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

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	7/18	CG
Richard A. Derham, GC	7/19	RAD
John R. Bolton, AA/PPC	JRB 7/18	

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

Madhya Pradesh Minor Irrigation
Project Paper

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3) Agricultural Analysis
4) Social Soundness Analysis
5) Environmental Assessment
6) Economic Analysis

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

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

Amendment Number

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: INDIA

3. PROJECT NUMBER: 386-0483

4. BUREAU/OFFICE: Asia Bureau 04

5. PROJECT TITLE (maximum 40 characters): Madhya Pradesh Minor Irrigation

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 89

7. ESTIMATED DATE OF OBLIGATION (Under 'B' below, enter 1, 2, 3, or 4)

A. Initial FY 83 B. Quarter 3 C. Final FY 85

8. COSTS ($000 OR EQUIVALENT $1 = Rs.10.00)

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			26,100	3,112	42,888	46,000
(Grant)	(1,060)	(640)	(1,700)	(3,112)	(1,888)	(5,000)
(Loan)	(-)	(24,400)	(24,400)	(-)	(41,000)	(41,000)
Other U.S. 1.		-	-	-	-	-
Other U.S. 2.		-	-	-	-	-
Host Country		160	160	-	35,250	35,250
Other Donor(s)		-	-	-	-	-
TOTALS	1,060	25,200	26,260	3,112	78,138	81,250

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) FN	B213	064	064			5,000	41,000	5,000	41,000
(2)									
(3)									
(4)									
TOTALS						5,000	41,000	5,000	41,000

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 022 | 050 | 091

11. SECONDARY PURPOSE CODE: B263

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

A. Code	BR	BRW	BS	LAB	TECH		
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

Increase irrigation coverage and efficiency through improved technology and management

14. SCHEDULED EVALUATIONS

Interim MM 10 YY 84 MM 06 YY 85 Final MM 10 YY 87

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

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

17. APPROVED BY

Signature: [signature]

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

Date Signed MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 05 DD 27 YY 83

AID 1330-4 (8 79)

VI

II. DRAFT PROJECT AUTHORIZATION

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Madhya Pradesh Minor Irrigation Scheme Project for India (the "Cooperating Country") involving planned obligations of not to exceed Forty-One Million United States Dollars ($41,000,000) in Loan funds and Five Million United States Dollars ($5,000,000) in Grant funds over a one 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 herein provided 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 construction costs of the MISs.

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2. The Cooperating Country provides or causes to be provided confirmation that budgetary resources are available to the State Government of Madhya Pradesh under the Sixth Five Year Development Plan and allow for the timely start of effective implementation of the project.

d. Covenants

1. The Cooperating Country agrees to carry out and use, or cause 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, on cause to be established, a special Demonstration Chak Unit within the Agriculture Department of the Government of Madhya Pradesh and to staff such unit to coordinate and manage the demonstration chaks.

3. The Cooperating Country agrees to establish, or cause 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, or cause to be implemented, 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 cause to be appointed, Project Managers from either the Madhya Pradesh Irrigation Department or the Agriculture Department for the operation and of subprojects (in groups of three or four) and ensure timely, reliable which will equitable water deliveries.

III. PROJECT SUMMARY, RATIONALE AND DESCRIPTION

A. Summary

India's growing demand for food and fiber makes it essential that there be corresponding increases in agricultural production. Due to limited new land availability and climatic factors, irrigation holds the greatest potential for increasing agricultural productivity. Reliable and timely supplies of water to the farmer permit higher yields from existing crops, higher crop intensities through multiple cropping and shifts towards higher value crops with greater moisture requirements. The GOI under successive Five Year Development Plans has invested and will continue to invest heavily in irrigation. Given the national priority irrigation development holds, it is important that irrigation systems be efficiently designed, constructed and operated. Moreover, there is a need to ensure that these systems are properly maintained and that water resources are equitably and efficiently distributed among farmers. Thus overall irrigation management is a complex undertaking and poses challenges for institutional development and effective technology transfer.

The project will improve the efficiency of surface irrigation in Minor Irrigation Schemes (MIS)1/ in Madhya Pradesh through improved technologies and management systems. This will require qualitative improvements in institutional capability through training and technical assistance as well as quantitative expansion of improved systems. The project represents AID's first involvement in minor irrigation. By virtue of their smaller scale and location, i.e. primarily in remote, hilly areas, with a high proportion of low income tribals and scheduled castes, minor irrigation schemes represent a substantially different set of challenges and constraints, both technological as well as social. Since, a smaller number of farmers will be served by each minor scheme, this provides more opportunity and responsibility for operation and maintenance by the users. Finding ways to do this effectively will be an area of research under the project. Project outputs include 50 minor irrigation schemes using improved design criteria, of which two will be pilot control projects to test alternative technologies and management modes. In addition, there will be 200 demonstration "chaks" disseminating new technologies, with the participation of farmer groups, to demonstrate benefits of land development and other on-farm infrastructure. There will also be special field studies to

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1/A MIS is defined as an irrigation system commanding less than 2,000 hectares of cultivable land. It normally consists of a reservoir; headworks or dam; main and branch canals; minors; public outlets; watercourses and field channels.

collect socio-economic data to improve the understanding and quality of public sector support services to farmers. Similarly, special training for Irrigation and Agriculture Department staff will be supported in water management and systems operation and quality control in the construction of irrigation infrastructure. Finally, special equipment including water control devices will be installed to improve water allocation and control. In this way, the project will encourage and support the development of a more demand-based irrigation system, one which is more responsive to farmer needs and effective in raising agricultural productivity.

The beneficiaries of the project will be those farmers who actively participate and receive irrigation water. The 50 MISs constructed under the project will have a combined command area of 25,000 hectares. Given the median farm size of roughly 2 hectares, approximately 12,500 farm families will directly benefit from the project. Many of the beneficiaries will be members of tribal or scheduled caste groups. In addition, improvements in institutional capability and enhanced professional development will mean better irrigation systems designed and constructed in the future, both in Madhya Pradesh and elsewhere in India.

B. Project Rationale

Consistent with India's goal of attaining food self-sufficiency, the GOI plans to expand the coverage of surface irrigation from 37 million ha. in 1980-81 to 73.5 million ha. over the next two decades. This ambitious expansion by nearly 37 million hectares stands in contrast to the historical increase in irrigation potential of about 25 million hectares achieved since 1950-51. Therefore, the GOI planning target implies an accelerated rate of annual growth equivalent to 4.2% through the end of the century. Importantly, the GOI recognizes the need for qualitative improvements in irrigation as well as continued system expansion.

AID shares the GOI's objectives of increased food production and rural employment through irrigation development. Limited resource availabilities, however, dictate that AID concentrate its efforts on selected aspects of the GOI's irrigation development program. Within that program, returns to efforts to increase irrigation efficiencies on both existing and new systems are likely to be fruitful given current levels of irrigation efficiency.

During intensive project review and analysis, it became apparent that despite very large and substantial GOI investments in irrigation infrastructure, the potential benefits in terms of agricultural productivity were less than what could reasonably be expected from technical and engineering grounds. The importance of

a reliable and timely supply of irrigation water to the farmer in making his individual investment and production decisions was not being adequately addressed by public sector institutions. Part of the problem is that irrigation systems tend to be supply oriented with emphasis on watershed capacity and the problems of water conveyance through a canal system down to outlets serving 40 to 100 hectares. Seasonal aspects of crop demand for water were generally neglected and hence the usefulness of irrigation "support" to the farmer diminished. Irrigation systems simply lacked the flexibility to adequately respond to the client-farmer's needs. Therefore, the irrigation system tended to be under-utilized either by not making the necessary complementary on-farm investments to effectively draw on the main irrigation system or simply by not using water resources to maximum advantage.

