured by the home office of the resident specialist team.

A preliminary and illustrative budget of imported equipment and instruments likely to be needed for implementing the various components of the project are shown in Section II.F. The imported equipment will be grant financed under the project and the procurement and procedures will be reviewed and approved by A.I.D.'s Regional Commodities Management Officer stationed at Bangkok.

3. Progress Reporting

CWC/IRMIC in collaboration with the resident specialist team and water resources planning contractor will prepare a project implementation report annually, to be reviewed by the Technical Advisory Committee and CSC and used as the basis for the Annual Project Evaluations scheduled to begin in August 1984. Copies of the report will be sent to the State Technical Councils. The report will show an assessment of progress against work plans, annual forward work plans and a summary of inputs such as specialist services and outputs such as persons trained, seminars, publications etc. Projections and schedules will be made from time to time of the progress of various activities and of inputs and outputs.

C. Preliminary Calendar of Project Events

July	83	-GOI and USAID sign Project Agreement
August	83	-GOI and USAID agree to provisions of Project Implementation Letter No. 1; USAID issues the PIL. -GOI and USAID agree to Scope of Work for the two main contractors; RFTP or RFP issued as appropriate.

September 83 to November	-Main CPs met -Central Steering Committee (CSC), Technical Advisory Committee (TAC), and Irrigation Research and Management Improvement Cell (IRMIC) in CWC established and staffed. -State Technical Committee (STC) established in all States. -USAID and CWC (IMIC) begin discussions with WALMI/Aurangabad concerning detailed project workplans and training plans. -Initial orientation of WALMI faculty begins, preparing for 3-5 seminars for senior officials. -Preliminary list of irrigation projects in Maharashtra to be considered for action research studies prepared by GOM/ID, A.I.D. and WALMI; basic research objectives and workplans prepared. -Detailed workplans and training plans for WALMI approved. -Technical proposals for resident specialist team from U.S. universities, consortiums and other institutions received; joint GOI/USAID evaluation begins. -Proposals for Water Management Planning and Management component received and evaluated. Joint GOI/USAID evaluation begins. -Initial seminars for senior officials held at WALMI.
December 83	-Course outlines and materials prepared for mid-level and junior-level courses. -Technical proposals for contractors ranked by GOI/USAID Technical Evaluation Committee; negotiations initiated with top ranked proposer. -One action research study site selected in Maharashtra. -CSC begins planning for academic program development.

January 84	-Negotiations completed for contractors; contracts executed for the water management components and the water resources planning and management component.
February 84	-Contractors contract signed. -Construction of site facilities for Maharashtra action research study begins.
March 84	-Resident specialists for contractors begin to arrive to arrange office and residential facilities for the teams.
April 84 to June	-Reminder of resident specialists arrives; workplan for initial contract year prepared; procurement list finalized and procurement initiated. -Discussions between resident team, IRMIC, World Bank, USAID, Tamil Nadu and Gujarat regarding STIs and action research studies. -Construction of Maharashtra site facilities for action research completed. -Water Resources Planning and Management; workplan for initial year prepared; procurement list finalized and procurement initiated. -Maharashtra Action Research Study begins. -Sites selected for Tamil Nadu and Gujarat action research studies.
July to Sept. 84	-Construction of site facilities for Tamil Nadu action research studies begins. -All faculty and course plans in place in Madhya Pradesh and Gujarat STIs. -First Annual Evaluation.
October to Dec. 84	-Construction of site facilities begins at Gujarat STIs. -Action research studies begin in Tamil Nadu.

January to June 85 June	-Discussions between resident team, IMIC, etc. and Rajasthan and Madhya Pradesh re: STIs and action research studies; plans worked out; sites identified; construction started.
July to December 85	-Training begins at Rajasthan and M.P. -STIs; action research studies begin in these states. -Results of first action research study in Maharashtra begin to emerge. -Second Annual Evaluation; organizational and procedural changes recommended.
July-Dec.86	-Mid-term, in-depth evaluation, organizational, procedural changes recommended.
December 87	-Fourth Annual Evaluation
December 88	-Fifth Annual Evaluation
December 89	-Sixth Annual Evaluation
December 90	-PACD; EOPS Evaluation

S.NO.	ITEM	1983	1984	1985	1986	1987	1988	1989	1990
		July Oct Sep Dec	Jan Apr Jul O Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec	Jan Apr Jul Oct Mar Jun Sep Dec
1	Signing of Agreement	—							
2	Discussion with GOI on project implementation	—							
3	Setting of CSC, TAC & STC	——							
4	Setting up and staff IRMIC	——							
5	Contractor Negotiated and Arrival		———						
6	ARTST Team functional		———						
7	Prelimnaries of								
	(1) Aurangabad	———	———						
	(2) Gujrat		———	———					
	(3) M.P.		———	———	———				
	(4) Rajasthan		———	———	———				
	(5) Tamilnadu		———	———					
8	Setting up Unit for Water Res Plg.		———	———					
9	Training of Trainers for STI		———	———	———				
10	Training of Unit Staff for Water Res Plg	———	———	———	———	———	———		
11	Startup of Trg Courses (1)	———	———	———	———	———	———	———	———
	(2)		———	———	———	———	———	———	———
	(3)		———	———	———	———	———	———	———
	(4)		———	———	———	———	———	———	———
	(5)	———	———	———	———	———	———	———	———

S.NO.	ITEM	1983 July Sep	1983 Oct Dec	1984 Jan Mar	1984 Apr Jun	1984 Jul Sep	1984 Oct Dec	1985 Jan Mar	1985 Apr Jun	1985 Jul Sep	1985 Oct Dec	1986 Jan Mar	1986 Apr Jun	1986 Jul Sep	1986 Oct Dec	1987 Jan Mar	1987 Apr Jun	1987 Jul Sep	1987 Oct Dec	1988 Jan Mar	1988 Apr Jun	1988 Jul Sep	1988 Oct Dec	1989 Jan Mar	1989 Apr Jun	1989 Jul Sep	1989 Oct Dec	1990 Jan Mar	1990 Apr Jun	1990 Jul Sep	1990 Oct Dec
12	Action Res Studies	(1)																													
		(2)																													
		(3)																													
		(4)																													
		(5)																													
13	Seminars & W/Shops	(1)																													
		(2)																													
		(3)																													
		(4)																													
		(5)																													

Monitoring Plan

A. Monitoring Actions

USAID monitoring of project activities will be conducted through on-site inspections of classroom activities at each of the training institutions, each of the action research study locations and through participation, when required, in Central Steering Committee and technical advisory committee meetings and interactions with the IRMIC. Monitoring will also be in conjunction with the monitoring of AID supported state-specific irrigation projects.

Each training institute carrying out project activities will be visited at least twice yearly for a minimum of one week. During these visits, USAID's irrigation and water management specialists may on occasion participate in classroom activities as guest lecturers but usually will sit as silent observers. Course materials will be reviewed, and trainees will be interviewed to assess the degree to which the training sessions and courses are achieving their objectives.

Visits to each action research study site will be conducted at least twice yearly. Each visit will be for a minimum of one week, during which time the on-site research team will be interviewed and visits to various sites within the study area will be made. Research plans, operations and preliminary findings will be reviewed and discussed.

The principal objective of these visits to training institutes and research sites will be to determine whether there are unforeseen problems and if so, to take or arrange actions to address them. Special attention will be directed to the coordination of training and research and specifically to the reaction of the trainees to the training program as a whole.

During the monitoring visits, equipment procured with A.I.D. funds will be inspected to assure that it is in place, functioning and being used and maintained properly. Also, technical services financed with project funds will be reviewed to assure that the work force paid for is being provided and used effectively.

Detailed reports will be prepared and submitted to USAID's Project Committee following each field trip or participation in the Central Steering Committee, Technical Advisory Committee and State Technical Council meetings. USAID's Project Committee will be convened quarterly to review implementation of the project and its relationship to other projects in the Mission's irrigation and water management portfolio.

During the quarterly reviews conducted by the Mission Project Committee, the project components outlined in this Project Paper, as well as specific provisions in the Project Agreement and Project Implementation Letters, will be examined to assess compliance and progress.

A tentative calendar of monitoring and implementation actions is outlined below. The calendar is strictly illustrative to demonstrate how the USAID staff members assigned to the project could spend their time. Precise dates for monitoring trips, sites selected for monitoring and duration of each visit will be finalized as the project develops.

B. Tentative Calendar of Monitoring Actions by USAID Staff

	USAID workdays
July-September 1983	
Review conditions precedent and PIL	3
Review RFTP for resident specialist team	5
Review RFTP for Water Research Plan & Management Contract	2
Visit Maharashtra STI and work plan	6
USAID start-up actions and documentation	15
October-December 1983	
Meet with Central Steering Committee (CSC) Technical Advisory Committee (TAC) and Irrigation Research & Management Improvement Cell (IRMIC)	6
Visit Maharashtra STI (Two visits): To review training plans and preparations	8
To monitor senior officer seminars	6
Review technical proposals for resident specialist team	5
Review technical proposals for Water Resources Planning Unit	5

Review preliminary plans for action research (Maharashtra)	2
Discuss and review workplan for Water Resources Planning Unit	3
Review initial GOI requests for reimbursement	4
<u>January-March 1984</u>	
Meet with CSC, TAC and IRMIC	5
Negotiation with contractor	8
Monitor start-up of resident specialist team	5
Monitor start-up of Wtr.Res.Pln team	5
Review initial procurement lists and procurement procedures	4
Visit Tamil Nadu	6
Visit Gujarat STI	6
Visit Maharashtra STI	6
Visit two universities	10
Review contractors' vouchers and GOI requests for reimbursement	2
<u>April-June 1984</u>	
Meet CSC, TAC and IMIC	5
Visit Maharashtra STI and ARS	11
Discussions w/ Water Res.Plg.& Mgt. Unit and documentation	10
Visit two universities	6
Contractor monitoring	8
Review vouchers and requests for reimbursement	2

July-September 1984	
Meet with CSC, TAC and IMIC	5
Visit Maharashtra and Tamil Nadu and STI and ARS	20
Program work of Wtr.Res.Plg.& Mgt. Unit	6
Visit university	6
Contractor monitoring	8
Review vouchers and requests for reimbursement	2
October-December 1984	
Meet with CSC, TAC and IMIC	8
Visit T.N. STI and Action Res. site	11
Visit Gujarat STI and Action Res.site	11
Visit university	3
Participate in First Annual Evaluation	5
Contractor monitoring	8
Review vouchers and requests for reimbursement	4
January-March 1985	
Meet with CSC, TAC AND IMIC	8
Visit Madhya Pradesh STI and ARS	11
Visit Gujarat STI and ARS	11
Visit Maharashtra STI and ARS	11
Contractor monitoring	8
Visit university	3
Review vouchers and requests for reimbursement	4

April-June 1985	
Meet with CSC, TAC and IMIC	8
Visit with Wtr.Res.Plg. & Mgt. Unit	5
Contractor monitoring	8
Visit university	3
Review vouchers and requests for reimbursement	4
Visit States	10
July-September 1985	
Meet with CSC, TAC and IMIC	8
Visit Tamil Nadu STI and ARS	11
Visit Tamil Nadu and ARS	11
Visit Maharashtra STI and ARS	11
Visit university	3
Contractor monitoring	8
Review vouchers and requests for reimbursement	4
October-December 1985	
Meet with CSC, TAC and IMIC	8
Visit Rajasthan STI and ARS	11
Visit Madhya Pradesh STI and ARS	11
Visit with Wtr. Res. Plg. and Mgr. Unit	5
Visit university	3
Participate in Second Annual Evaluation	5
Contractor monitoring	8
Review vouchers and requests for reimbursement	4

Subsequent quarters would have similar monitoring workloads through the final quarter of CY 1990.

C. USAID Staffing Implications

The monitoring and implementation actions outlined tentatively in the preceding section require USAID staff time as summarized below. If delays in arrival of contract personnel or implementation difficulties arise, staff time requirements will vary accordingly:

US Fiscal Year	Work weeks of USAID Staff time
83	6
84	37
85	40
86	50
87	50
88	50
89	50
90	50
91	12

A senior U.S. direct-hire water management specialist (Project Officer) has been assigned to USAID with full time responsibility for the monitoring of this project. He will be assisted as needed by the other members of USAID's irrigation and water management team. The services of one senior Indian and one U.S. water management professional will be acquired through Personal Services or Institutional Contracts. In addition, other Mission personnel will assist in voucher and reimbursement request review and processing and in on-site review of records. Primary responsibility will remain, however, with the Project Officer.

In addition to the time shown above to provide direct monitoring and implementation of this project, approximately 15 person weeks per year will be required by the three USAID personnel to monitor related activities. During FY 84 through FY 87 there will be approximately 30 special field studies and numerous project specific training programs being carried out on other USAID financed irrigation projects and a similar amount on World Bank irrigation projects. The USAID staff will be expected to be familiar with these studies to assure the assimilation of results by all concerned and to avoid duplicating the same efforts under this project.

On an average, this project will require a net input of 65 person weeks per year. After allowing for normal leave, holidays, TDY's outside of India, and administrative and consulting time required for other activities within the USAID Mission, each of the three persons assigned to this project would have approximately 22 weeks available or a total effort of 66 person weeks per year.