Clearly, there is a need within the agricultural sector to increase productive on-farm employment and, given climatic circumstances, irrigation holds the largest potential for achieving that end. Yet, investment in irrigation shows limited returns because of inadequate system design and managerial ability to regulate and distribute scarce water supplies to the farmer in the amounts and time desired. The project attempts to address this situation by providing alternative design criteria and upgrading managerial capacity to operate a more complex irrigation system, one that has the desired supply flexibility to better respond to farmer demand. The full potential of irrigation can be realized only when the system is viewed as a whole. Within this context, the amounts and timing of agricultural inputs play a crucial role in determining output levels and economic returns for the farmer.

1. Contribution of Irrigation to Increased Agricultural Productivity

India's population of 725 million is growing at a rate of 2.3 percent annually. In order to feed and clothe this growing population and gradually reduce poverty and malnutrition, agricultural production will have to increase at an annual rate of 4 percent. Since there is little prospect of bringing new land under cultivation, practically all of this growth must come from higher yields and greater crop intensities from existing agricultural regions.

Fortunately, there is considerable scope for irrigation development in India. Approximately 30 percent of India's cultivated area of 140 million hectares receives enough rainfall for production of at least one crop a year. Given the seasonal rainfall pattern characteristic of India's monsoon climate, irrigation is needed in

this area to make multiple cropping possible. In addition, there is another 25 to 30 percent of the net cultivated area which receives low rainfall but can be reached by irrigation. Thus, irrigation systems could cover up to sixty percent of net sown area.

In terms of crop yields, rainfed agriculture produces on average only 0.7 M.T. per hectare in basic grains compared to 1.7 M.T. per hectare obtained from irrigated land. While this is indicative of the importance of irrigation in raising yields and permitting greater crop intensities, it is generally recognized that irrigation combined with the use of high yielding varieties of seeds and proper fertilization could increase average yields to 5.0 M.T. per hectare. Therefore, the full contribution of irrigation to agricultural productivity requires greater utilization of complementary inputs as well as application of more advanced farming technologies. Conversely, more intensive use of other agricultural inputs including labor requires the reliable and timely supply of water. Therefore, irrigation may be viewed as a prerequisite to more modern and efficient agricultural development.

The impact of irrigation on farmers' incomes is substantial, even when taking into account the costs of additional inputs associated with more intensive agricultural modes. Optimal irrigation provides the farmer with reliable and timely water supplies which allow him to obtain higher yields from existing crops; increase crop intensity through multiple cropping; and shift into higher value crops with higher moisture requirement e.g. horticulture. It is estimated that the annual increase in net income to the farmer ranges from Rs.3,000 to Rs.4,500 per irrigated hectare. Thus irrigation is a key factor in raising agricultural productivity and farmer incomes.

2. Factors limiting Irrigation Potential

Perhaps the most obvious constraint to greater irrigation is the capacity of regional watersheds to supply sufficient water. Since this constraint is determined by climatic and topographical factors, there is little prospect of changing the absolute quantum of water available. Therefore, water will remain a scarce resource which must be efficiently used in order to achieve maximum agricultural productivity.

Nevertheless, there are a number of constraints which can be addressed to improve the efficiency and scope of irrigation systems. At present, India has developed only 54 percent of the total land area suitable for irrigation. The coverage of irrigation systems will be steadily expanded both in the Sixth (1980-85) and

Seventh (1985-90) Five Year Development Plans. The GOI hopes to achieve full irrigation potential in terms of land area by the end of the century. This will require heavy financial investment and replication of irrigation systems throughout the country. Currently, irrigation absorbs 9 percent of total national investment and accounts for 11 percent of GOI planned expenditures. Hence, the expansion of irrigation coverage within the limitations imposed by nature is a national priority.

In realizing its full irrigation potential, India must improve the efficiency of its existing irrigation infrastructure and improve the quality of new systems which will become operational in the next two decades. This will require improvements in irrigation planning and design as well as improved management of water distribution among farmers. Since irrigation is largely a state responsibility in India, there is wide variation in institutional capabilities to achieve efficient irrigation at the farm level. Symptomatic of the qualitative and quantitative constraints to improved efficiency are the following:

-- Limited capacity to plan and expeditiously execute irrigation projects. The state authorities tend to initiate too many projects without completing in a timely fashion those already underway. This often results in cost overruns due to inflation and delays in receiving irrigation benefits. Both factors contribute to a reduction in the actual economic return to project investment.

-- Inadequate engineering design which does not permit flexible demand-based systems. Therefore, conceptual designs need to be improved in order to provide reliable, efficient and equitable water supply. Design assumptions concerning water conveyance losses are often unrealistic. Moreover, there are insufficient control structures and communication systems to permit reliable water delivery at irrigation outlets.

-- Limited managerial capacity to regulate and distribute scarce water supplies. Water delivery through the system is often unreliable. Moreover, there is no organized method of water distribution beyond the irrigation outlets in many cases. Finally, there is a need to move towards volumetric supplies and pricing to encourage flexible water consumption consistent with maximum efficiency in water resource use.

-- Limited water distribution to farmers' fields below the outlet due to a lack of adequate watercourses and field channels. In many cases farmers do not have the capacity to design, finance and cooperatively construct watercourses and field channels.

-- Inadequate data base for proper planning and design of the irrigation system. Frequently, the required detailed topographic and soil data are not made available to irrigation planners limiting their capacity to design systems adequately to fit site specific conditions.

From these general constraints flow a number of specific constraints, not the least of which is better institutional coordination in providing services to the farmer. As pointed out earlier, to achieve the full benefits of irrigation, greater utilization of other agricultural inputs is implicit. Thus there is a clear need for better coordination between the state departments of Irrigation and Agriculture to ensure that complementary inputs including agronomic information are available to the farmer. A principal innovation of this project will be the establishment of an institutional mechanism to help ensure that publicly-financed farm support services are attuned to farmers' needs.

3. AID Irrigation Strategy

The project represents the first AID financed minor irrigation project in India. The Narmada Basin in the state of Madhya Pradesh was chosen as the project area. Currently the state is undertaking an ambitious irrigation program and could benefit significantly from improved planning, design and management training in minor irrigation systems. The project is fully consistent with Mission development strategy as recently articulated in the 1985 CDSS. The emphasis will be on institutional development through professional training, technical assistance and the expansion of improved irrigation systems. Advanced irrigation technologies will be tested as well as different management modes in two control pilot subprojects. An important outcome will be the establishment of a more flexible demand based system involving, where feasible, active local participation. Since farmer participation in India appears to be culture specific, experiments and alternative organization modes will be tested under the project. In addition demonstration irrigation blocks or "chaks" will also be established in each Minor Irrigation Scheme (MIS) to encourage dissemination of new technologies and organizational systems throughout the state. Socio-economic studies will establish benchmarks for local development and provide reliable information for the Departments of Irrigation and Agriculture to improve the quality of farmer support services.

Specifically, the project will support the following AID strategy objectives.

a) Technology Transfer: The most appropriate irrigated agriculture technology will be tested, adapted and after assessment disseminated. This will be done through the design and construction processes for each MIS, especially the control pilot projects and the demonstration chaks. Examples include development of a hydrological forecasting system based on a continuous water balance model; irrigation guides for each agro-climatic zone; land development techniques and demonstration of irrigation methods; establishment of fully regulated distribution systems; improved planning procedures using detailed topographic and soil information, and finally criteria developed for canal lining based on a hydraulic conductivity-soil classification system.

b) Institutional Development: An in-service professional development program will be set-up using information obtained from field studies for specialized management and technical training. Inter-institutional coordination will be enhanced through various project units such as the Minor Irrigation Committee (MIC), Special Appraisal and Supervision Cell (SASC) and the Implementation, Operation, Monitoring and Evaluation Division (IOMED) designed to improve irrigation planning, design, appraisal, quality control and monitoring.

c) Private Sector Participation: Farmer groups will become more actively involved in the layout of minor irrigation channels such as the water courses and field channels as well as the location of turnouts. They will also participate more in managing water distribution below the outlet and construction of land development infrastructure. Local private sector consultants will supplement expertise in planning and design of MISs while local contractors will carry out most of the construction activities. Finally, if the control pilot projects are found feasible U.S. and local consultants can be made available to the GOMP to assist in the planning and design of control pilot projects including required training and field studies.

d) Policy Dialogue: Special field studies will enable indepth review and analysis of problems and recommend possible solutions. It is anticipated that certain statewide policy changes will evolve as a result of the studies to improve management efficiency; increase farmer input in the planning, construction and maintenance of minor irrigation systems; induce better conjunctive use of groundwater; improve operational cost recovery systems; improve the planning, design and construction approaches to MISs; and encourage more efficient allocation of water resources. The

policy dialogue will be carried out at a pragmatic level with concerned experts from the Departments of Irrigation (ID) and Agriculture (AD). As concensus develops at the technical and administrative levels, policy reform proposals will be formulated for consideration by competent policy-makers.