V. Summaries of Analyses

A. Technical

By the end of the project life it is estimated that the "universe" of individuals engaged in irrigation and irrigated agriculture in the five states in which the project will be operating will be as follows:

Table 1: Estimated Numbers of Irrigated Agriculture Professionals in the Center, Maharashtra, Madhya Pradesh, Gujarat, Rajasthan and Tamil Nadu by 1989:

1. Senior level Irrigation and Agriculture Professionals:		1,700
2. Midlevel professionals:		4,000
3. Junior level professionals:		8,000
4. Irrigation Management Extension Personnel:		12,000
Village Level Extension Workers:(x20)		240,000
5. Land Development Personnel:	800	
Land Development Technicians:(x6)		4,800
6. Irrigation farmers	3,500,000	
7. Water Resource System Analysis	300	

These numbers are based on the arable land projected to be under irrigation in each of the five states in 1989, and on the judgment of senior and experienced officials as to the numbers of people needed to provide irrigation development and management services. The objective of the training and professional development component of the project is to train a critical number of individuals -- a significantly large proportion of the workforce so that substantial changes in irrigation water management practices are assured -- and at the same time to establish a permanent training capability to continue the training in these states indefinitely for new entrants into irrigated agriculture and for repeat, remedial and new training. Training is to be conducted at six institutions, five state level and one central level. One of these is already functioning, i.e., the Water and Land Management Institute (WALMI) at Aurangabad, Maharashtra; two others, in Gujarat and Tamil Nadu, are expected to be turning out graduates by 1985. Those in Madhya Pradesh and Rajasthan are anticipated to be producing graduates beginning in 1986. The training facility expected to be developed by the Irrigation Research and Management Improvement Cell at the Center is in very early stages. It may be expected, with donor assistance, to provide training of training institute faculty members by 1984 and become fully operational in training activities by 1985.

Training supported by the project will be undertaken during the initial project year only at WALMI in Aurangabad. The schedule of training at WALMI will be carefully worked out in discussions between USAID, WALMI and the World Bank. The projected numbers of people to be trained at WALMI and the other institutes and the WRPM unit are summarized in the following table. "Indirect" training of village level extension workers and land development technicians provided through regular technical supervison is also estimated. Also, rough figures are shown for the number of farmers expected to be reached through contacts with VLEWs and benefited by the work of land development technicians.

Table 2: Total numbers of individuals to be trained under this project, directly and indirectly

	Categories of People to be Trained	Total trained	Percent of total
1.	Senior Level Irrigation and Agricultural Professionals	1,700	100
2.	Mid Level Professionals	4,000	100
3.	Junior Level Professionals	2,100	25
4.	Irrigation Management Extension Personnel	500	4
	- Village level extension workers	10,000	4
5.	Irrigation Farmers		
	- Directly through State Training Institute(STI) workshops, field days	17,000	0.5
	- By VLEWs	3,150,000	90
	- Benefiting from L.D. Technicians	400,000	11
6.	Land Development Personnel	400	50
	- Land Development Technicians	2,400	50
7.	Water Resource System Analysis	200	66

By the final year of the project it is expected that the institutes receiving support under the project will be able to produce a total of the following numbers of trained persons annually:

1. Senior level professionals:	300
2. Mid-level:	700
3. Junior:	300
4. Irrigation Management Ext. Personnel	100
5. Land Development Personnel	75
6. Farmers trained by STIs	3,500
7. Water Resource System Analysis	50

Technical guidance and training will be provided indirectly by state irrigation management extension and land development personnel to field technicians, and in turn by the land development technicians and VLEWs in roughly the following numbers annually by the final year of the project:

Indirect training performed annually by the final year of the project:

1. Land Development Technicians:	450
2. Village Level Extension Workers:	2,000
3. Farmers reached by VLEWs:	50,000
4. Farmers benefited by L.D. Technicians:	100,000

Thus, a substantial portion of the total universe of individuals engaged in irrigation and irrigated agriculture will have been trained under the project by its completion, and a good percentage will be trained annually thereafter by the six institutions and by the frontline trainers. The training levels are believed to be realistic and achievable and, more importantly, a significant enough portion of the total number of people involved to achieve on a broad and lasting scale the expanded emphasis on irrigation management necessary to improve system efficiencies and to increase the productivity of delivered water.

2. Relationship of Action Research to Training

Each of four to five states participating in the project will initiate at least one action research study during the first three years of the project. The Director of the STI will participate in selecting the sites for the studies and in the assignment of trainees to the study. This field assignment will provide the opportunity to practice and apply what has been learned in the classroom. For example, the trainees will help take measurements of water flows and water losses at various points in the system, keep records on canal operations, collect data on yields, cropping patterns, irrigation intensity and cropping practices of individual farmers in the study area. They will learn to install and operate measuring devices and to understand what the measurements mean. They will study social variables such as the agricultural practices of

different ethnic groups, their social and political structures, family bonds and the implications of these variables for water user associations. They will review the adequacy and effectiveness of related facilities such as roads, drains, markets, banks and extension services. The trainees will also participate with the on-site team in analyzing the design and operation of the irrigation system and in recommending any actions to improve it. A major feature of the entire field assignment will be the necessity to interact with, listen to, learn from and work alongside farmers.

Upon completion of the field assignment, the trainees will return to their classrooms to complete their training. Their field experience will provide valuable grounding for the classroom training and will equip them to contribute substantially to the remainder of the training. They will also be in a position to suggest improvements to the coursework or field study portion for future training cycles.

After graduation, they will be assigned to irrigation projects or to command area development authorities, charged with exactly the kinds of operational responsibilities they practiced during their training.

B. Financial

The principal activities introduced by the project which should continue after its completion are training at each of five state training institutes and a national institute; one or more action research studies directed to identified irrigation problems; a system for collecting, editing, compiling, preparing, publishing and disseminating information via printed materials, videotapes, etc.

The training institutes are in various stages of readiness, ranging from WALMI at Aurangabad which is established and operational to the others which are still in the final planning stages. Using WALMI as the model suggests that the costs are not likely to be significant. Maharashtra's approved budget for WALMI for IFY 1982-83 totaled Rs.15 million (US$1.5 mil.). This represents a small fraction of the state's irrigation budget of Rs.2,960 million ($296 million). Maharashtra's total development budget for IFY 1982-83 amounted to Rs.13,220 million ($1,322 million). Although difficult to quantify in financial terms, the returns to education as described in the economic analysis that follows indicate the investment is potentially well worth the cost and in any case not an onerous addition to the state's budget. Comparison figures for the other states follow.

Approved Budgets for IFY 1982-83 ($ million)

State	Education	Irrigation Development	Total
Madhya Pradesh	0.8	182	725
Gujarat	2.5	201	670
Rajasthan	0.6	69	340
Tamil Nadu	1.4	43	711

Action research studies are difficult to assess in the abstract. The project budgets a total of $ 9.7 million for up to four to five studies, for an average of $ 2.0 million each. The costs will very likely vary widely from study to study. In all cases, a major portion of the cost is attributable to the resident expatriates being financed with grant funds. By the end of the project, the participating states should be in a position to undertake action research studies with little or no outside assistance. The cost of each study would therefore be much less. Also, smaller, problem-specific inquiries covering less territory and for shorter periods of time, may be sufficient for most problems after the main long term intensive studies have laid the groundwork. If the problems being addressed are significant, the studies well designed, the system for technology transfer functioning, the pay-off should far exceed the very nominal cost.

The system for technology transfer is not yet fully designed. Aside from initial expenditures for modern communication technology such as video tape recorders, the main elements of a good system should add little to existing costs. New recurring costs will accrue for publications, video tapes and productions, maintenance, field days, workshops and seminars.

In terms of cost effectiveness, comparisons can be made for training, but not for the other project components until, in the case of action research, specific sites have been selected and research plans and objectives prepared; or in the case of technology transfer systems, all details and costs worked out. An important task of the resident specialist team will be to assure that the costs and benefits of all reasonable alternatives are worked out in detail before final plans are approved.

With respect to the training, costs are reasonable on a work month basis when compared to standard A.I.D. participant training figures, even if all other elements of the project are included in the cost basis:

Total project cost ($):	$ 51,000,000	
Total workmonths of direct training:		45,000
Cost divided by workmonths provided: ($/workmonth)		1,120
Standard A.I.D. participant training cost for other projects excluding international costs:	Academic ($/workmonth)	2,130
	Technical ($/workmonth)	4,480

C. Economic

1. Rationale

The economic rationale for this project is based upon (a) the size and value of the agricultural sector in India, (b) the value of irrigation in support of that sector, (c) the value of irrigation water management in improving the productivity of irrigated agriculture, (d) the value of investments in training and action research in irrigation management, and (e) the value of basin wide integrated systems analysis for developing sound investment schedules. Data for rates of return on investment in irrigation are available from several studies. The estimated economic IRR is around 12 percent on A.I.D. and World Bank projects in India. Data are not available for marginal rates of return for improving irrigation management or specifically for investment in training and action research in irrigation management in India.

In macro-terms, the value and importance of the agricultural sector in India is measured by the fact that it accounts for 42 percent of the net national product in real terms, employs 80 percent of the labor force but is growing only at the rate of 2.5 percent per year, barely faster than the population growth rate of 2.25 percent per year. About 35 percent of India's gross cropped area is irrigated. Simply investing in irrigation, not counting technological advances, accounts for almost half of the 2.5 percent growth rate per year[3/]. Food grain yields under irrigation average 1.7 metric tons per hectare compared to 0.7 Mt/ha for non-irrigated; irrigated agriculture, however, should easily yield 4-5 Mt/ha. The World Bank[4/] reports that considering partial multiple cropping, irrigated crops in India yielded incomes Rs.4,480/ha higher than non-irrigated areas.

3/ Dharm Narain and Shyamal Roy, Impact of Irrigation and Labor Availability on Multiple Cropping: A Case Study of India, Research Report No. 20. International Food Policy Research Institute, Washington, D.C. 1980.

4/ World Bank, "Costs and Benefits of Agricultural Research: The State of Art". Staff Working paper No. 360, 1979.

Because irrigation management has been neglected and because water is scarce when needed on farmer fields, marginal returns on investment in improving irrigation management should be high, probably much higher than for investment in other activities in the sector, e.g. irrigation infrastructure, fertilizer, pesticides, etc. There is some empirical evidence from other countries that this is so. Also costs will be very modest compared with the costs of these other activities. Moreover, experienced and knowledgeable Indian and international officials and specialists in irrigated agriculture are unanimous in agreement that poor irrigation management is a major constraint to increased agricultural production on irrigated farms. Experts also agree that the best, possibly the only, effective way to improve irrigation management is through massive training of responsible officials, specialists and farmers. There is also agreement that this training needs to be undergirded with intensive, long term research on functioning irrigation systems if it is to be applicable to actual conditions.

While there is a dearth of economic research on irrigation management training and action research, considerable research has been done in India and elsewhere on rates of return for agricultural research generally and for education. Extending the argument of scarcity of irrigation management expertise and water as a production input, the rates of return also should be higher than for education and general agricultural research.

2. Comparable Returns

Theodore Schultz[5/] has documented economic returns to education, skills training, and research for several countries including India and the USA. In India, Evenson and Jha[6/], Bal and Kahlon[7] and others have documented the high rates of return to investments for agricultural research in India both before and after the high yielding varieties programs were implemented. Their figures are summarized below:

5/ Schultz, T.W.: Investing in People: The Economics of Population Quality. University of California Press, Berkeley, 1981.

6/ Evenson, R. and Jha, D: The Contribution of Agricultural Research System to Agricultural Production in India. India Journal of Agricultural Economics. Volume XXVIII No. 4, 1973.

7/ Bal, H.K. and Kahlon, A.S.: Returns from Investment in Agricultural Research. Indian Journal of Agricultural Economics. Volume XXII No. 3, 1975.

Table 3 : Estimated Internal Rates of Return for Agricultural Research and Extension in India

Study	Activity	Period	Returns to Rupee expenditure	Time lag (yrs.)	Internal Rate of Return %
Evenson-Jha	Research	1953-71	Rs.10.88	8	50.0
Evenson-Jha	Extension	1953-75	Rs. 1.75	1	17.5
Kahlon et la	Research	1960-73	Rs.11.61	5	63.5
Bal, Kahlon	Research	1967-73	Rs.14.91	5	71.7
"	Research	1960-65	Rs. 1.91	5	14.0

Ruttan[8/] estimates the rate of return for agricultural research in India over the study period covered by the above table at about 40 percent and at 60 percent during the green revolution period.

Mark Blough, quoted by Kluck[9], estimates the social and private rates of return shown in Table 4 for various levels of formal education for India in 1960.

Table 4 : Returns to Formal Education in India, 1960

Types of Returns		Level of Returns %
1. Primary:	- Social	20.2
	- Private	24.7
2. Secondary:	- Social	16.8
	- Private	19.2
3. Higher:	- Social	12.7
	- Private	14.3

Considering the mix of research and training and the argument for relatively high marginal returns, one would expect IRR for this project to not be less than for education generally, i.e., at least 20-25 percent. More likely, it would be in the higher range for agricultural research of 40 to 60 percent.

8/Ruttan, Vernon "The Asia Bureau Agricultural Research Review" Department of Economic Development Center Bulletin No. 81-82 University of Minn., March, 1981.

9/Kluck, John, "A.I.D. and Human Resources" Draft Paper for AID, August 26, 1982.

D. Social

Principal concerns expressed by scholars on the social impacts of irrigation projects are:

1. Inequitable sharing of the water. Larger, more powerful farmers and front enders tend to get more than their share; smaller, poorer farmers and tailenders get less.

2. Unearned increments due to increased value of land brought under irrigation by public investment accrue mostly to larger farmers making them more powerful. Both this and inequitable sharing are the main potential regressive changes in distribution of assets.

3. Disruption of household economies may shift labor requirements and control of incomes unfairly within the household resulting in secondary problems, e.g., shifting to cash crops away from subsistence ones may increase the tasks of women for feeding the family and actually reduce household nutrition.

4. Traditional family, religious, tribal and other ties may be disrupted with adverse effects on quality of life perceived by participants.

5. Lack of effective participation by involved farmers in planning and operation of irrigation systems has led to low utilization of irrigation potential, water distribution efficiency and low agricultural productivity.

6. Very little or no interaction between the farmers and the professionals resulting in a lack of understanding of the problems of the farmers.

The conclusion that these adverse effects are generalizable for irrigation is by no means proven[10/]. Case studies show results either way under the widely varying agroeconomic, social and political circumstances among cases.

In any event, this project will not produce new irrigation so it would have at worst no direct effects of the kind just mentioned.

10/ Socio-economic baseline surveys are being made on all A.I.D. financed state-specific irrigation projects in India. These will lead to more specific information regarding the extent and nature of these effects.

Training and research proposed could only be positive in indirectly helping to mitigate these adverse social effects. A major reason for inequitable distribution of water is the unreliability of the systems in delivering water to fields and difficulties in scheduling its delivery. With solutions to these physical and administrative difficulties and their institutionalization through training and implementation of change, the difficulty of water distribution inequities will certainly be relieved.

The project will make a strong effort to define in what practical ways farmer participation can be most effective and how farmers may be organized and mobilized. Traditional social ties will have to be understood and taken into account before significant improvement can be achieved. Action research and other studies will reveal information on all of these issues, pointing the way to policy and procedural changes to help relieve them where they exist.

E. Administrative Analysis

1. A.I.D.:

The administrative set-up in A.I.D. for the implementation of this project has been outlined in Section III.A b. and the administrative arrangements in Section III B. It is felt that this will enable A.I.D. to meet fully the responsibilities envisioned in this project.

2. G.O.I.:

At the level of the Government of India, the Ministry of Irrigation would be responsible to ensure the planning of the project with A.I.D. and coordination with the State Governments for efficient implementation of the project. In this, the Ministry of Irrigation would be assisted not only by the Central Water Commission but also by the various concerned ministries like Agriculture, Finance, the Department of Economic Affairs, etc. The Ministry of Irrigation has excellent experience for this task, having responsibility not only for other U.S.A.I.D. irrigation projects but for those of World Bank as well.

Technical responsibility will flow through the Central Water Commission (CWC), the technical arm of the Ministry of Irrigation. CWC is the highest technical agency in irrigation engineering in India, having a staff of over 1,000 experienced engineers. All irrigation projects in India having a command area of 2,000 ha or more are technically reviewed by the CWC. For the working of this project, CWC will establish a special Irrigation Research and Management Improvement Cell. A brief description of the principal organizations at the Centre connected with the project is dealt with in VIII E. 4. II. A.

The organizational arrangements for implementation of the project at the central level are indicated in VII E. 4. III. B. These arrangements are optimal considering the need for multi-departmental involvement and to establish a clear line of direction.

3. States

The planning, design, construction, operation and maintenance of irrigation projects, major, medium, and minor, are carried out by the State Irrigation Departments. In this effort, they work very intimately with the State Department of Agriculture, who provide data on cropping patterns, yields, crop-water requirements, etc., for planning and design and are usually responsible for water channel development below public canal outlets on to farmers' fields. Command Area Development authorities (CADA), major users of project outputs, have been set up primarily in major irrigation projects either under Irrigation or Agriculture Departments in various states. Irrigation and Agriculture are principal departments working in CADAs. In areas where CADAs have not been set up, the Irrigation and Agriculture Departments are well set to utilize outputs from this project.

A detailed note on the administrative and organizational arrangements at the state level have been furnished in Sections VIII. E. 4, II. B., and III.C.3.1 and 2 respectively.

VI. Conditions and Covenants

A. Conditions Precedent to First Disbursement

Prior to the first disbursement of loan or grant assistance the cooperating country will, except for funding required for the training of trainers and technical assistance:

1. Establish a Central Steering Committee[1/] and Technical Advisory Committee[1/].

2. Establish an Irrigation Research and Management Improvement Cell[1/] in the Central Water Commission.

B. Condition Precedent to Disbursement of Local Currency for State Activities

Prior to the disbursement of local currency for state activities State Technical Council[1/] will be established in the state for which disbursement is sought.

[1/]Note to APAC: See Annex E.4 for composition.

C. Covenants

1. Ensure continued coordination between center and states, between Central Ministries of Irrigation and Agriculture and between counterpart state departments and STIs.

2. Encourage collaboration between STIs and engineering and agricultural universities and management institutes.

3. Agreement to effect whenever feasible, adjustments to organizational structure, authorities and procedures to facilitate improved design and operation of irrigation systems and improved agricultural production.

4. Agreement that the GOI and State Governments will continue the funding, etc., for the training institutes and action research studies after the completion of the project.

5. Agreement that the state and central employees and officials trained under this project will, as far as possible, be retained in or assigned to positions concerning irrigated agriculture in accordance with established bonding requirements.

6. Agree to make available the personnel and budgets needed for implementation of this project to the State Governments as and when required.

VII. Evaluation Arrangements

Evaluation is a central and integral element of this project. The training and action research studies will be assessed as part of the monitoring by the GOI, the resident specialist team and USAID. The action research studies are essentially long term evaluations of existing irrigation projects, of problems constraining their optimal operation and of actions taken to address these problems. Baseline production and income data will be collected at the outset of each study for farmers living within the study area; comparable data will be collected during the study whenever appropriate and at its completion in order to measure directly the impact of changes in design and/or operation of irrigation systems upon the status of client farmers.

A. Regular Evaluations

Project-specific evaluations are scheduled annually, beginning in December 1984. These regular annual evaluations will assess, among other things, the quality of training being provided, its relevance to project objectives and its applicability and utility to

trainees after completion, i.e., the extent to which it has led to changes in the way they perform their jobs; the success of efforts to relate training to action research through short term assignments of personnel and provision of research data and reports to training institutes; value of interim research findings in contributing to the efficiency of irrigation systems and the productivity of delivered water; progress of the water resources planning and management component in establishing a functioning indigenous capability.

B. In-Depth Evaluations

An In-Depth mid-term evaluation and End-of-Project evaluation will be held in December, 1986 and December, 1990 respectively. In addition to the areas of concern addressed in Regular evaluations, these special examinations will focus on the extent to which the practitioners of irrigated agriculture -- especially the professionals in the Central and State Governments -- have come to regard irrigation from the standpoint of farmers' needs rather than from strictly engineering aspects. This enquiry will be difficult to quantify objectively and will have to be mainly anecdotal in nature. Nevertheless, the question is critical and at the center of the project's objectives. The evaluation team may have to resort to interviews of individuals who have been trained and of their direct subordinates concerning key elements in the design and operation of irrigation systems, along with interviews of persons who have not been trained.

Evaluation of the extent to which the professionals trained utilize the concepts learned during the training and are successful in applying them to real world problems.

Also, the working of systems for the transfer of technology will need to be assessed. Are useful and accurate messages being conveyed? Effectively received? By whom? Utility and quality of publications, video programs and any other forms of general communication should be examined.

The impact if any, of the project on farmers needs to be assessed, how they relate to their irrigation systems and whether increases in production and incomes have resulted. Such changes should be significant on specific sites such as action research study areas. They will be more gradual and difficult to measure elsewhere but they should be real and, by the end of the project, substantive.

Finally the degree to which a permanent central unit has been established and its operational capability to provide specialists in water resources planning and management using sophisticated system analysis. In addition the capability of the one state center established under this project will be evaluated.

$100,000 is separately budgeted for project evaluations, to be spent principally on the two In-Depth Evaluations. An evaluation specialist from AID/W will be asked to help prepare scopes of work for these evaluations. These evaluations will be done by an interdisciplinary team comprising an engineer, a management specialist, a rural sociologist, an economist and a systems specialist mostly drawn from within the country with the assistance of AID Water Management Specialists. Officials of the GOI/State Government may be co-opted for this study. This evaluation shall be submitted by the team to the USAID as well as the Government of India for necessary action to be taken by them.

Regular Annual Evaluations will be undertaken with Mission and GOI staff with little or no projects funds spent on these efforts.

Annex A

PID APPROVAL -- ISSUES AND RESPONSES

Excerpted below are pertinent passages from 81 STATE 203551. This telegram reported the APAC approval for the Water Management and Training PID and raised the following issues to be addressed during project design.

1. "a recurrent question concerning recent India Irrigation Project PIDs has been how each, as a discrete project, fits into the Mission's irrigation sector strategy. That is, while conforming to the general statements of a CDSS, it is not clear why certain choices have been made, what the trade-offs might be with alternatives unmentioned, and how the emerging portfolio represents a coherent approach that maximizes the use of A.I.D.'s resources in this crucial and heavily financed sector. The PP should spell out in some detail the Mission's long-range irrigation strategy, building on that described in the FY 1983 CDSS. It is suggested also that a more comprehensive portfolio statement be included in the next CDSS".

The Mission's irrigation sector strategy has evolved and sharpened considerably since the PID for this project was prepared. The strategy has been carefully scrutinized and sharply questioned both in the Mission and in Washington and was specifically approved by the Asia Bureau as part of the review and approval of the FY 85 CDSS in February 1983. Briefly, the strategy emphasizes the transfer of new irrigation technologies and water management concepts and practices to institutions and people involved in all aspects of irrigated agriculture, from the planning and design of irrigation systems to the cultivation of fields within command areas. The portfolio of state-specific projects provides resources for design, construction and operation of prototype, demonstration irrigation systems on which new technologies and practices can be applied and tested for broader application throughout each respective state's irrigation program. The Irrigation Management and Training Project provides the conceptual underpinning for these state-specific efforts. Massive training and field level research, carefully coordinated to provide classroom and field level hands-on experience, will help reorient irrigation and agriculture departments to place prime emphasis on the needs of irrigated crops.

USAID's strategy in this sector is still evolving, and will and should continue to do so as we become more familiar with the technologies involved and with the constraints facing Indian

irrigation. Alternatives to the project as proposed would involve greater or lesser degrees and magnitudes of training, different training emphases, for example on perhaps structural engineering rather than social and agricultural requirements, etc. More drastic alternatives would include continuation of financing of system construction along the lines of USAID's initial project in Gujarat in 1978. Our experience, however, since that initial effort has led us to the mix of inputs now proposed in this project and in the companion state-specific prototype and demonstration projects. Further refinements will be expected to arise in the coming years. For example, training needs will be more sharply defined most likely in such areas as community development, water user organizations, design and operation of field level control systems, etc. It is possible that higher technology systems, for example use of underground pipe instead of open channels and of drip or sprinkler irrigation instead of surface flooding or furrow irrigation may be tried. We believe, however, that the major needs to be addressed will be in the areas of farmer participation and responsiveness of systems to crop requirements.

Close and continuous interaction between USAID and the World Bank's New Delhi office has led us to conclude that A.I.D. has a unique and valuable contribution to make in this sector despite -- and perhaps because of -- heavy financing by other donors. A.I.D. is far better able to support productive and cooperative long term relationships with world respected technical specialists. A.I.D. has the capability to place such experts as residents in India, facilitating the creative interaction that best comes with easy familiarity and day-to-day working relationships. These specialists provide benefits that accrue not only to A.I.D.'s own projects but also to the larger efforts of the other donors.

2. "Related Multilateral Training and Research Activity: In developing this project, the Mission should take cognizance of the fact that an effort supported by several donors including the World Bank and A.I.D.'s Science and Technology Bureau may be planned for India in 1982 which could seek to develop an international activity in the water management sector".

In March 1983, the Government of India, after lengthy deliberations, decided against hosting an International Irrigation Management Institute (IIMI). Although the prestige associated with having such an institute in India was very attractive, the Government of India reluctantly concluded it should direct all of its available professional manpower to India's own irrigation challenges. Current plans

are for IIMI to be located in Sri Lanka. India remains eager to take advantage of the resources offered by IIMI, and to contribute talents and new technologies in return whenever appropriate. This project is designed to be fully compatible with IIMI regardless of its ultimate location. Tentatively $1.5 million in project funds have been budgeted for obtaining services from IIMI and to disseminate lessons learned to other countries. The Irrigation Research and Management Improvement Cell at the center will have direct linkages to IIMI.

3. "Functions of the Central and State Institutes:
   Careful analysis must support the division of funding between promotion of area-specific improvements, and national coordination and dissemination of new knowledge and technique Linkages and coordination problems between national and state activities need to be care carefully understood and addressed".

Project funds budgeted for national level irrigation management training facilities are less than ten percent of total project costs, but crucial to assure coordination of and with state specific activities, national dissemination of lessons learned, technology transfer between states, interaction with the International Irrigation Management Institute and to provide for training of trainers. To accomplish these important tasks, strong linkages are required with all concerned Ministries at the Center and at the state levels. Under this project. there will be a Central Steering Committee (CSC) consisting of representatives from the Ministries of Finance, Irrigation, Agriculture and the states. This committee will be a high-level body primarily for establishing guidelines and making policy decisions. The CSC will have a Technical Advisory Committee (TAC) to work out detailed annual plans for implementing the project and for approving project disbursements. The TAC will have representatives from the Ministries of agriculture and irrigation, Central Groundwater Board, state ministries of Agriculture and Irrigation, USAID and the World Bank. Under the TAC there will be the Irrigation Research and Management Improvement Cell (IRMIC) established in the Central Water Commission for day-to-day control and support for this project. IRMIC will provide guidance and assistance to each state in developing and carrying out annual workplans, supervising action research studies, supervising and coordinating the Water Resources Planning and Management component of the project and arranging for and coordinating the training of trainers to be used at the various state and national institutes.