Finally, the direct involvement of AID in the development of minor irrigation systems provides a unique opportunity to achieve rapid impact on water management for this type of irrigation system. It should be kept in mind that opportunities for local participation are enhanced by the smaller scale of infrastructure used in minor irrigation schemes making local operation and maintenance more feasible.

4. Other Donor Activities

The International Bank for Reconstruction and Development (IBRD) is by far the largest lender for irrigation projects in India. As such, the GOI will look to the Bank for replication of successful irrigation models. At present, the World Bank is financing a medium and major irrigation project in Madhya Pradesh of which five subprojects are located in the Narmada Basin. The USAID Mission has developed over the years a close collaborative relationship with IBRD resident staff and irrigation policy issues are jointly discussed with the GOI. The Bank is financing, in addition to a large portfolio of irrigation projects, the Water and Land Management Institutes (WALMI) located in Maharashtra and Gujarat. There is a proposal for a similar institute in Madhya Pradesh in the Chambal Phase II project also being assisted by the World Bank.

The Ford Foundation has financed a number of irrigation studies evaluating both engineering and institutional aspects. Ford has contributed substantially through its research in defining the state-of-the-art of irrigation in India. Both the World Bank and AID draw heavily on Ford Foundation work in shaping irrigation development strategy as well as designing individual projects such as this project.

C. Detailed Project Description

1. Project Design

The goal of the project is to raise rural production and incomes by providing improved on-farm employment opportunities. The purpose is to increase irrigation efficiency at the farm level through improved technologies and management systems.

Project outputs include better planned and designed minor irrigation systems; improved quality control in irrigation construction; pilot projects employing new technologies and involving local farmers; demonstration irrigation blocks or "chaks" to disseminate tested production and management modes; improved socio-economic data collected for system design and trained personnel in irrigation and agriculture departments applying "service" management techniques.

AID inputs will consist of loan financing of roughly half of the construction costs (two thirds of eligible costs) of fifty minor irrigation systems (MIS) to be built in Madhya Pradesh.AID will also provide technical assistance, training and field studies to improve the quality of irrigation planning, design, management and water distribution among farmers. Technical assistance and other institution-building inputs will be financed under a companion grant.

The project is designed to address both qualitative and quantitative aspects of irrigation. Both dimensions must be addressed simultaneously to ensure institutionalization of a farmer-oriented irrigation system. In the past, irrigation engineers and agricultural extension agents have not adequately addressed the needs of the farmer. This has resulted in low irrigation efficiencies in terms of crop yield per unit of water which show that only 25-30 percent of conveyed water actually reaches the plant root zone. Moreover, there has been a general lack of farmer participation in the planning of irrigation systems and their maintenance. The qualitative component of the project will introduce new management concepts at the technical level to ensure better coordination between irrigation and agricultural staff, while at the same time, involving the farmer more in management decisions. The quantitative component will assist the GOI in increasing irrigation coverage through the construction of fifty minor irrigation schemes (MIS). These systems are small scale and will be completed during project life. They will incorporate qualitative management improvements as well as local participation inputs. The result will be a more reliable and timely water supply which will permit significant increases in agricultural productivity.

2. Project Elements

a) Construction of MIS

The project will consist of the planning, design and construction of 50 MISs over a six year period[1/].

1/a Minor Irrigation Scheme (MIS) is defined as an irrigation system with a command area of less than 2,000 hectares of land.

Construction elements of the project include irrigation dams, headworks, control structures, canals, distributaries, watercourses and field channels to capture and carry water to individual farms. Also to be constructed are adequate land development and drainage facilities on all MISs including two pilot control MISs, and 200 demonstration chaks. This may include specialized water regulating equipment and volumetric devices. There will be four demonstration "chaks" established and located in each MIS, two near the headworks and two near the tail-end of the distribution system.

All of the 50 subprojects will be designed and constructed during project life and will be supervised by ID and AD staff. However, since there may be some manpower constraints within the Departments of Irrigation and Agriculture, provision has been made for use of private sector consultants and other experts to plan and design some of the MISs to assure that all projects are completed on schedule.

b) Technical Assistance

Three categories of Technical Assistance will be provided for under this project. A U.S. institution will provide a resident long-term U.S. water management specialist and short-term consultants to assist GOI and GOMP in defining and carrying out the field studies and training activities. In addition, the U.S. institution will provide the services required to procure the specialized equipment, publications and carry-out a prefeasibility study of the control pilot subprojects. Local consultants will provide assistance in designing subprojects where required and assist in the monitoring and evaluation of subproject performance. The third category of technical assistance will be an Indian consulting organization, acting individually an or in collaboration with a U.S. water resources organization, to provide specialized consulting advise on the control pilot projects.

c) Professional Development & Training

Special professional development and training programs will be organized for personnel drawn from the state Departments of Irrigation (ID) and Agriculture (AD). The training will emphasize the importance of irrigation and extension activities in providing the farmer with a complete package of services designed to meet his needs. Short courses, workshops and seminars will be provided for design officers and field technicians. Topics covered will include land development activities and the conjunctive use of surface and groundwater. Project training will be conducted in-country. Most of the training efforts will be directed at the field officers and

technicians in the form of short courses, workshops and seminars. Special seminars and workshops will also be designed for the senior level officials in ID and AD. Topics covered will include planning and layout of irrigation systems, watershed model operation, reservoir operation studies and construction quality etc. Participant training requiring highly specialized or technical skills development will be provided in the United States, if comparable training is not available in India.

A training program for farmers will also be developed to instruct in proper operation and maintenance of the system below the turnout. The content of this program will be jointly established by the Departments of Irrigation and Agriculture assisted by grant financed technical assistance. Farmers will be shown how to use various low cost equipment to level land as well as regulate and distribute water on a more efficient and equitable basis.

3. Project Process

A major objective of the project is to establish an institutional process whereby the state Departments of Irrigation and Agriculture better coordinate their "services" to the farmer. Since the farm enterprise is the basic production unit, sound management of support services requires a better understanding of the farmer's requirements. The project will stimulate local participation by establishing certain "contact points" between irrigation engineers/agricultural extension agents and the communities they serve. By improving communication between these three groups i.e. irrigation engineers, extension agents and farmers, the overall system will become more demand oriented. Ultimately, this means that farmer's concerns and preferences are incorporated into irrigation design and complementary inputs are provided when needed.

To illustrate how this process would operate, some of the interactions involved in designing and implementing a minor irrigation scheme (MIS) are examined. The process consists of various stages including subproject identification and design, final appraisal and funding, construction and finally normal operation and maintenance. Each stage will be supported by appropriate technical assistance and training provided under the AID project.

The process begins with a local initiative from the village committee or "panchayat" requesting the Irrigation Department (ID) to provide irrigation water to area farmers. The ID will initiate a pre-feasibility investigation as to whether a dam site is possible in the local area. If contour maps and available

hydrological information suggest that irrigation is technically feasible, a more complete feasibility analysis is undertaken. At this point, the Agricultural Department (AD) will carry out a pre-irrigation soil survey to help determine soil suitability for irrigation as well as current and future cropping pattern possibilities. Farmers groups will also be surveyed to determine market interest in various crops and the scope of the irrigation network. The latter is defined by the tentative lay-out of the high-line canals which form the outer boundary of the minor irrigation system. If it appears that irrigation is both technically feasible and would significantly raise agricultural incomes, the Irrigation Department (ID) requests a "financial sanction" or budgetary allocation.