There is a proposal before the central government to establish a permanent, autonomous central training facility. When this facility becomes functional, it is planned that it will absorb IRMIC and associated responsibilities. Funding has been provided to facilitate

this transfer. At the state level, there will be State Technical Councils (STC) with membership from the state departments of finance, agriculture, irrigation, cooperation and representatives from USAID, World Bank, concerned agricultural and engineering universities and the state training centers. The STC will in turn be assisted by technical working groups with similar membership to the STC, but of a lower rank, to carry out day-to-day working activities.

4. Use of Title XII.

Title XII procedures were not used in the development of this project. U.S. land grant universities will most likely be involved in the provision of technical assistance for the Irrigation Management portion of the project; a separate consultant-university consortium will probably be involved for the Water Resources Planning component. In both cases, however, conventional competitive direct A.I.D. contracting will be used rather than Title XII procedures.

5. "Pilot Studies: Special attention in the PP should be given to the self-contained nature and expected results of individual pilot studies to be supported during the life of the project. The direct connection should be made between what is attempted and its feasibility and its early application through the system. Otherwise pipeline, efficiency and ultimate efficacy problems could result".

Pilot studies mentioned in the PID have been expanded conceptually during development of the project. The project paper proposes support for four to five long term on-site action research studies. These studies will be conducted by resident teams located at functioning irrigation systems. The teams will study the operation of each system, analyze shortcomings, recommend remedial actions, implement these actions and evaluate the results. The teams will be augmented by the assignment for three to four month periods of students receiving long term in-service training at the state training institutes. These students in return will benefit from hands-on application of material covered in classroom training. Findings generated by these students will be systematically disseminated throughout the irrigation sector in India. Findings will also be incorporated into the curricula of both the state training institutes and the center training facility. We do not expect the action research studies to give rise to pipeline problems. Each such study will be very intensive, involving the on-site assignment of up to 20 professionals for up to 5 years. The efficiency and ultimate efficacy of these studies will depend in large part on the success of the project in disseminating study findings and facilitating their application to design criteria, construction techniques and water management practices throughout Indian irrigation. If widely disseminated and successfully applied, their efficiency and efficacy promise to be unparalleled.

LOGICAL FRAMEWORK

NARRATIVE SUMMARY		OBJECTIVELY VERTIFIABLE INDICATORS
Goal:	Increase food grain and fiber production for growing population.	Over the past 30 years the annual growth rate of foodgrain production has averaged 2.5%. By the final year of the project the annual growth rate of foodgrain production will average 3%.
Purpose:	Strengthen the institutional capability to plan, design, construct, operate, manage, and maintain efficient and productive irrigation systems.	By the final year of the project it is expected that the institutes receiving support under the project will be able to produce on an annual basis the following numbers of trained individuals: . senior level professionals 300 . mid level professionals 700 . junior professionals 300 . irrigation management extension personnel 100 . land development personnel 75 . farmers (trained at state training institutes) 3500 . water resources system analysts 50
Outputs:	Upgraded professional skills in all phases of irrigation systems management.	Approximately 1700 senior professionals participate in project seminars. Approximately 4000 mid-level professionald participate in project training courses. Approximately 2000 junior professionals participate in project training courses. Approximately 450 land development personnel participate in project training courses. Approximately 500 irrigation management personnel participate in project training courses.
	Shift in management focus from "administering" water to meeting farmer needs.	Approximately 17,000 farmers and between 500 and 1000 irrigation professionals interact at special workshops, field days, demonstrations, and short training sessions conducted over the life of the project.

	Adoption of a systems approach which considers the interactive effects of engineering, agronomic, and social components.	Courses on the interdisciplinary nature of irrigation management developed and introduced in selected engineering and agricultural universities. At least four long term, on-site case studies of irrigated areas completed by interdisciplinary teams of irrigation, agriculture and other professionals.
	Technology transfer capabilities enhanced	Irrigation Research and Management Improvement Cell established in the Central Water Commission of the Ministry of Irrigation.
	National capability in water resources planning and management at the basin level improved.	Central training facility linked to leading Indian and U.S. universities set up, providing a continuous source of personnel trained in water resources planning and management.
Inputs:	Training	Approximately 1700 senior professionals, 4000 mid-level professionals, 2000 junior professionals, 500 irrigation management personnel, 450 and development personnel, and 17,000 farmers receive direct training under the project.
	Technical Assistance	For institutional development component of project, 4 resident expatriates, 7 resident Indians, 38 person years of short term expatriate technical assistance and 32 person years of short term Indian technical assistance will have been provided. For Water Resources Planning and Management component, 3 years of resident expatriate technical assistance and 30 person years of short term expatriate technical assistance will have been provided.
	Equipment & Materials	Procurement actions valuing $5,379,000 completed.

Annex C

C. PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP-TO-DATE? Yes.

HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT? Yes.

A. General Criteria for Project

1. Continuing Resolution Unnumbered: FAA Sec. 653(b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more that $1 million over that figure)?	(a) Formal notification to Congressional Committees was given in AID's FY 1983 Congressional Presentation. To the extent additional funds are required or funding categories shift, proper Congressional notifications will be made. (b) Yes.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000 will there be (a) engineering, financial and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	(a) Yes, see Section III Project Paper. (b) Yes, see Section II Project Paper.
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	Not Applicable.
4. FAA Sec. 611(b); Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	Yes.

5.FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	Not Applicable
6.FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not executed? Information and conclusion whether assistance will encourage regional development programs.	Whereas this is not a multilateral project, it is part of a multilateral effort to upgrade the human resources and institutional base of India's irrigation sector. AID and the World Bank are coordinating closely to strengthen training institutes and to develop and refine irrigation curricula. Regional development programs are not pertinent in this instance.
7.FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c)encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce and (f) strengthen free labor unions.	(a) Not applicable (b) Yes, in letting of certain technical assistance contracts. (c) Yes, especially water-user cooperative committees. (d) Not applicable (e) Yes, especially irrigation as managed by the Government of Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, and Tamil Nadu. (f) Not applicable
8.FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	U.S. technical assistance provided under this project; technical collaboration between U.S. and Indian private institutions will be encouraged.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	The Government of Madhya Pradesh will finance 46 percent of construction costs and is contributing sufficient amounts of local currencies for contractual and other services (See item 10 for U.S. owned currencies.)
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and if so, what arrangements have been made for its release?	The U.S. owned Rupees are being used for various U.S. government agencies' program and administative support. These currencies are expected to be liquidated over the next 10 years.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes.
12. Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity.	Not applicable. Agricultural products produced will be consumed in India.

B. Funding Criteria for Project

1. Development Assistance Project Criteria

a .FAA Sec. 102(b); 113: 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b)help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c)support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?	(a) These represent the entire intent of the project. See Sections III and VII of the Project Paper. (b) Water user organizations will be created on a prototype basis. Cooperative modes may be tried. (c) This project entirely supports Indian self-help in agricultural development. (d) See Social Soundness Analysis in the Project Paper. (e) Not applicable.
b.FAA Sec. 103, 103A, 104, 105, 106, & 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)	
(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is designed to increase productivity and income of rural poor.	The project is specifically designed to increase productivity of the rural poor, especially small farmers.
c. [107] is appropriate effort placed on use of appropriate technology?	c. Yes, especially regarding agricultural inputs and improved water management.
d.FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed country)?	Yes.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made and efforts for other financing, or is the recipient country "relatively least developed"?	Not applicable
f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participiption in governmental and political processes essential to self-government.	The project addresses the need for increased food production and will also minimize the risks of drought through the development of irrigation systems. Institutional development will be fostered insofar as the host country's implementing agencies will acquire a strengthened capacity to design, execute and maintain an effective irrigation system. Cooperative water management activities will be strengthened, encouraging local, self government efforts.
g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?	Yes, especially land made more productive by irrigation.
2. Development Assistance Project Criteria (Loans Only).	
a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan including reasonableness of repayment prospects.	India's foreign exchange reserves are currently $4.865 billion. This $ 41 million loan represents .4% of India's average yearly value of exports in an expanding economy.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	Not applicable

3. Project Criteria Solely for Economic Support Fund Support Fund

This section not applicable.

Annex D

S. Sunder,
Joint Secretary,
Tel.No.:372734.

भारत सरकार
वित्त मंत्रालय
आर्थिक कार्य विभाग
Government of India (Bharat Sarkar)
Ministry of Finance (Vitta Mantralaya)
Department of Economic Affairs (Arthik Karya Vibhag)

D.O.No.F.2(5)AID/81-Vol.II

नई दिल्ली/New Delhi July 30, 1983

Dear Mrs. Boughton,

Government of India hereby request a loan of $ 10 Million and a grant of $ 3 Million for the Irrigation Management and Training Project under the US FY 1983 Programme. The Government of India agree to provide equivalent of $ 1.6 Million including costs borne on an in-kind basis.

Yours sincerely,

(S. Sunder)

Mrs. Priscilla M. Boughton,
Director, US AID,
American Embassy,
NEW DELHI.

Annex E

Project Analyses

1. Technical Analysis

Irrigation Water Management for agriculture requires that the following criteria be utilized in the design of new systems and the improvement of existing systems:

- Increased water control and reliability of supplies to the farm level,
- Increased productivity of water to farms and farmers,
- Improved equity of water distribution among all classes of farmers,
- Improved maintenance of soil and water resources over time,
- Increased participation of farmers in the operation and maintenance of the farm system,
- Increased cost effectiveness of investments in the system.

The irrigation management and training project has been designed largely to meet the above criteria along the following lines:

(a) Setting up of a central unit for training of personnel in the systems approach to water resources planning and management,

(b) Setting up five state and one central training institute for providing professionals a comprehensive irrigation water management focus,

(c) During the training providing the professionals with a solid focus and orientation to the needs of farms and farmers at the productive end of the system and farmer involvement in design, implementation, operation and maintenance of the system below the outlet,

(d) As a part of the action field studies, carrying out team diagnostic analysis and developing solutions. The skills and procedures acquired on live systems with farmer involvement are used to design, implement and operate systems which fit specific physical and cultural settings,

(e) Conducting live action studies which serve as system demonstration areas where farmers are the chief salesman of useful technologies,

(f) Creating an awareness of the need for mutual understanding and interaction between irrigation and agricultural departments for achieving effective integration of timely inputs and services for end users.

The nature and focus of this project is illustrated in the figure that follows. The initial or direct audience is made up of policy makers, planners, irrigation and agricultural professionals and technicians. The impact at the farm level takes place primarily through the direct audiences.

Project Mechanism	Direct Audience and Intended Impact	Indirect Audience Farm Level Impact
Training Action research and special studies Technology transfer	Policy makers, senior officials, technicians students Changes in attitudes, skills, behavior, and knowledge related to IWM by professionals as a means to create institutional changes needed for an IWM focus	Farmers Improved Water Management for higher crop yields which increases level of farm income

The two major components of this project are the training and special studies shown under the project mechanism. A unique aspect of this project is the action research component. Unlike most component research, a team of irrigation and agricultural and behavioral science professionals will diagnose a live irrigation system to determine what the priority problems and their causes are. The team then will test various interventions until cost-effective solutions for farmers are found. Solutions will be implemented and monitored. This will provide information for design and for training. Procedural manuals will be developed. This living laboratory will be a site for field training. Over time the action research study area becomes a demonstration. In addition to action research, a number of component studies - "special studies" - will be made on identified problems.A third component of the project

mechanism is "technology transfer". Under training there will be a unit or cell responsible for acquisition, development and dissemination of information about training materials, technical manuals, reports, etc. Under the action research and special studies component, some of the studies will impact farm-level audiences directly. These are studies and experiments related to farmer participation.

The training and action research and special studies are linked closely as a means to keep training relevant and useful. Likewise action research and special studies and training are closely linked to technology transfer. This is to assure that lessons learned will be documented and made available on a wide scale both within and outside of India through linkages with A.I.D. WMSP-II and the IIMI.

The philosophy which undergirds this project has evolved from A.I.D. experiences in several countries. The research development process upon which the WMSP-II is also based provides a workable framework. Action studies will begin with diagnostic analysis to define the problems. The next step is to develop the solutions followed by careful assessments of each set of solutions. The key concepts and emphasis which guide this process are: a systems approach with a management focus, an on-farm client focus, interdisciplinary team collaboration, client involvement, monitoring, evaluation and institution building.

Simply stated, the rationale for this project is to implement a critical mass level effort to introduce and institutionalize the comprehensive irrigation water management approach in India. Both action research and special studies and training are viewed as instruments for institutional change.

Because of the importance of the irrigation sector in India, the universal agreement that training and action research are the appropriate instruments for institutional change in that sector, Indian and A.I.D. background, interest and experience, this project is highly appropriate as a bilateral endeavor at this time.

2. Economic Analysis

"The most important economic resource in the world consists of the acquired abilities of people - their education, skills and health. The quality of human agents is underrated. Population quality and knowledge matter. A good number of low income countries have a positive record in improving population quality and in acquiring useful knowledge. These achievements imply favorable economic

prospects provided they are not dissipated by politics and government policies that discriminate against agriculture. As Alfred Marshall wrote, 'knowledge is the most powerful engine of production; it enables us to subdue nature and satisfy our wants'."

Theodre Schultz (1981) in his recent volume "Investing in People", has clearly documented the economic returns to education, skills training, and research for several countries including India and the USA. Mark Blaug as quoted in Kluck's discussion paper on "Of A.I.D. and Human Resources" as well as Anderson and Bowman (1976) have documented and described the returns to human resource development. This is now an A.I.D. special program emphasis. In India, Everson and Jha (1973); Vernon Ruttan (1980); Kahlon, Saxena, Bal, and Jha, 1975; and others have documented the high rates of return to investments in India agricultural research both before and after the high yielding varieties programs were implemented.

While these scholars' findings for human resources development are well substantiated and widely accepted, the specific application to returns for irrigation water management training and action research have not been studied formally. Specific studies of an ex-post or ex-ante nature are not available.

The economic rationale for this project therefore is indirect and inferential but is nevertheless powerful. This section will present the major rationale and indirect data which indicate what economic returns might be expected. The case rests on seven major arguments.

a. Agriculture and especially irrigated agriculture is the major economic sector in India. The agricultural sector in India has the role of feeding a rapidly expanding population, meeting the increased demands for food from improved income, providing materials for local industry, earning of foreign exchange and providing for improved rural welfare. Though the irrigated area is only about 35 percent of total cropped area, it contributes over 75 percent of food grain production.

b. Irrigation in India is the key to increased and more stable agricultural production. Given the large capital investments already sunk and about $2.5 to $3.0 billion in annual investments, there are opportunities for great marginal gains on modest investments in irrigation water management training and action research studies. Though average irrigated crop yields are only about 1.7 metric tons per hectare (MT/ha) versus non-irrigated yields of 0.7 Mt/ha, the potential for foodgrain yields with good water management is 4 to 6 MT per hectare. Water management implies that

other inputs and services are provided. It is no mystery why the high yielding grain varieties in India and other countries have succeeded most in areas with water availability and control of water. Likewise, in India, the returns to investments in fertilizer are greatest in irrigated areas because there are strong physical and biological interactions between these inputs and the new seed varieties. Desai (1982) has found that though the irrigated area was less than one-fourth the total sown area between 1955-56 and 1976-1977, the irrigated area had a 70 percent share of total fertilizer consumption. Kahlon, Saxena, Bal, and Jha in their 1973 studies found that during 1960-61 to 1964-65 (Pre-HYV period) irrigation and fertilizer contributed an estimated 38 and 30 percent, respectively, to the growth of agricultural output. In irrigation, where there are already substantial investments in hardware, often modest additional software investments in management, training, action research, and services provide exceptionally good returns to incremental investments (IFPRI, 1979).

c. There is now wide agreement among Irrigation Water Managemet (IWM) specialists and organizations at the forefront of IWM, that improved irrigation management from the reservoir to the farm is the most promising place to increase returns to both past and present investments.

Irrigation Management Improvement is concerned with optimizing the returns of all productive inputs. This is why training, action research, and implementation programs require a team or inter-disciplinary approach. Kahlon (1978) using the work of IRRI has said that applied team research and action programs provide higher direct economic payoff in terms of new materials, procedures, more productive technology and better institutional performance than conventional mono-discipline research.

It is not adequately realized that the returns to IWM action research and hands-on training require a much shorter time lag between investment, adoption on the farm, and economic returns than many types of biological research in agriculture. Compared to research related genetic materials and long periods of time to evolve new varieties, the time lag for most IWM applied or action research, for which most of the technologies are known, is very short. Usually for biological based research the lag between generation of new knowledge and its actual use at the farm level is 5 to 8 years under the best conditions and usually it is considerably longer than 8 years. The longer the time lag, the less the returns to investment due to income foregone. In contrast, IWM action research in Pakistan found that when watercourses were rehabilitated and precision land leveling done, the time lag was often less than one cropping season. For example, irrigation efficiencies can be improved from 30 to 60 percent along with increased cropping intensities and a doubling of yields the first season.

d. There is now a consensus in India, the FAO, A.I.D., Ford Foundation, World Bank, and among irrigation water management professionals that both in the short and long term, the most cost effective area of attack to the problems of irrigation development is to promote relevant training for professionals with action research on live systems. This view prevails widely throughout Asia also and is well documented by a growing body of literature.*

e. What is this project, using a solid institution building and software approach, expected to yield to the largest irrigated agricultural establishment in the world?

The expected outputs of trained professionals, action research on live systems, institutional change, and technology transfer are described in some detail elsewhere in the project paper. As explained earlier, the rationale for estimating economic returns for this project is primarily inferential, however there are some solid facts from Pakistan, the Philippines, Egypt, the USA and other countries which are indicative. The direct impacts on the farmer comes from better trained professionals, useful action research and transfer of technology. A World Bank study confirms research in Pakistan that the cost per acre foot of water saved through watercourse improvement alone is 25 percent or less than the cost of developing new water supplies.

In terms of increased farm income the potential is great. Recent data published by the World Bank is indicative. In a comparison of rainfed and irrigated crops it was found that a gross cropped hectare using 1979-80 prices yielded Rs. 2,950 per hectare more than the rainfed area. When the higher cropping intensity of irrigated land (multiple cropping) was taken into account, difference is about Rs 4,480 per hectare. This latter difference reflects the combined effects of irrigation, complementary inputs, technology, and farm labor.

Improved water control in irrigated areas in Pakistan which increased yields, cropping intensities, quality of crops, fertilizer and labor inputs for cotton, wheat, and rice resulted respectively in 115, 105, and 400 percent higher net income per acre in comparison with irrigation where there were no improvements and little water control. (Lowdermilk, 1979).

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* See annexes 1 to XV in Volume II, and the proceedings and Reports on internationally-sponsored programs to improve irrigation water management by CIGAR, DAC FAO, TAC and Meetings between 1970 to 1982.

When the results of IWM Training and action research, effective water use extension, and improved institutional services are provided, the direct benefits are increased yields, stability of yields, increased labor input, higher cropping intensities, reduced per unit costs of production, extra incomes to farmers, lower food prices, increased foreign exchange earnings, and improved conservation of soil and water resources. With improved IWM, substantial benefits to both producers and consumers can become a reality.

f. By comparison with the best internal rates of return studies found on agricultural research and training, this project should do as well or better because at the margins there are great opportunities which in India have generally not been exploited - namely IWM action research and field-oriented training.

g. In summary, the available analogous internal rates of return for activities similar to those which form the heart of this project are shown in Table 1 below:

Table 1. Comparative Study of Returns to Investment in Indian Agricultural Research and Extension Using different Estimating Method

Study	Activity	Period	Returns to one Rupee expenditure	Time lag (years)	Internal Rate of Return %
Evenson-Jha	Research	1953-71	Rs. 10.88	8	50.0
Evenson-Jha	Extension	1953-75	Rs. 1.75	1	17.5
Kahlon et al	Research	1960-73	Rs. 11.61	5	63.5
Bala Kahlon	Research	1967-73	Rs. 14.91	5	71.7
"	Research	1960-65	Rs. 1.91	5	14.0

In analyzing these studies, Ruttan (1981) estimates the IRR to be about 40 percent for the overall time period and about 60 percent for the so-called "Green Revolution" period. In Punjab state, Karan Singh estimated that for every rupee invested for

research during the HYV period Rs 27 were returned. Both surface and groundwater are more highly developed in the Punjab and Haryana than in most other areas of India. Private sector tubewells also provide much water control and the 100-year old Warabundi rotation system provides more predictable supplies of surface water. This illustrates the high returns that can be expected from good water management.

Note in Table III C.1 that the returns to investment in extension were estimated at about 18 percent. This is probably low because the period covered is prior to the introduction of the World Bank sponsored training and visitation program which is now in operation in most states where the USAID and this project will be involved in irrigation. This project will train irrigation water management subject matter extension specialists who presently are not available in India. They in turn will train and supervise village level workers who will be able to give farmers much better assistance on farm irrigation practices.

At this time, because of lack of data, the returns to education and training are more difficult to estimate than research. Mark Blaug, as quoted in Kluck's A.I.D. paper on Human Resources (1982), estimates the social and private rates of return shown in Table 2 for levels of formal education for India in 1960 compared with no education.

Table 2. Returns to Education

Type of Returns		Level of Returns Percent
Primary	- Social	20.2
	- Private	24.7
Secondary	- Social	16.8
	- Private	19.2
Higher	- Social	12.7
	- Private	14.3

Though these data are for a different type of training than that in the project, they provide economic justification for training. Formal IWM training does constitute a part of this project but much of the training will be similar to agricultural extension training which is mostly in-service, short-term, field oriented, and skill focussed. One would expect that the training under this project will provide higher rates of return than extension training

because it will involve professionals who have higher than 12th class entry educational levels. One should note however, from Table 1 that the time lag between training and returns for extension is on the order of only one year.

Finally, AID/S&T/Agriculture WMSP II will be requested to provide technical assistance to refine existing methodologies and conduct studies to document returns to investment in the types of applied research and training which this project will implement. This is important as was indicated in a resolution at the recent FAO Expert consultation on Irrigation Water Management Training in Rome, September 19-24, 1982. Such studies will be most useful in policy and program development in India, for A.I.D., the World Bank, FAO, and many other organizations and countries significantly involved in irrigation improvement. A.I.D. has been a leader in economic analysis of returns to investments to Agricultural Research. A.I.D. can also make a sound contribution toward determining the value of this new applied science of Irrigation Management.

As Welch (1978) in his outstanding study on "the Role of Investments in Human Capital in Agriculture" stated:

> "Development is knowledge in use. It is the product of knowledge interacting with and attempting to hold back physical constraints imposed by nature. Useful knowledge is definitionally vested in people prior to vesting in land, machines, or seed varieties. It is meaningless to discuss development without focussing on people, people not only as benefit recipients but also as agents of change.

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3. Social Analysis

The initial beneficiaries of this project are professionals in government departments and other agencies involved in design, implementation, and operation of irrigation systems from the reservoir to the farm. Farmers will benefit both directly through farmer training programs and action research studies on live systems, and indirectly through technology transfer by extension and, very importantly, by better service from irrigation projects and more direct involvement in their planning and operation.

Through training and research this project will help expand the capacity within the irrigation and agricultural departments to deal more effectively with the complex human and social problems of irrigation summarized in Section V.

This section will examine how the needed expanded capacity will be brought about within the departments and how it will be related to improving the social effects of irrigation, which is practiced in at least some measure by one-half or more of India's 70 million farmers. Organizational arrangements and responsibilities are covered elsewhere (Section V, Section VIII.E.4.). They are repeated here only to the extent necessary to present the analysis[1/].

The Ministry of Irrigation (Central Water Commission) at the GOI level and Departments at the State level have the responsibility for irrigation design, construction and operation. In India, as elsewhere, irrigation departments comprising a total of about 60,000 professional staff members control very large financial resources for developing a very scarce natural resource.

Irrigation Department professionals need further training on how to improve the management of water. As they move closer to the farm level, they face complex human problems. More orientation toward working with professionals of other disciplines and working with farmers is needed. The project will address this problem through training and special studies that will find ways to link water supplies and water use.

1/Representative demographic and social data for the project area are included in detail in the Project Papers and their Annexes prepared for the Gujarat and Rajasthan Medium Irrigation Project and the Maharashtra Irrigation Technology and Management Project.

Agriculture Department professionals in research and extension deal more directly with farmers and farm problems than irrigation engineers. Agricultural professionals need to become more involved in water management improvements. In summary, integrated rural development adapted to irrigation commands (known as command area development) is needed. One vehicle for this is the Command Area Development Authority (CADA)[2/], but CADAs cover about a half of India's canal irrigation command. Full coverage of all surface irrigation by CADA's may probably not be practical. More than half of the area irrigated by surface sources is in minor projects ranging from 50 to 2000 ha in area. The CADA program is under the Agriculture Department in some states and under Irrigation in others. It is designed to provide the coordination of several Government departments for improving water use efficiency below the outlet by lining of channels, constructing small structures, leveling fields, etc. CADAs as constituted now are probably the best form of organization for irrigation management in larger projects.

More agricultural research related to irrigation water management needs to be done in the operations mode on live irrigation systems in addition to that being done on experiment station and farm plots. The Training and Visit (T&V) extension system needs to increase its capacity to provide irrigation water management advice to farmers. At present there are no subject matter specialists trained in improved on-farm water use practices. Clearer departmental responsibilities for various aspects of irrigation water management (IWM) need to be defined.

This project does not neglect lower-echelon personnel working directly with farmers: agricultural extension specialists, village-level extension workers and irrigation functionaries such as canal inspectors under irrigation departments and "Patwaris" who represent farmers, etc.

There are other organizations outside of the departments which can effectively contribute to the task of improving the social environment for irrigation. These include the Indian Institutes of Management at Ahmedabad and Bangalore. The Institutes of Management have developed a core of inter-disciplinary staff which is involved

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[2/] One should distinguish between "command area development" (lowercase letters) and Command Area Development Authorities (capitalized). The former is an activity needed on all irrigation commands everywhere. The latter is a specific organization formed to do cad on larger projects in India.

in IWM research and some training with a management orientation. This emphasis has developed from interest in recent years for management in agriculture and management of natural resources.

With the rapid increase in the area under irrigation, there is an increasing need for a larger number of professionals to effectively operate and maintain the irrigation systems. For example, a study by the International Food Policy Institute (1979) estimated that a total of 43,000 additional professionals, technicians, and extension workers are needed in India for new projects alone. Another estimate which includes new and old systems suggests that total training needs for professionals are about 150,000 over the next decade. It would therefore be desirable to equip the professionals graduating from engineering and agricultural universities with adequate knowledge of irrigation management. This could be done by the introduction of suitable induction courses at the undergraduale level to include a stronger focus on irrigation water management. A provision has been made within this project to help implement water management concepts in training and research program in selected engineering and agricultural universities.