The next stage consists of an in-depth feasibility analysis and detailed project design. This usually includes a survey of the possible dam site along with detailed topographic and soil analysis. This analysis will identify the physical structure requirements of the MIS as well as the anticipated cropping pattern. Local panchayats are consulted by ID and AD to determine the water distribution system and agree on system alignment. Local groundwater potential is also assessed and possibilities for conjunctive use of groundwater with surface irrigation are investigated. Certain alternative uses of water are also evaluated to determine what additional village facilities might be required. This might include provision for drinking water, road crossings, a place to wash laundry etc.

The subproject design, reflecting various institutional and financial inputs, is forwarded for final approval to the Members of the Minor Irrigation Committee (MIC) representing ID, AD and Ministry of Finance. If the subproject meets GOI/AID construction standards and has an economic return of at least 12 percent (10 percent for drought stricken or tribal areas), the subproject will be approved for construction and AID financing.

Due to the smaller scale of minor irrigation schemes,the construction phase will not exceed four years from the time of initiation. Under the Superintending Engineer, the Project will establish special quality control units. These units will conduct spot checks and play an active role in identification of generic problems encountered during construction and recommend remedial measures. The quality control units will work towards solution of identified problems by organizing workshops and appropriate training.

Meanwhile, during the construction phase, Agriculture Department extension agents will be working with farmers to help them plan for water use and apply for credit needed to make on-farm

improvements. As MISs become operational, grant and loan financed demonstration chaks will be set-up to show farmers various land development techniques such as land leveling, construction of drainage ditches, suitable irrigation methods and agronomic practices, etc. A special cell or unit of the Irrigation Department will monitor groundwater use and encourage local farmers to develop available groundwater resources.

Following the physical completion of the minor irrigation schemes, there is an on-going need for proper system maintenance and control. Normally, the Irrigation Department operates and maintains the system from the dam to the public outlet. A joint project manager will coordinate ID and AD activities and supervise a system of rotational water supply. Local farmer groups will take responsibility for water distribution below the outlet within their chak and perform basic maintenance functions. Technical assistance and training will be provided to farmer groups and proper water use will become part of the on-going extension program in the area.

IV. COST ESTIMATES, FINANCIAL PLAN DISBURSEMENT PROCEDURES

A. Cost Estimates and Financial Plan

The total cost to complete fifty MIS subprojects during the six year life of project is estimated to be $76 million (Rs 762 million). The project will provide $41 million (approximately Rs 410 million) in loan funds to cover slightly over half of all the planning and construction costs (two-thirds of the eligible costs). Loan funds will partially cover such items as construction of the dam, canals, water distribution system up to the two ha. level, demonstration chaks, field establishment, appraisal, monitoring, and the drainage system. The GOMP will cover compensation for land, identifiable taxes, and a portion (one-third) of the cost of the construction of the MISs in order to reach a total contribution of slightly less than half of all costs. The GOMP will provide $35 million (Rs 352 million) towards the construction cost of the fifty MISs and for technical services for on farm development activities. It is estimated that initial year costs will be $2,500 (Rs 25,000) per hectare of culturable command area (CCA) with an escalation of seven percent per annum during the six-year project period. In addition to this, the GOMP will budget for operation and maintenance costs, averaging about $5 (Rs 50) annually per irrigated hectare which will be recovered from beneficiary farmers in the form of water use related charges. USAID will also provide a grant of $5 million to cover the costs of technical assistance; professional development and training; demonstration chaks; field studies and demonstration equipment.

B. Projection of Expenditure by Fiscal Year

Ten subproject MISs are scheduled to begin construction during the first year of project implementation. Twenty more will be started during the second year, and the remaining twenty during the third year. The flow of expenditure on an individual MIS is estimated as follows:

Year	Headworks Dam, Canals & Minors	Water Courses & Field Channels	On Farm Development
1	10%	-	-
2	30%	30%	20%
3	45%	30%	30%
4	15%	40%	50%
	100%	100%	100%

Tables 1 and 2 estimate expenditures by GOMP and AID for the construction of all fifty MISs constructed through the sixth year of the project.

TABLE 1

M.P. - MIS
Summary Cost Estimate and Financial Plan
1983 - 1989

($,000)

PROJECT ELEMENT		LOAN	GRANT	TOTAL	ID	AD	TOTAL	GRAND TOTAL
MIS Construction	LC	40,280	-	40,280	34,850	-	34,850	75,130
Field Studies	LC	-	340	340	-	-	-	340
	FX	-	118	118	-	-	-	118
	SUB-TOTAL	-	458	458	-	-	-	458
Training	LC	-	260	260	-	-	-	260
	FX	-	175	175	-	-	-	175
	SUB-TOTAL	-	435	435	-	-	-	435
Demonstration Chaks	LC	360	380	740	-	180	180	920
Pilot Projects	LC	-	200	200	-	-	-	200
	FX	-	2,040	2,040	-	-	-	2,040
	SUB-TOTAL	-	2,240	2,240	-	-	-	2,240
Soil Survey & Testing	LC	180	60	240	-	110	110	350
	FX	-	45	45	-	-	-	45
	SUB-TOTAL	180	105	285	-	110	110	395
Agric. Extension	LC	180	-	180	-	110	110	290
Liason/Coordination, Audio Visuals, guides/hand books, special equip.etc.	LC	-	360	360	-	-	-	360
	FX	-	265	265	-	-	-	265
	SUB-TOTAL	-	625	625	-	-	-	625
Contingencies	LC	-	288	288	-	-	-	288
	FX	-	469	469	-	-	-	469
	SUB-TOTAL	-	757	757	-	-	-	757
GRAND TOTAL	LC	41,000	1,888	42,888	34,850	400	35,250	78,138
	FX	-	3,112	3,112	-	-	-	3,112
	TOTAL	41,000	5,000	46,000	34,850	400	35,250	81,250

Legend: LC = Local Costs
FX = Foreign Exchange Costs

TABLE 2

M.P. MIS
Project Expenditures by U.S. Fiscal Year
($ million)

FISCAL YEAR	U.S. AID GRANT	U.S. AID L O A N	U.S. AID TOTAL	GOVT. OF M. P. PROJECT SHARE ID	GOVT. OF M. P. PROJECT SHARE AD	GOVT. OF M. P. PROJECT SHARE TOTAL	PROJECT GRAND TOTAL*
1983	0.20	0.17	0.37	0.13	0.03	0.16	0.53
1984	0.50	1.36	1.86	1.17	0.03	1.20	3.06
1985	1.00	5.00	6.00	4.23	0.06	4.29	10.29
1986	1.40	10.36	11.76	8.87	0.06	8.93	20.69
1987	1.00	12.76	13.76	10.86	0.08	10.94	24.70
1988	0.60	8.80	9.40	7.47	0.09	7.56	16.96
1989	0.30	2.55	2.85	2.12	0.05	2.17	5.02
PACD	5.00	41.00	46.00	34.85	0.40	35.25	81.25

*includes US Grant Component

M.P. - MIS
Project Expenditures by GOI Fiscal Year
(Rs. million)

FISCAL YEAR GOI	U.S. - A.I.D. GRANT	U.S. - A.I.D. LOAN ID	U.S. - A.I.D. LOAN AD	U.S. - A.I.D. TOTAL	GOMP COUNTERPART ID	GOMP COUNTERPART AD	DEPT. BUDGETS 1/ ID	DEPT. BUDGETS 1/ AD	CONSOLIDATED PROJECT BUDGET 2/
1983	5.0	6.0	0.5	11.5	5.2	0.2	11.2	0.7	11.9
1984	8.0	34.4	1.0	43.4	29.8	0.6	64.2	1.6	65.8
1985	16.0	92.5	1.1	109.6	80.0	0.6	172.5	1.7	174.2
1986	10.0	133.0	1.6	144.6	115.0	0.8	248.0	2.4	250.4
1987	7.0	104.3	1.7	113.0	90.3	0.9	194.6	2.6	197.2
1988	4.0	32.6	1.3	37.9	28.2	0.9	60.8	2.2	63.0
PACD	50.0	402.8	7.2	460.0	348.5	4.0	751.3	11.2	762.5

1/ Includes AID Loan Funds
2/ excluding grant

C. Details of Grant Budget

The grant funding of $5.0 million (see Table 3) will be provided to fully support conducting field studies, training of personnel from the ID and AD, the Special Coordination Cell, procurement of audio-visual equipment, development of guides, and supply of reference books including specialized equipment. The Grant will also finance technical assistance and coordination of the field studies and training. In addition, partial assistance will be provided for the design and implementation of two control pilot projects and establishment of field demonstration chaks within all of the MISs.