The motivation and commitment for interdisciplinary irrigation water management training and special studies is high in India. This conclusion is demonstrated by the evaluation data from the two Diagnostic Analysis Workshops held in Gujarat (1981) and Rajasthan (1982) and a special survey carried out to determine the views of both agricultural and irrigation professionals.

There is much ferment in both agricultural and irrigation circles about the need to improve irrigation systems. At the grassroots, farmers and politicians are demanding more reliable systems. The 1979 drought affected 284 million people in 174,000 villages, 184 of 251 districts in 10 States. Only irrigation will reduce the large variations in crop production due to the variable nature of the monsoons.

To build on this ferment for change, this project will utilize a number of communication strategies to help enlarge attitudes and behaviors toward managing irrigation water as well as better design and construction. These strategies are described in other sections of the project paper.

As with all projects involving institutional change there are several obstacles to be overcome, these include the fact that integrated irrigation management is a relatively new concept compared to the tradition of building and operating irrigation systems, and that the usual vested personal interest in maintaining the status are present. These are not, however, believed unusual and are considered

quite manageable. Farmer involvement will receive high attention in the training, special studies, and the technology transfer components of this project. Participants will have the chance to work with farmers during their training. Under special studies attention will be directed to useful studies related to farmer participation. Based upon the findings of these studies, various experiments will be attempted to discover what organizational mode works best for what systems and cultural context.

Studies and field experience indicate that farmers are motivated to participate in irrigation improvements when they are convinced that water supplies will be made more reliable and water losses will be reduced. The rationale for farmer involvement in irrigation projects in India are the following:

a. Use of farmer knowledge for planning and design of system in order to fit the physical and cultural context of the society to be served.

b. Helping farmers develop a stronger voice in the operation of the system above and below the outlet.

c. Developing and strengthening local organizations which may be able to manage the farm level system.

d. Mobilization of local resources for improvement, rehabilitation and maintenance of the system.

e. Finding mechanisms whereby there will be greater equity between head and tail enders in the supply of water.

In India, and elsewhere, farmer involvement is likely the weakest component of irrigation improvement. Special studies and experiments associated with this project are expected to show the way to achieve maximum participation of farmers.

4. Administrative Analysis

a. Introduction

This Annex consists of two parts: (1) a description of the principal government departments, and agencies to be concerned with this project and (2) a description of the administrative structure for the project including a statement of responsibilities of each administrative or technical unit.

b. Principal Organizations Concerned with the Project

The organizations mainly concerned with this project can be grouped under three heads:

1) Government of India comprising:

a) Department of Economic Affairs, Ministry of Finance.
b) Ministry of Irrigation

i) Central Water Commission
ii) Water Management Division
iii) Central Ground Water Board

c) Ministry of Agriculture
d) Indian Council of Agricultural Research
e) Ministry of Planning

2) State Governments:

a) Irrigation Department
b) Agriculture Department
c) Command Area Development Authorities

3) Other Institutions Comprising:

a) Credit Banks
b) Insurance Companies
c) Educational Institutions
d) International Irrigation Management Institute.

1) Government of India

a) Ministry of Finance (Department of Economic Affairs, DEA)

DEA is the link between GOI and the external aid agencies. This department scrutinizes all external aid project administers financial matters and, as such, will play an important role in acceptance and implementation of the project.

b) Ministry of Irrigation (MOI)

According to the constitution of India, irrigation is a state subject with the State Government having full authority over the utilization of water resources below ground and rivers which

lie wholly within the State. Utilization of the waters of inter state and international rivers by the states will, however, have to be concurred by GOI/MOI. MOI is responsible for general policy guidelines to the states in respect of irrigation and flood control projects. It also assists the states irrigation sector in procurement of scarce construction materials, making available needed foreign exchange and, in a few cases, deputing technical staff for guidance and implementation of specialized investigations and construction. MOI also has the responsibility for reviewing and approving all irrigation projects, having areas of over 2000 hectares. MOI also carries out groundwater surveys, and renders advice to the state government on the utlization of groundwater. Activities of MOI are accomplished through one or more of the following agencies.

i) Central Water Commission (CWC): The Central Water Commission is the high level technical wing of the Ministry. It is headed by a Chairman of the rank of Secretary and four members of a rank equivalent to Joint Secretary. CWC has over 1000 highly qualified and experienced graduate and post graduate engineers and specialists in various fields such as hydrology, floods, design and construction, water resources, machinery and equipment, etc. Specialized cells are headed either by Chief Engineers or Directors. Prototype subprojects under USAID infrastructure projects are appraised for compliance with the design criteria and guidelines established by CWC and USAID by the Foreign Assistance II cell of CWC. The Irrigation Research and Management Improvement Cell to be supported under this project is to be set up under the charge of the Member (Water Resources) of CWC.

ii) Water Management Division: A separate wing of the Ministry of Irrigation assists the state governments in the work of the Command Area Development Authorities set up by the states in various major irrigation project areas. Assistance is provided in the form of technical advice on on-farm development and allied activities. In addition, financial assistance is rendered through matching grants to state governments to meet the costs of surveys, planning, design and supervision of on-farm development, construction of field channels and to conduct adaptive trials and demonstration below the outlet.

iii) Central Ground Water Board: Assessing the availability of ground water in all parts of the country and advising the state governments on its development and use are the principal functions of the Central Ground Water Board.

c) Ministry of Agriculture (MOA)

The Ministry of Agriculture issues general policy guidelines for agriculture and rural development. Its sphere of activities include among others, crop production, fishery development, forestry, seeds and fertilizer distribution, agricultural implements and machinery, land and soil conservation including watershed hydrology and sedimentation, scarcity relief, agricultural extension and coordination of all India soil and land use survey. The activities are implemented through the respective state departments of agriculture. Many activities, such as Integrated Rural Development, Drought Prone Area program, Small Farm Development Agency etc., are grant funded (subsidies) from the funds available to the Ministry of Agriculture.

d) Indian Council of Agricultural Research (ICAR):

It is headed by a Director General of the rank of Secretary. He is assisted by a team of highly specialized and qualified agricultural scientists. Research activities are carried out through the research institutes attached to the ICAR, agricultural universities and state agricultural research and seed development farms.

The Water Technology Center (WTC) within ICAR is directed to irrigation research in general, short-term training and academic training in water management essentially for agronomists and agricultural engineers from the State Governments. It also organizes short courses, seminars and workshops from time to time on various topics in water management. WTC has the potential to provide support for many of the roles in the water management training and technology transfer at central level envisioned under this project.

e) Ministry of Planning

Major and medium irrigation schemes submitted by the state governments and reviewed and approved by the Central Ministries of Irrigation and Agriculture are forwarded to the Ministry of Planning for budget allocations. Block allocations are made for minor irrigation schemes submitted by the state governments and for other grant-funded schemes of the Ministry of Agriculture. Mid-term reviews are carried out by the Planning Commission with the help of the Ministries of Irrigation and Agriculture, to identify progress and corrective actions to be taken to overcome shortfalls identified.

2) State Governments

State Governments are fully responsible for the planning, design, construction and maintenance of irrigation projects including utilization of the created irrigation potential and for crop production. Irrigation projects over 2,000 hectares in area are reviewed and approved by the Central Ministries of Irrigation and Agriculture. Planning of minor irrigation projects under 2,000 hectares are left entirely to the state government. These include small-run-of-the-river, tank and/or lift irrigation projects. Less attention is paid to water management on minor projects than in medium and major ones although the total area under irrigation in minor projects is 50% of the total. Minor irrigation projects are under the purview of the Irrigation Department in some states and the Agriculture Department in others. Likewise the CADAs are under the Department of Agriculture in some states but in others, like Maharashtra and Gujarat, they are under the Irrigation Department.

a) Irrigation Department (ID)

Irrigation Departments have the full responsibility to identify, conceive, design, construct, operate and maintain irrigation projects down to public outlets. They draw on sister agencies like the Department of Agriculture for supporting information on crop water requirements, cropping patterns for yield projections, the Geological Survey of India for maps and geological review, etc.

They are headed by Secretaries, who may be senior professionals and who normally have the technical support of an Engineer-in-Chief (large states like Madhya Pradesh and Uttar Pradesh) or the Chief Engineers. The Engineer-in-Chief coordinates the activities of Chief Engineer's, assist in preparation of respective annual and five-year plan budgets, and approve the sanctioning, recruitment and placement of personnel. In the absence of an Engineer-in-Chief the above activities are performed by the Secretaries themselves. Chief Engineers oversee survey, investigation, planning, design, implementation, operation and maintenance (O&M), quality control, monitoring and evaluation of irrigation projects under their control.

The field level regional organizations called Circles are headed by Superintending Engineers (SE's). SE's report directly to Chief Engineer's. Survey, investigation, planning, design and construction of the project head works and irrigation distribution network down to public outlet is controlled at the Circle level.

Each Circle is comprised of four to five divisions (construction, implementation and supervision unit) each headed by an Executive Engineer (EE). The EE is empowered as a canal officer under the Irrigation Act and thus has the primary responsibility as executive officer for efficient management of and control over the irrigation works under his charge. Each division consists of four to five subdivisions, each headed by an Assistant Engineer (AE) who reports to the EE. An AE has the support of four to five sub-engineers in performing his responsibilities at the construction-supervision level.

The responsibility and organization at chak level varies greatly throughout India and even from village to village. These personnel, even where they are in place, lack training and organization to distribute water effectively. The Irrigation Department is normally concerned with water allocation and release to an outlet serving a command (chak) of about 40 ha. Below the outlet, distribution is the responsibility of the farmers served. Unfortunately farmers are ill-equipped to assume this responsibility. For management of irrigation water within the outlet command Chak Samities (Irrigation Association for the outlet) have been formed in some states. These Samities function under the auspices of the political district administration and take care of the maintenance of the water distribution system within the chak. Such samities are however, in many cases, not functioning properly. Therefore there is a need for this project to focus heavily on farmer involvement.

One of the major problems for achieving effective water use and higher utilization of irrigation potential created has been the lack of adequate water courses and field channels conveying water from the outlet to farmers fields below the public outlet. Out of India's 32 million ha of surfact irrigation, water courses and field channels have been constructed and are operating on only a small fraction of the area.

While the situation varies from place to place, farmers below an outlet usually appoint someone whom they respect but who lack technical expertise (called a patwari in some states) to represent them, interact with irrigation department operations personnel and assist farmers in keeping track of and distributing the water among them. From the canal outlet to a private ditch or farm, the watercourse is a communal responsibility of the farmers served. Dealing with the construction, operation and maintenance of this important part of the distribution system is very difficult. One problem is the financing of construction of the water courses which nearly always requires credit. The task of getting all of the 20-40

farmers in a chak to agree to mortgage their farms, obtain the credit and repay the same is formidable. Another is the rendering of technical advise on design, construction operation and maintenance. Fortunately procedures for getting this done at the time of development of the new and on-going irrigation system being implemented by irrigation and agricultural departments has helped on new donor-financed projects. In summary, however, organizational arrangements and institutionalization below the outlet are very weak or non-existent. These need to be improved and strengthened if irrigation systems are to work effectively. An important objective of this project is to help bring this about.

With the average holding in India of 1-2 hectares, a 40 hectare outlet has to serve 20-40 farmers or more located at various distances from the outlet. Unless carefully managed, those farmers located close to or near the head end receive a larger share of water than their due, while farmers located at a distance receive less or none. The Planning Commission, realizing this, have recently decided that in new and on-going irrigation projects, the construction of the water courses up to 5 to 8 ha would be done as part of project construction. Mainteance of watercourses is however left to the farmers themselves, a task for which they are not organized nor technically informed. The table below shows the current responsibility for financing, constructing, operating and maintaining water courses in several states likely to participate in this project:

	Water Courses (40 ha to 8 ha)			Field Courses (8 ha to fields)		
State	Construction	Financing	O & M	Construction	Financing	O & M
Maharashtra	ID/AD[a/]	Govt.[a/]	Farmer	Farmer[b/]	Govt.	Farmer
Gujarat	ID/AD[a/]	Govt.[a/]	Farmer	Farmer	Farmer	Farmer
Rajasthan	IDAD[a]	Farmer	Farmer	Farmer	Farmer	Farmer
Madhya Pradesh	ID/AD[a/]	Farmer	Farmer	Farmer[b/]	Farmer	Farmer

a/ Only in case of external assistance projects, otherwise farmer is responsible.

b/ Except in Maharashtra Irrigation and Technology Management Project and the Madhya Pradesh MIS where 8 ha. to field, field channels are constructed using government resources. Later on financial recovery modalities are to be agreed upon.

b) Agriculture Department (AD)

The State Agriculture Department plays a key role in irrigation development. The scope of work of the department includes: cropping patterns, yield, production cost and market price information, crop water requirements and soil surveys. In many states and on CADAs they are responsible for planning, design and constructing but not for financing water courses, field channels drainage channels and land leveling.

Working in close coordination with ICAR, the agricultural research institutes and universities, State Agricultural Departments have the responsibility for developing and disseminating agricultural production technology.

The Extension division of the Department is responsible for the flow of subject matter information through the T&V (Training and Visit) Extension system. This system is being implemented in 15 major states.

AD officers and extension workers are in day to day contact with farmers. They develop information on and needs input logistics through tehsil and district committees. AD deputes officers to CADAs where they are established. Outside of CADAs, agricultural support is organized by political subdivision whereas irrigation service is organized project-wise along hydrological units. Coordination of these to geographical units is essential. The special needs of irrigation systems must be appreciated and integrated into the general agricultural support logistics.

c) Command Area Development Authorities (CADA)

On the eve of the Fifth Five-Year plan, (1973) a review was carried out to identify deficiencies in the development of command areas of irrigation projects and to consider measures for maximizing agricultural production in such areas. Various policy and technical measures were proposed. The need for an integrated area development approach on the irrigated command was recognised to coordinate the activities of different disciplines involved such as: irrigation, soil conservation, agricultural extension and cooperation, credit etc. To date, 44 CADAs covering 76 major (over 10,000 ha) irrigation projects with an area of about 13 million hectares have been established.