Specialized equipment such as a desk top computer for analysis of hydrologic and climatological data and for reservoir operation studies; establishment of agro-climatological stations for improving existing data bases, study of stress effects on crop yields, and soil testing laboratories will be procured from grant funds, using local and foreign exchange.

Grant funds will be used to provide partial support for the development of four demonstration chaks in each MIS covering an area of approximately 8 ha. each. The demonstration chaks will be used to exhibit to the farmers within and around the command of the irrigation schemes the latest irrigated agriculture development technology.

TABLE 3

MADHYA PRADESH MINOR IRRIGATION SCHEME
DETAILS OF GRANT BUDGET

		Local Cost	International Cost TR	TA	Equip.	Total
A.	Field Studies					
	1. Watershed yield methodologies	40	5	10	25	80
	2. Sedimentation	30	5	20	-	55
	3. Irrigation guide development	40	-	10	15	65
	4. Seepage loss	50	-	18	-	68
	5. Alternative water allocation	40	-	-	-	40
	6. Farmers organization for O&M and water allocation	50	-	-	-	50
	7. Socio-economic baseline studies	25	-	-	-	25
	8. Input distribution network	35	-	-	-	35
	9. Water stress affecting crop yields	30	-	-	10	40
B.	Training					
	1. Quality control	35	-	10	-	45
	2. Operation and maintenance	30	-	10	-	40
	3. Watershed model operation	20	5	30	-	55
	4. Reservoir operation	10	5	15	-	30
	5. Planning & design of distribution network	40	-	20	-	60
	6. Soil surveys and testing	60	10	15	20	105
	7. Water management	60	10	30	20	120
	8. Economic analysis	20	-	-	-	20
	9. OFD design and construction	45	-	10	10	65
C.	Pilot Projects	200	-	1040	1000	2240
D.	Demonstration Chaks	380	-	-	-	380
E.	Audio Visuals, Guides, Reference Books, Special Equipment, etc.	-	-	-	15	15
F.	Liaison and Coordination	360	-	250	-	610
	TOTAL	1600	40	1488	1115	4243
	Contingencies, @ 18%	288	7	262	200	757
	GRAND TOTAL	1888	47	1750	1315	5000

TR: Indian Participants Training
TA: Technical Assistance - U.S. Participants

The grant funding provides for both long (18 months resident water management specialist) and short-term (14 person-months) U.S. technical assistance to assist the GOMP in preparing for and carrying out in-country training, field studies, and establishing of the demonstration chaks. In addition, the resident specialist will arrange for and coordinate sending Indian participants for training to the U.S. and for the procurement of the various U.S. equipment and supplies needed for the training and field studies.

The planning, design, construction and procurement of specialized water control devices for two control pilot projects will be partially supported under the grant. These pilot projects will demonstrate the use and adaptability of utilizing the latest sophisticated design and water control/regulation equipment coupled with improved management from planning to operation stages to meet the requirements of crops on a timely basis. Approximately 70 person-months for a U.S. water resources consultant have been allocated for supporting the planning and development of the control pilot projects in addition to local consultant support.

D. Disbursement Procedures

1. Loan Funds: AID loan funds will be used to finance local currency costs of construction on the fifty prototype MISs. Financing will be on a Fixed Amount Reimbursement (FAR) basis for discrete construction components. For each MIS, agreement will be reached during the appraisal of the subproject between AID and the Minor Irrigation Committee (MIC) on the amount to be reimbursed for main canals/distributaries, minors, watercourses and field channels, drainage works, roads required for project operations, etc. For canals, distributaries, drains, the FAR method will be used.

With respect to headworks, reimbursement may be made on the basis of contractor's billings to the Irrigation Department which bills in turn, are prepared on the basis of work completed. Where competitive bidding has resulted in a decision by the Irrigation Department to do the work departmentally, reimbursement may be made on the basis of the schedule of rates then currently in use by the department for the described work. Works are carried out departmentally only when competitive bidding has produced unacceptably high bids as compared with the scheduled rates. Reimbursement at the scheduled rates will therefore achieve cost savings.

AID will approve the basic contract format and standard procedure to be used for all contracts for headworks and therefore will not review each of the estimated 100 such contracts for headworks.

Other construction costs and resettlement costs will be reimbursed on an actual cost basis.

Field establishment costs of subprojects and the appraisal and monitoring cells will be reimbursed on a pari-passu basis.

Upon certification that a certain percentage of completion has been achieved based on prior agreed to plans, USAID will initiate reimbursement procedures. This involves the transfer of the dollar equivalent of the unit reimbursement amount for completed work to the New York account of the Reserve Bank of India.

2. Grant Funds: AID grant funds will be used for direct financing of foreign exchange costs associated with training in the United States technical assistance and special demonstration equipment and reference material. The grant funds will also finance certain local currency costs for training, coordination, demonstration chaks, pilot projects and conducting field studies. These latter activities are all expected to be expenditures incurred by the GOMP beyond and in addition to approved items in the State's irrigation or agriculture budgets. To provide for local currency expenses, USAID will transfer the dollar equivalent of planned costs for each activity into the New York account of the Reserve Bank of India, and will advise the Department of Economic Affairs (DEA) of the Ministry of Finance upon completion of transaction. DEA will then arrange to have the rupee amount credited to Madhya Pradesh's current general budget, in behalf of the GOMP Irrigation or Agriculture Departments.

To facilitate implementation of the locally-funded items under the grant, an advance of grant funds will be provided upon completion of conditions precedent equivalent to the initial three months projected expenditures. This is estimated to be approximately U.S. $50,000 (Rs 500,000). Each three months of thereafter, the Government of Madhya Pradesh will report to USAID on actual expenditures for the previous quarter and estimated requirements for the ensuing quarter. On this basis, USAID will liquidate the previous advance and will advance requested funds for the next quarter.

V. IMPLEMENTATION PLAN

A. GOI/GOMP Administrative Arrangements

1. Planning and Budgeting

The Irrigation Department of the State of Madhya Pradesh develops an overall plan for both surface irrigation and groundwater

development. This includes a long-range Five Year Plan which is adjusted each budget year. The state's Minor Irrigation Program is part of this overall plan. The Irrigation and Agricultural Departments proposals are required by the State Planning Department, and a final program is submitted to the GOI Planning Commission for approval. After approval of the overall program, including the identification of specific projects by the Planning Commission, the state Irrigation Department proceeds with detailed project development.

During the current Five Year Plan (1980-85), the ID is constructing 2442 new MISs out of which 352 MISs are located in the Narmada Basin. The Sixth Plan provides $50 million (Rs 500 million) for these 352 MISs. Under this project 50 MISs, having a CCA of 25,000 ha, are to be constructed in the Narmada Basin for which a total of $76 million (Rs 762 million) will be needed. This will require a budgetary allocation of Rs 77 million in Sixth Plan and the balance of Rs. 686 million during the Seventh Plan. The AD will require a budget of Rs 2.3 million for the Sixth Plan and Rs 8.7 million for the Seventh Plan. The GOMP/ID and AD have assured that adequate budget provisions during the Sixth and Seventh Plan periods will be made available for the life of this project to bring all 50 MISs, covering approximately 25,000 has, into full operational status.