The CADAs were expected to implement at the chak-level, on-farm development and other allied activities such as proper operation and management of canal systems, crop planning, agricultural extension, arrangement for supply of inputs and credit,

roads and markets, etc. directly. Sizeable financial assistance by way of matching (50 percent center, 50 percent state) grants is available to state governments to help meet the cost of establishment, survey, planning, design and supervision of on-farm works and certain activities in developing demonstration farms, adaptive trials and the construction of field irrigation channels.

CADAs are organized under a CADA Commissioner who coordinates the functions of the Irrigation, Agriculture and Cooperation Departments. Each state has its own version of CAD organization with varying degrees of control and authority over the constitutent departments. Thus in some states, the CAD Commissioner has direct control of only the soil conservation wing of Agriculture for OFD works, but has no direct control over the Irrigation Department or the Agriculture Extension Wing of the Agriculture Department. Though the command area development concept is a major break-through from the traditional approach and has helped create an awareness of the need for greater emphasis on the development of the irrigation commands below the outlets, the impact of CADA program has not matched expectations. A number of high level evaluations[1/] have concluded that this is because objectives laid down could not be accomplished fully due to constraints of authority, staffing, financing etc.

Regardless of the their difficulties, CADAs constitute the valid existing organization established to fill the vacuum below the outlet. The establishment of the CADAs has taken a great deal of bureaucratic and political investment. However, CADAs should be suitably structured so that they become effective institutions to carry out irrigation water management.

CADAs will be major users of personnel trained under this project, CADA organizations can provide facilities for and sponsor workshops, seminars, field days etc. serving both farmers and AD/ID officers.

1/ See for example, GOI, Ministryof Irrigation (CAD and WM Division), Report of the High-level Committee on Organizational set-up of Command Area Development program in Major and Medium Irrigation Projects and Creation of a Water Management and Land Development Wing in State Irrigation Departments, New Delhi, December, 1982.

3) Other Institutions

a) Credit Banks

Other than Agricultural Extension Services and CADAs, Credit Banks are the only agency which transfer external resources into the area of agricultural development. Credit banks and their branches are becoming common even at village level. Both commercial and cooperative banks provide short-term loans for production credit and longer term loans for development (water courses and field channels, on-farm land development, wells and pumps etc.) Banks employ agricultural specialists for evaluations of credit packages and to assist in supervising loans.

The construction costs of field channels, watercourses and land development when financed by the credit banks are be recovered over a period of 11-13 years. The banks could have an important role in improving the technical features of watercourse and land development through their supervised credit program for watercourse and private land development as well as in the continuing operation and maintenance of watercourses and field channels. Operating personnel including trained water distribution functionaries could be under the control of the CADA, but costs for their services could be included in supervised production credit loans. Improved water delivery as a result would certainly improve farmers' ability to repay loans. Data from a number of countries show that the private sector, when provided the incentive and training, can play a significant role in land leveling programs.

Each branch bank could adopt an irrigated area of 5,000-10,000 ha and work in close coordination with the CADA where it exists or with the district administration/project where CADAs have not been set up. Experimentation with credit banks involved below the outlet should be included in irrigation water management of some of the schemes being proposed by GOI. The Ford Foundation has recently agreed to finance a pilot project study of the above model in Madhya Pradesh.

b) Insurance Companies

Similarly to credit banks, insurance companies could help in augmenting agricultural production by providing short and long-term loans to the farmers for production and development. The companies could also employ specialists to assist them in carrying out the works. As in the case of credit banks the cost of contruction of watercourses, field channels and land leveling as well as maintenance and operation costs could be recovered suitably from the beneficiaries.

One approach to demonstrating the benefits of better irrigation would be to offer a package of crop insurance and guaranteed production as an incentive for the farmer to take short and long term loans from the companies.

c) Educational Institutions

The need for imparting knowledge in the field of irrigation management to meet the requirements of professionals in the field during the next two decades is imminent. This is proposed to be achieved through the introduction of suitable courses in the undergraduate and postgraduate level in the engineering and agriculture universities. A beginning will be made in this project with a few selected universities for which necessary financial provision has been made.

The engineering and agricultural universities have been established for quite a few decades and have substantial experience and faculty in the departments of irrigation and agriculture. However there is a need to train the faculty in the modern concepts of irrigated agriculture and in more sophisticated teaching methodologies. Two universities viz., the Roorkee University in U.P. and the Ama University in Tamil Nadu are already giving postgraduate courses on irrigation water management.

In addition to the knowledge in engineering and agriculture, the professionals have to be trained in humanities and social sciences to enable them to have a better understanding of the farmer's problems, and a greater interaction with the farmers so as to assess their needs. This will require training in social sciences, particularly in the fields of leadership, behavioral sciences, etc., and can be offered by the institutes of management in different parts of the country. These institutes have faculty trained in the social sciences and even now offer short course training to professionals in the various fields. They also assist public and private organizations in solving management and organizational problems. The institutes have expertise in the design of programs, development of modules and evaluation of training. This project provides not only for further strengthening of the capabilities of these institutes but also for effective utilization of the expertise in the irrigation management training programs at the various training institutes.

d) International Irrigation Management Institute (IIMI)

For a decade or more the Consultative Group for Agricultural Research (CGIR) in which A.I.D. represents the U.S., has been investigating the need and feasibility of an International

Irrigation Management Institute to advance research, training, action programs, and the transfer of IWM technology world wide. In May, 1982, CGIAR endorsed the concept which had been developed for such an institute, but because of budget limitations imposed by the joint donors of CGIAR, could not provide funding at this time. However, several individual donors were interested in supporting the concept. On November 4, 1982, interested and potential donors met in Washington, D.C. and pledged sufficient funds implement the International Institute. Along with several other donors AID/Washington pledged a significant contribution to the core budget.

The IIMI will have a small international professional staff and will work primarily on developing field research methodologies, training of researchers, and information dissemination. A significant complementary role is visualized for IIMI, under this project through the purchase of special services. These services could include development of research methodologies, procedural manuals, training materials, curriculum development, training of researchers and teachers, special studies, and technology transfer systems.

Advantage could be taken by this project from the IIMI in respect to technical assistance in training and action research, technology transfer etc. Adequate provision for the same has been made in the project costs to cover the costs of services to be obtained from IIMI.

c. Organization and Administration for the Project

1) Introduction

Among the objectives of the projects' administration are:

a) National and State commitment through officials involved in irrigation management.

b) A close and intimate working relationship between all concerned Ministries and Departments particularly the Departments of Irrigation and Agriculture both at the center and in the states so that there is a maximum coordination of activities and integration of timely inputs and services for increased agricultural production.

c) Implementation and support of training institutions providing the knowledge and skills actually needed for project implementation, system maintenance and operation and irrigated agriculture production.

d) Irrigation and agricultural professionals trained with a comprehensive irrigation management focus to supplement existing discipline and professional skills.

e) Definite, clear cut line responsibility for the execution of the project.

Thus the project administration must provide a mechanism to ensure the full commitment of several organizations with somewhat diverse objectives and, at the same time provide a clear channel of line responsibility. Attachment I provides the organization chart for the project administration.

2) Central Government Level

a) Lead Agency and Central Steering Committee

The lead organization for the Project is the Ministry of Irrigation, Government of India, who will have line responsibility for its execution. The Ministry will carry out its functions through a Central Steering Committee (CSC) constituted specially for this project. This committee will be a high level body primarily for laying down guidelines and taking policy decisions. The membership of this committee will be as follows:-

(1) Secretary, Ministry of Irrigation, GOI (Chairman)

(2) A representative of the Ministry of Finance, GOI - Member

(3) A representative of the Department of Economic Affairs, Member

(4) A representative of the Ministry of Agriculture, Member

(5) Member (Water Resources), Central Water Commission - Member

(6) A representative of the CADA, Ministry of Irrigation

(7) Chairman, Central Ground Water Board

(8) Secretary, Dept. of Irrigation, Maharashtra, Member

(9) Secretary, Dept. of Irrigation, Madhya Pradesh, Member

(10) Secretary, Dept. of Irrigation, Rajasthan, Member

(11) Secretary, Dept. of Irrigation, Gujarat, Member

(12) Secretary, Dept. of Irrigation, Tamil Nadu, Member

(13) Joint Secretary & Financial Adviser, Ministry of Irrigation, Government of India, Member Secretary Representatives of the Ford Foundation, USAID, World Bank and the International Irrigation Management Institute will be available to attend the CSC meeting as needed.

This Committee shall meet at least twice a year and shall carry out, inter-alia, the following functions:

(1) Evolve, approve and revise overall policies related to the project;

(2) Approve annual work-plans and allocation of funds for the Irrigation Research and Management Improvement Cell (IRMIC) in CWC as well as those of the training activities in the States;

(3) Carry out semi-annual reviews of the activities of the IRMIC and the training activities in the states;

(4) Coordinate the training programs of the international institute, the IRMIC and the state training centers;

(5) Carry out with USAID at least two formal external evaluation of the project over its life of seven years;

(6) Lay down suitable guidelines for the smooth and coordinated functioning of the Technical Advisory Committee at the center and the respective State Technical Councils.

(7) Work towards the setting up an Irrigation Management Cadre in the State Governments so as to ensure that professionals trained in water management will return to work in that cadre;

(8) Create an awareness in the government of the importance of irrigation management in light of the 20-Point Program of the Prime Minister.

b) Technical Advisory Committee

The Central Steering Committee will have a Technical Advisory Committee (TAC) to work out detailed plans for implementing the project. TAC will have the following membership:

(1) Member (WR), Central Water Commission - Chairman

(2) Representative Ministry of Agriculture - Member

(3) Representative of the CADA, Ministry of Irrigation - Member

(4) Representative of the Central Ground Water Board - Member

(5) Secretary, Irrigation of the concerned state - Member

(6) Secretary, Agriculture of the concerned States - Member

(7) Secretary, CADA/Commissioner - Member

(8) Director of the concerned State Training Institute - Member

(9) A representative of the USAID - Member

(10) A representative of World Bank as a]]rp]roate

(11) Chief Project Coordinator, IRMIC Member Secretary

Representative of IIMI, Ford Foundation,

Resident team, or other may attend as needed.

In addition the chairman of the TAC may ccopt officials and nonofficials as and when deemed necessary. The Technical Advisory Committee will meet at least twice a year or more often as may be required. Being the highest technical body, its functions will include:

(1) Assisting the State Governments and Training Center to work out a realistic program of work and in successfully carrying it out;

(2) Monitoring and evaluating the progress of the training program and suggesting suitable course corrections and improvements;

(3) Developing the role of the IRMIC in CWC and ensuring coordination of the activities of the cell, action research studies and the State Training Centers;

(4) Examining the methodology for active association of private sector and academic institutions like Engineering and Agricultural Universities and Institutes of Management in the program;

(5) Making a broad assessment of irrigation management training needs;

(6) Working out details of training programs including the number and level of courses, number of trainees at difference levels for each course, recommending curricula for each level of training, etc.;

(7) Selection in consultation with USAID of one or more sites in each state for "action research" studies;

(8) Determination of the physical and infrastructural works to be carried out prior to the commencement of the action research in order to determine the budget provisions to be made;

(9) Examining in detail the recommend interventions evolved in the action research studies to finalize the methodology for implementation the subsystem;

(10) Assessment of the monitoring of the results of action research studies to determine the steps to be taken for improvement of the total system;

(11) Working out details of the water resources planning and management training program, selection of institutes and individuals to assist in the training, selection of a basin to be used as the first case study, and developing detailed work plan;

(12) Working out effective linkages for the International Irrigation Management Institute and A.I.D.'s Water Management Synthesis Project with the IRMIC, the State Training Centers and action research studies;

(13) Working out procedures and methods for ensuring that the results of action research studies on technology validated from other sources are fully disseminated and integrated into training programs and design and operating procedures of irrigation and Agricultural Departments and CADAs.

c) Irrigation Research and Management Improvement Cell

This special cell, to be set up in CWC, will provide the staff support for the TAC. It will also arrange for and coordinate the training of trainers and train central officers and others where facilities for such training cannot be provided by State Institutes. Other responsibilities for the cell will include overviewing technology transfer, developing educational materials, maintaining a central information system, and publishing a water management newsletter. IRMIC will be chaired by Member, Water Resources, CWC, and consist of a Chief Project Coordinator who will be assisted by three Directors (see Attachment 2). One Director will be responsible for the coordination of the action research activities and training programs. In addition, he will ensure that proper placement of trainers for the optimum utilization of their talents. A second Director will coordinate the complex set of activities envisioned under the Water Resources Planning and Management component of this project. The third Director will be responsible for implementing the technology transfer aspects of the project between IIMI and India, between the center and the states and between states. He will also be responsible for monitoring and evaluating the project progress.

Each Director will be supported by two Deputy Directors and necessary administrative support staff.