2. Subproject Design and Implementation

GOMP/ID is responsible for the design and construction of civil works, and the AD will provide appropriate information and details for cropping patterns, soil surveys, supply of inputs (seeds, fertilizers, pesticides, etc.), agricultural extension services and will carry out on-farm development works. Feasibility reports for subprojects will be prepared by the field organization assisted by two Project Formulation Cells (PFC) and will be reviewed by a "Special Appraisal and Supervision Cell" (SASC) to be headed by a Superintending Engineer who reports to the Engineer-in-Chief. The SASC will assure that the proposed subprojects meet the agreed to criteria established in Volume II of this Project Paper. Annual summary reports on implementation and annual performance of the MIS's will also be prepared by the SASC and submitted to USAID during July of each year.

3. Subproject Appriasal and Approval

A "Minor Irrigation Committee" (MIC), headed by an E-in-C, along with a Chief Engineer and the Special Secretary (Minor Irrigation) will represent ID. The MIC will also nave representation from the Special Secretary of Finance, Additional Director of

Agriculture and the SE (SASC) as a Member Secretary. This committee will approve the subprojects under this project certifying their compliance with project criteria set forth in the Project Paper and Loan Agreement. The Committee will also approve a schedule for unit rates of the different construction components to facilitate reimbursement for each subprojects. After approval and certification of MISs technical and financial soundness, the MIC will notify USAID. USAID will approve the unit reimbursement under the FAR method and will check MIC estimates on a selective basis. Upon approval by the MIC, costs incurred on the subprojects will be eligible for financing.

4. Water Allocation and Management

General principles for allocating water among farmers are set forth in the Madhya Pradesh Irrigation Act of 1931 and Irrigation Rules of 1975, which provide for water allocation to the farmers on the basis of both agreement (short and long term) and demand. Farmers can enter into agreement with ID for irrigating crops other than perennials. The applications received for agreement or demand of water are reviewed and allocations approved subject to the availability of water. This follows drawing up of a schedule of water supply and its notification to the applicant farmers. Such a system, however, prevents the farmers who had not applied prior to the start of the season from using irrigation water. This adversely effects small and marginal farmers especially during drought years and inculcates inequity of water distribution. In this scheme, the qualifying MISs will follow a system of Rotational Water Supplies (RWS) (see Vol.II, Chapter II, Section G) which assures that the farmers within the command of a watercourse or an outlet follow a fixed roster of turns to use irrigation water at a specific time on a day of the week determined on the basic of cropped area and water availability. This system ensures equitable water distribution among the farmers. Results of the proposed management studies on water allocation/distribution practices in the currently operational M.P. Medium Irrigation Project (IDA Cr-1108-IN) and USAID assisted Maharashtra IT&M Project will be available prior to the completion of the first ten MISs. These results will be used to develop policy and management modes on the optional RWS to be applied in this scheme.

B. AID Implementation Arrangements

1. AID Administrative Arrangements

USAID/New Delhi will designate a Project Officer who will be responsible for coordinating subproject analyses and will handle routine project implementation matters. In addition, an FSN engineer

will be assigned to the project as the Operations Manager. A USAID Project Committee will support these officers. USAID's Controller will make all project disbursements in accordance with standard AID procedures regarding fixed reimbursement for loan-funded construction and regarding direct dollar and local currency financing of grant-funded activities.

2. Progress Reporting

An "Implementation, Operation, Monitoring and Evaluation Division" (IOMED) unit will be established under the Special Appraisal and Supervisory Cell(SASC). It will be responsible for in-depth monitoring and review of MIS progress from the initial stages of surveying and planning to final design, construction, and ultimately operation. The IOMED will prepare comprehensive program reports twice a year, providing complete physical and financial details for each MIS under construction or operation. It will also identify existing or foreseen constraints to project implementation and report these to the SC (SASC) who, in turn, will inform the Engineer-in-Chief and USAID, along with the action taken to remove any constraints. The IOMED will provide independent continual monitoring and evaluation of completed subprojects. This in turn will provide feedback for the planning and construction process.

C. Preliminary Calendar of Project Activities
Pre-Implementation Phase:

- Tentative selection of 50 possible MISs for support under the project.

- Identification of individuals and creation of positions to serve on the MIC, SASC Appraisal Division and IOMED.

- Finalize the scope of work for the resident water management specialist.

- Create positions for the special coordination cell attached to the SASC for all grant funded activities.

- Water management specialist arrives under the Maharashtra IT&M project.

- AD establishes two soil survey units and starts the detailed soil survey of the MISs.

- AD and ID to establish required soil testing laboratories.

- Prepare project report for first four MISs.

Implementation Phase:

July 1983:

- Terms of reference for the feasibility study of the pilot projects prepared.
- GOI and USAID sign project agreement.

August 1983:

- USAID issues Project Implementation Letter No.1.
- WMSP-II requested to provide services to carry out the pilot project feasibility study.
- SASC finalize project reports of first four MISs to serve as a model.

September 1983:

- MIC and USAID review the four model MISs and SASC finalize appraisal reports.
- Develop general work plan for the special studies and training activities.

October 1983:

- Conditions Precedent to first disbursement met.
- Begin the development of detailed scopes of work for each of the special studies and in-country training workshops.
- WMSP starts pilot project feasibility.
- MIC approves four MISs.
- U.S. training in water management commences.

November 1983

- Local training/workshop begins.
- SASC finalizes additional three MISs.

December 1983:

- SASC finalize an additional 3 MIS subproject reports.
- MIC approves 3 MIS appraisal reports.
- Construction begins on first four subprojects in accordance with appraisal reports.

January 1984:

- Detailed scopes of work for all special studies and in-country training workshops completed.
- MIC approves an additional 3 subprojects.
- Construction of additional 6 subprojects commences in accordance with appraisal reports.
- SASC finalize 5 additional MISs.

February 1984:

- Resident water management specialist working with GOMP initiates contracting action for various special studies.
- SASC finalizes the next 5 additional MISs.

March 1984:

- SASC finalizes an additional 5 MISs.
- MIC approves additional 5 MISs.
- Pilot project feasibility report completed, reviewed and decision taken on the proposed pilot project.

April 1984:

- Special studies commence.
- Consultant terms of reference for the pilot project developed and proposals requested.
- SASC finalizes an additional 5 MISs.
- MIC approves additional 10 MISs.
- Construction of an additional 10 MISs begins.

Summer 1984:

- SASC finalize revised reports for additional 10 MISs.

Fall 1984:

- MIC approves revised reports for 10 MISs.
- Proposals received, evaluated, and consultant selected and arrives to initiate design of pilot projects.
- First annual project evaluation.
- SASC finalize designs for final 10 MISs.
- Construction commences on additional 10 MISs.
- AD establishes special units to coordinate demonstration chak activities.

Winter 1984:

- MIC approves final 10 MISs.

Summer 1985:

- Second annual evaluation.

Fall 1985:

- Construction commences on final set of 20 MISs.

Spring 1986:

- Design of pilot projects complete and contracting procedures for construction finalilzed.
- AD committee on credit availability for on-farm development reports findings to GOMP and AID.
- Results of special studies reviewed and incorporated into on-going subproject designs.

Fall 1986:

- Demonstration chaks started on initial 10 MISs/construction of pilot project commences.
- Third annual evaluation and mid-term review.

Fall 1987:

- Fourth annual evaluation.
- Demonstration chaks started on 10 MISs.
- Initial 10 MISs operational.

Spring 1989:

- Pilot project operational.
- Final batch of 20 MISs operational.

July 1989:

- PACD

Post-Implementation Phase:

Fall 1989:

- EOPS evaluation.
- Liquidate final request for reimbursement.