3) State Government Level

a) State Technical Councils

To ensure coordination among the different departments of the state government in carrying out the program as laid down by the Technical Advisory Committee, State Technical Councils will be constituted. These are the key working agencies which will plan, organize, supervise and monitor the working of the training institute and the action research studies. In this, the Council will be assisted by the State Irrigation and Agricultural Departments, and the resident specialists. The State Technical Council (STC) membership which will meet not less than three times a year will consist of:

(1) Secretary, State Dept. of Irrigation, - Chair-person

(2) Member (WR), CWC or his representative - Member

(3) Secretary, State Dept, of Finance - Member

(4) Secretary, State Dept. of Agriculture - Member

(5) Secretary/Commissioner, CADA- Member

(6) Secretary, State Dept. of Cooperation - Member

(7) A representative of USAID resident training team -Member

(8) A representative of World Bank -Member

(9) Representatives of concerned universities - Member

(10) Officer in charge ARTST - Member

(11) Director, Land Dev. Corporation - Member

(12) Director, State Training Center- Member Secretary

The responsibilities of the council include:

(1) Planning developing work plans making technical reviews of all project activities.

(2) Coordination of project activities and ensuring that strong linkages and commitments including budgets and personnel sanctioned are developed among all participating agencies.

(3) Ensure deputation of an adequage number of professionals from Irrigation and Agriculture Departments for training and their appropriate deployment after training in the operation of irrigation systems.

(4) Create an awareness in the state administration on the need and importance of irrigation management. Facilitate a cadre of irrigation water management comprised of specialists from the relevant disciplines.

(5) Review monitoring reports of project activities and forward the reviews CSC and TAC.

(6) Facilitate arrangements for services from various institutions (universities, management institutes) as needed for training and special studies.

(7) Elimination of bottlenecks in the execution of the project.

(8) Review results of action research and other sources of improved technology to see that appropriate materials are incorporated into training programs and departmental procedures.

b) Technical Working Group

To facilitate its work, the State Technical Council may set up a Technical Working Group comprising of the following:

(1) Chief Engineer, Irrigation	Chair-person
(2) Director of Agriculture	Member
(3) CADA Commissioner	Member
(4) Officer in charge ARTST	Member
(5) Director, Training Center	Member Secretary

The Technical Working Group shall meet as needed to facilitate the responsibilities of the council, review project activities and solve problems which arise as the project develops. Report of the Working Group shall be forwarded to the State Technical Council for necessary action.

d) Resident Specialists:

Progress in improving irrigation management and basin wide planning will require long-term interdisciplinary continuity and an integrated approach. Experience in other countries in developing large irrigation management and basin programs has revealed the need for resident teams of international specialists to assist in these functions and to provide liaison with USAID and International Sources of Expertise.

A.I.D. will enter into a contract for resident specialist in consultation with and on behalf of the GOI. It is envisioned that two separate contracts will be required. One would be a contract with a U.S. university or university consortium to provide the irrigation research, water management and related training expertise. The second would be a joint effort between water resources and university to provide the basin wide water resources planning system analysis expertise.

1) Irrigation Management

The task of the irrigation management resident specialist team fall into two groups. The main tasks in the first group include:

a) Participating on a continuous basis with USAID and Ministry of Irrigation in developing work-plans for the project;

b) Providing or arranging international technical specialists for helping to define, plan, develop and implement programs in the training centers, the IRMIC and action research studies.

c) Assisting in the training of trainers and trainees within the country and in the selection of institutions for training overseas.

d) Helping in the development of training materials, manuals, modules etc.

e) Assisting in the procurement of equipment to be obtained from overseas on U.S. dollar account.

f) Identifying programs, arrange for courses and study tours and to look after travel and all other formalities for short and long-term training overseas.

g) Assisting in developing and conducting routine monitoring and evaluation efforts.

h) Reviewing routine and special monitoring and evaluation reports and recommend action where appropriate.

i) Providing project progress reports to USAID.

j) Maintaining full awareness of all technical assistance activities of USAID and other donors, and scheduling these to avoid duplication, and to facilitate through multiple assignments.

To carry out the above tasks, the contractor will provide a resident expatriate team of 4 specialists, one of whom will be Team Leader. The contractor will also employ as many additional senior Indian professionals as are required to carry out the above tasks. Any additional needed administrative and technical support will be obtained locally.

The second main task of the resident irrigation management specialist team will be to provide interdisciplinary technical advice on the identification, design and implementation of action research studies. An ongoing action research technical support team (ARTST), will be designated this team will be a multidisciplinary international team of specialists in specific disciplines including a civil engineer with expertise in main system problems, an irrigation agronomist, a water resource economist with a farm management orientation and an irrigation extension specialist or behavioral scientist. One member of ARTST may be provided by IIMI under agreement with the GOI without expense to the contractor.

Duties of ARTST will include:

a) Advising on selection of suitable sites for carrying out the live system studies;

b) preparing an inventory of the equipment required for the study;

c) assisting in the design of the study;

d) helping to carry out diagnostic analysis;

e) advising on methodology and procedure in each case;

f) identifying with the concerned agency, short-term technical assistance needs;

g) advising on the program of interventions;

h) advising and assisting in internal monitoring and evaluation;

i) assisting in conducting seminars and workshops;

j) assisting in the preparation of reports for the State Advisory Council and the Technical Advisory Committee;

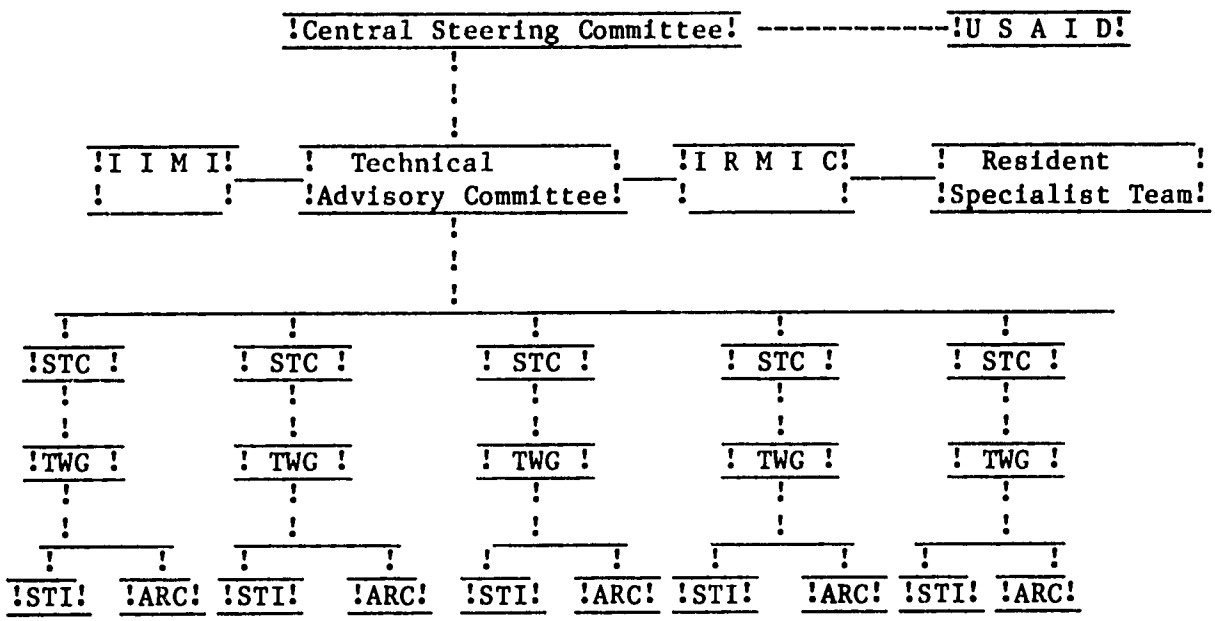
k) assisting in institutionalization of research results, seeing that they are published and incorporated into agency standards and procedures and training programs.

2) Water Resources Planning

The contractor will assist the IRMIC to establish and carryout a five-year phased program to develop the center's capability to provide a continuous output of trained specialists for basin wide water resources planning and management. In addition the contractor will assist in establishing an operational planning unit in one selected state.

Attachment 1 to Annex E

ORGANIZATIONAL CHART - IM&T PROJECT



USAID - United States Agency for International Development

IRMIC - Irrigation Research and Management Improvement Cell, CWC

IIMI - International Irrigation Management Institute

STC - State Technical Council

TWG - Technical Working Group

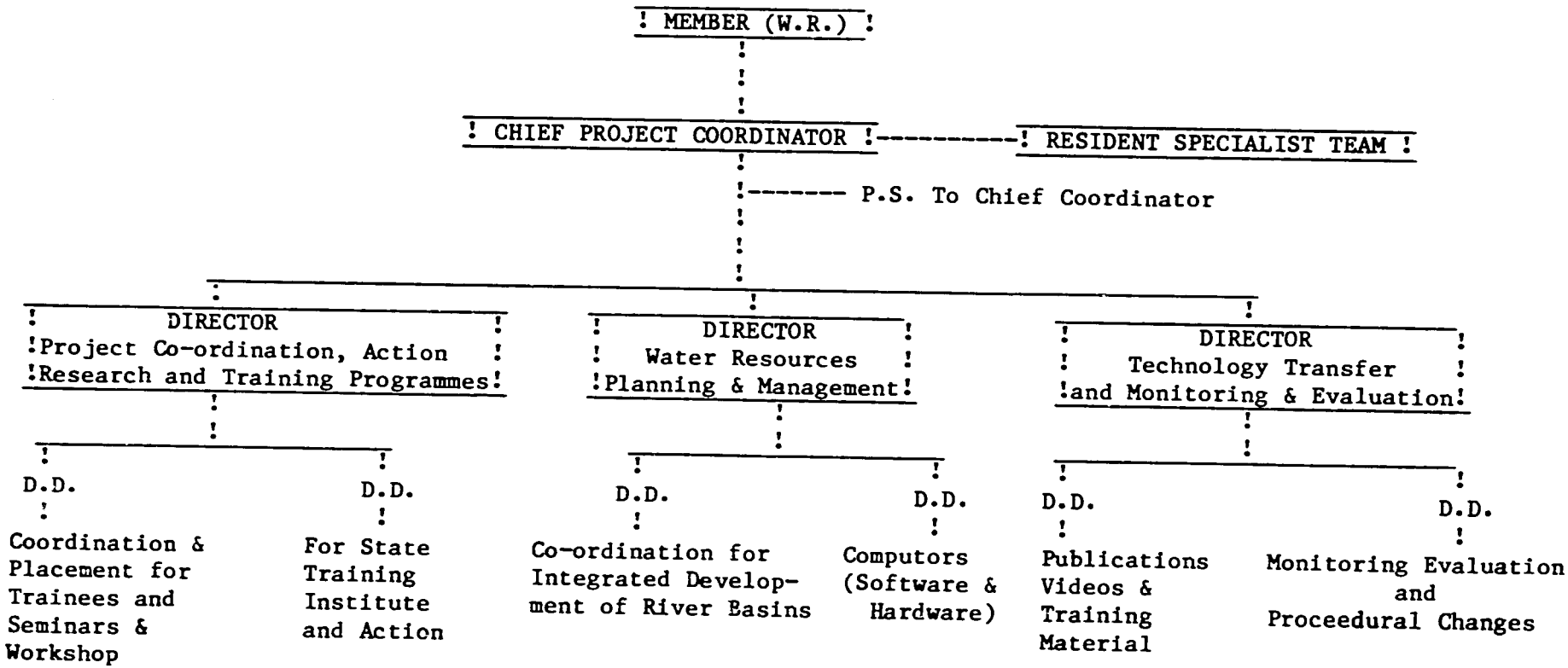
STI - State Technical Institute

ARC - Action Research Center

Attachment 2 to Annex E

IRRIGATION MANAGEMENT AND TRAINING PROJECT

IRRIGATION RESEARCH & MANAGEMENT IMPROVEMENT CELL C.W.C.



OTHER SUPPORTING STAFF

Annex F

Section 611 (e) Certification
IRRIGATION MANAGEMENT AND TRAINING

This project is intended to strengthen the Government of India's institutional capability to plan, design, construct, operate, manage, and maintain efficient and productive irrigation systems. Grant funds will be used to finance all expatriate and Indian Technical Assistance, imported experimental equipment, a water resources planning and management component, and project evaluations. Training, field action research, and a system for technology transfer will be partially loan and partially grant funded.

I, Richard M. Brown, Principal Officer of the Agency for International Development in India, do hereby certify that in my judgment the Government of India and the Governments of Gujarat Madhya Pradesh, Maharashtra, Rajasthan, and Tamil Nadu have both the financial capacity and the human resources to carry out, maintain and utilize this project effectively. This judgment is based upon the analyses contained in the Project Paper, as well as upon the successful maintenance and utilization of projects in India previously financed or assisted by the United States.

Richard M. Brown, Director (Acting)
USAID/India

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

THE ADMINISTRATOR

IRRIGATION MANAGEMENT AND TRAINING PROJECT, 386-0484
FAA Section 612 (b) Certification

When the development assistance program in India was re-established in FY 1978, the Developing Coordinating Committee on December 21, 1977 determined that project local costs could be U.S. dollar-funded rather than funded with U.S-owned excess rupees. PPC reaffirmed this policy by memorandum on May 7, 1980, with the understanding that henceforth all interested parties would have an opportunity to express their views on the matter at the annual strategy and budget reviews. Consistent with this policy, the CDSS and ABS submissions for FY 1983 included this project and were approved by AID/W, following an interagency review process in which no objections were raised on local cost financing with U.S. dollars. Thus, the provisions of Section FAA 612 (b) have been considered and the use of U.S. dollars for local costs of this project can be approved.

In view of the above and pursuant to Section 612 (b) of the Foreign Assistance Act of 1961, as amended, I do hereby certify the need to disburse United States dollars to cover local currency costs in lieu of using United States-owned excess rupees under the Irrigation Management and Training Project.

Signature Frank B. Kimball
M. Peter McPherson
Administrator

July 29, 1983
Date