MADHYA PRADESH MIS - IMPLEMENTATION SCHEDULE (U.S. FISCAL YEAR)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PROJECT ACTIVITIES	1983	1984	1985	1986	1987	1988	1989	1990
• PRE-IMPLEMENTATION	----							
• SASE APPRAISAL								
- First 10	---------Y							
- Next 20		----Y						
- Last 20			------Y					
• CONSTRUCTION OF MISs								
- First 10								
x Major Works		----------	----------	----------	----------	----------	Fully Operational	
x Field Channel				----------	----------			
x Land Dev.				----------	----------			
- Next 20								
x Major Works			----------	----------	----------			
x Field Channel				----------	----------		Fully Operational	
x Land Dev.				----------	----------			
- Last 20								
x Major Works			----------	----------	----------	----------	Fully Operational	
x Field Channel					----------			
x Land Dev.					----------			
PILOT PROJECT								
- Feasibility	----------							
- Design		----------						Pilot Projects Operational
- Construction				----------	----------	----------	----------	
SPECIAL STUDIES		----------	----------	----------	----------			
TRAINING		----------	----------	----------	----------			
TECHNICAL ASST. & COORDINATION		----------	----------	----------	----------	----------	----------	
EVALUATIONS		X	X	XX	X	X	XX	

Y = MIC and AID approval
X = ANNUAL Evaluation
XX = Mid-Term/EOP Evaluation

VI. MONITORING PLAN

The following areas, based on experience on similar projects, require intensive AID monitoring. The problem areas and AID's role are described below.

a. Delays in preparation of subproject MIS plans or revised plans; delays in appraisal and approval of these plans by the SASC and MIC.

Ten subproject MISs are planned for approval during the first project year. USAID irrigation staff plan to work closely with the SASC and attend the MIC meetings throughout this period to assure that the design-appraisal-approval process is working satisfactorily. Relatively intensive monitoring is planned for the first year and it is expected that monitoring requirements will diminish once three or four subprojects have been formally approved. Approximately eight work weeks of USAID/ARD time will be devoted to this activity during the first year.

b. Delays in sanctioning and acquiring adequate staff to implement the project.

This has proved to be a serious problem on both the Gujarat and Rajasthan MIP projects and it will be addressed in the project agreement as a condition precedent and covenant. The appraisal division and monitoring division of the SASC and the MIC will be established as a condition precedent and the necessary field staff assigned as a covenant. USAID/ARD staff will continually follow-up on this matter in conjunction with visits to Madhya Pradesh and the MIS field offices.

c. Delays in finalizing training plans, identifying appropriate institutions to conduct the training, designation of suitable candidates to be trained; delays in finalizing scopes of work for special studies, delays in completing arrangements to have the studies done, e.g., contracting.

Finalization of plans and preparations for training and special studies will be the principal activity of the resident water management specialist. Assuming his or her timely arrival on the Maharashtra IT&M project (one half time to be spent on this project).

d. Inadequate Irrigation Department budgets to continue or complete MIS construction on time.

As a condition precedent the GOMP will assure budgets for the first two years of the project (balance of the GOI Sixth Plan) and USAID staff will review periodically the adequacy of GOMP budgets, during the Seventh Plan, to complete the project. Approximately, one work month will be devoted to this item during the first project year.

e. Poor quality construction, inadequate supervision and adherence to specifications, the lack of construction materials for the irrigation distribution network.

The GOMP, recognizing the significance of this problem, will establish special quality control units under the Supt. Engineers associated with the MISs. These quality control units will visit the MISs on a regular basis to identify quality constraints, with primary concern for the lower end of the irrigation distribution network. These units will be independent of the field units implementing the project and will report back to the Suptd. Engineers who in turn will report to the Engineer-in-Chief on problems identified.

Under the project, several training workshops are proposed for the field construction units with the objective of improving construction quality and adherence to proper specifications. In addition to these project specific workshops, the quality control units will also hold workshops on those subjects identified to be a problem in the field. The quality control units will take a positive approach to improving quality and assisting the field staff rather than the normal inspector's role. USAID staff will spend a major portion of the estimated monitoring time required for this project on assuring quality construction. During each site visit the quality control units will be contacted and their test results reviewed. In addition the USAID staff will monitor the training activities and participate where appropriate.

f. Inadequate training; transfer of participants who have completed project-financed training from project activities to other, unrelated assignments.

USAID staff will monitor in-country training through selective visits; the USAID project officer may attend some of the sessions and workshops, and USAID staff will participate periodically as technical resource persons. This has been the pattern of training courses held in Gujarat and elsewhere. In addition a system will be established by the coordination cell, under the SASC, to monitor the location and utilization of trained participants. A total of four work weeks of USAID/ARD time is expected to be required for this item during the first project year.

g. Unsatisfactory studies; inadequate application of knowledge gained from the studies to the planning, construction or operation of MISs.

USAID will review each study during its implementation and upon completion; USAID will also follow through on any recommendations arising from the studies. Approximately one and one half work week will be devoted to each study. About ten such studies will be undertaken during the project, with all begun the first year and completed by the third year. Therefore, roughly five work weeks will be required for review and follow-up during each of the first three project years.

h. Inadequate budget coordination between the Irrigation and Agriculture Departments, resulting in delays in undertaking land preparation works below the MIS public outlets and on farmers' fields.

This problem has been anticipated by the Government of Madhya Pradesh. It will not arise until most of the major works are completed in three years time. USAID will monitor the GOMP and GOI budget process to assure that adequate provisions are made beforehand.

USAID Staff Requirements

The minimum USAID staff time required during the life of this project, assuming no unforeseen difficulties such as the delayed arrival of the resident water management specialist as outlined in the preceding section, is as follows:

Fiscal Year (U.S.)	Work Weeks of staff required
FY 83	15
84	30
85	35
86	35
87	35
88	25
89	10

USAID will recruit an FSN irrigation engineer who will be assigned to this project to assist the project officer.

Day-to-day implementation of the grant funded components of the project, i.e., special studies, training and technical assistance, will be the fulltime responsibility of the resident subject-matter specialist. In addition, monitoring assistance will be requested under the Water Management Synthesis II Project. Therefore, USAID's involvement in the implementation functions under the grant component are expected to be minimal, and limited to periodic monitoring.

VII. SUMMARIES OF ANALYSIS:

A. Technical Analysis

1. Agricultural Potential

a. Physiography and Climate

The project will help develop the agricultural production of the Narmada Basin, an area of roughly 28,000 sq. kilometers which stretches across the central portion of the state of Madhya Pradesh. The area lies in the semi-arid tropics, where tropical monsoon and alternate dry periods permit year round cropping. The Narmada river is fed by 41 principal tributaries and the area's fertile soils offer good prospects for intensive irrigated agriculture.

The Narmada Basin has rainfall which varies between 600 mm to 1,600 mm. While the upper basin is primarily dedicated to rice and wheat production, the lower part of the Narmada Basin is more suitable for millet crops (sorghum, pearl millet, etc.).

b. Soils

The Narmada Basin has predominantly black soils (vertisols) of varying depths. The deep black cotton soils due to their higher clay content and corresponding poor infiltration, permeability and drainage characteristics require special management for successful tillage and cropping. The medium and shallow black soils present less of a problem in this regard. In general, these soils tend to be deficient in phosphorus and nitrogen content.

c. Cropping Seasons

There are three seasons lasting approximately four months each. The kharif or wet season begins in mid-June and ends in mid-October. The rabi or winter season lasts between November and March. Crops may be either seasonal like sorghum or wheat or bi-seasonal such as chillies and some cottons. In most of the basin successful rabi crops cannot be grown without irrigation and during the hot season no cropping is possible without irrigation.

d. Agricultural Development

Agriculture dominates the economy of the state contributing 55 percent of the state domestic product and 11 percent of India's total foodgrain production. Due to limited area under irrigation (11 percent), the average yields of major crops are low

even by national standards. Moreover, the seed varieties currently used are low yielding and fertilizer use is only one third of the national average. With the development of irrigation in the Narmada Basin area, higher yields will be possible provided such complementary inputs as high-yielding variety seeds and fertilizers are made available. Suitable cropping pattern including crop varieties for the different climatic conditions and soil types must be selected and reliable irrigation provided.

e. Agricultural Services

Detailed soil survey and testing of physical and chemical properties is carried out using guidelines developed by the All India Soil and Land Use Survey Organization. Soil survey units operating in Madhya Pradesh have a capability to complete 2.5 million hectares of detailed soil surveys in a period of five years. The Narmada Basin has 12 operating soil survey units and six soil testing laboratories. As part of the project, the Agricultural Department will establish two additional survey units for the proposed minor irrigation schemes financed by AID in the Narmada Basin area. In addition, there will be a soil testing unit set-up under the project.

Agricultural extension services are being reorganized in the Narmada Basin districts. The reorganized services will be based on intensive agricultural extension i.e. Training and Visit (T&V) system. Under this project, The Agricultural Department will induct additional staff so that there will be one Village Agricultural Extension Officer (VAEO) for every 400 ha. of irrigated land and one subject-matter specialilst for every 2,000 ha. of irrigated area. A training program for AD extension staff will also be supported under the project.

f. Agricultural Inputs

At selected research stations, HYV breeder and foundation seed is produced and multiplied on a commercial basis on cultivator's fields and on farms operated by the National Seeds Corporation. The Madhya Pradesh State Seeds Certification Agency certifies the seeds before their distribution to farmers. These seeds will be made available to the project farmers.

Fertilizers are distributed through cooperative and private dealers. There are 412 buffer stock storage centers in Madhya Pradesh serving a wide distribution network. To improve deliveries the GOMP has made provision in the Sixth Plan for subsidization of transport and storage of fertilizers thus assuring adequate fertilizers for higher production.

The marketing of pest control chemicals is handled by the Agro-Industries Development Corporation and a network of private dealers. Stocks of plant protection equipment will be increased within the Department of Agriculture during the project implementation period.

The monitoring of input supplies and distribution will be carried out by a "Monitoring and Evaluation" unit within ID with participation of AD. The Agriculture Department will provide AID with an evaluation of the effectiveness of fertilizer and pesticides distribution network as well as farmer utilization in the first ten MISs completed under the project.

g. Credit

Short, medium and long term loans are available to farmers through cooperative credit societies, state cooperative land development banks and commercial banks. Generally, the amount of lending for irrigated crops is about two to three times higher than for non-irrigated crops. Groundwater development financing is also available to buy small pump sets and digging of private shallow wells etc. The commercial banks have been steadily increasing their lending in agriculture and now have a large number of branches in rural areas. The AD will appoint a committee to investigate whether credit availability or lending criteria pose a constraint for the first five MISs undertaken. A report with recommendations will be provided to AID and GOMP for pursuing further action.

h. Marketing

The marketing of agricultural produce is less developed in Madhya Pradesh than in many other states of India. So far, there are 250 regulated markets and 69 sub-markets in Madhya Pradesh. The Agricultural Produce Market Act provides funds to form market committees and set-up new markets. Market Committees are delegated authority to purchase lands and construct facilities. New market committees will be established in irrigated command areas as supplies increase.

i. Adaptive Research and Demonstration

Regional colleges in collaboration with agricultural extension stations will conduct applied research experiments in the Narmada Basin. Under the project, four operational demonstration chaks will be established in each minor irrigation scheme. The demonstration chaks will provide a mechanism for exhibiting to farmers the latest irrigated agriculture development strategy for

increasing crop production. On each demonstration chak, land development will be grant financed on areas not to exceed 0.5 hectare per farm. The Agricultural Department will set up special units to coordinate activities on the demonstration chaks.

2. Irrigation Infrastructure

a. Background

Basically, the irrigation system in Madhya Pradesh is designed from the top down. That is, after the location of a suitable reservoir site, the main canals are identified based on the land that can be commanded by a control canal. Then, distributories are laid out at specific intervals which flow into smaller channels known as minors. The public outlets are set-up along the minor canals and farmers are expected to build individual watercourses leading to their farms. Experience suggests that this approach leads to poor utilization of resources and improper canal sizing to meet the evolving demand stemming from changes in crop patterns.

Some common deficiencies identified by the project design team who analysed several MISs in the Narmada Basin include:

1) Inaccurate determination of watershed yield and expected peak discharges for spillway design.

2) Excessive channel seepage loss due to no lining being provided where channels pass through soils with high infiltration rates and due to poor maintenance.

3) Deterioration and loss of channel capacity from siltation, erosion, weed growth and general lack of maintenance.

4) Absence of control structures to maintain design flow levels.

5) No provision for regulation or measurement of flows at off-takes from distributaries, minors or outlets.

6) Improper alignment of canals and incorrect positioning of outlets due to lack of detailed soils and topographic surveys.

7) Supply to an excessively large area from a single outlet without watercourses and field channels or on-farm control structures.

9) Lack of organization of cultivators in the command area to equitably distribute water and maintain water courses and field channels.

10) Heavy operation losses due to absence of gated outlets and water control structures.

11) Inadequate number of bridges, culverts and roads and entry facilities for village domestic uses.

12) Inadequate road access for canal inspection operation and maintenance.

13) Absence of field drainage network.

14) Absence of communications facilities for conveying irrigation demands.

15) Absence of delivery schedules.

16) Absence of suitable organization attuned to the needs of cultivation at the farm level.

17) Inadequate delivery at the farmgate (small stream size) resulting in long irrigation periods, non-uniform distribution and excessive deep percolation losses.

b. Improved Infrastructure

A number of areas have been identified for improvement which involve profound changes in planning and management philosophy and normal operating procedures. While an exhaustive list of institutional changes and improvements is not possible, some of the current efforts to introduce changes that are reinforced by the project are highlighted below.

1) Reliability of Water Supply - At the watershed level, there is a need to better measure catchment potential or total water input into the system. Traditionally, "empirical formulas" were used to estimate water supply based on rainfall data and terrain/vegetation characteristics. These formulas were developed long ago and, at best, provide only a rough estimate of water

recharge in a given annual cycle. Madhya Pradesh is now installing an additional 543 gauging stations to obtain more precise measurements for making hydrologic predictions. The project will provide technical assistance in formulating system models which, using this improved data base, will be able to forecast watershed yields. A grant-financed mini-computer will be used to make model simulations, a useful management tool, to better predict and allocate limited water resources within the system.

2) Effective Utilization of Water - Crop water requirements are now being calculated according to recommended cropping patterns developed by AD and based on area climatological data. For planning purposes, efficiencies and requirements of land preparation will be incorporated in canal design and better analysis of conveyance losses will be undertaken. Groundwater potential and its conjunctive uses with surface water supplies will be more fully explored including crop rotational possibilities.

3) Dams and Reservoirs - Construction quality will be upgraded in practice and brought up to acceptable standards. A study will be undertaken of the distribution of sediment deposits within storage areas of existing projects. A program will be established for MIS systems being constructed under the project for selected surveys every five years to determine actual level of sedimentation. Reservoir operation studies will also be carried out to ensure availability of water supplies to the proposed cropping pattern.

4) Surveying and Mapping - Before final location of the distribution system is established, a detailed soil and topographic survey will be made. The maps generated from these surveys will be used by ID and AD staff in determining the best canal alignment given local soil and slope characteristics.

5) Planning Procedures - Under this project, the irrigation system capacities will be designed from the farmers' field upwards based on knowledge of cropping patterns, soil data, topography and plant water requirements.

6) Land Development - Improvements on individual farmers' fields will include land shaping/levelling, on-farm water distribution channels, water control structures and provision for surface drainage.

7) Watercourses and Field Channels - In this project, ID will be responsible for the planning, design and construction of watercourses and field channels below the public outlet extending to individual farmer's holdings or 2 ha. whichever is more. The watercourses and field channels shall have sufficient water control structures to provide full design discharge to the farm.

B. Financial Analysis

1. Financial Effect on Project Participants

The principal participants with which this analysis is concerned are the small farmers within a minor irrigation scheme command area. Given efficient operation a minor irrigation system will increase the reliability of water supply for crop irrigation, and thus reduce weather related risks in farming. The full utilization of irrigation water will raise both expenditures and incomes accruing to the farmer. The tables presented below show comparative incomes and expenditures for a typical two hectare farm with or without irrigation. The crops selected are representative of the region and crop mix grown by small farmers. Crop yields and corresponding output and input prices are those estimated by the World Bank for its M.P. Medium Irrigation Project (Staff Appraisal report, Madhya Pradesh Irrigation Project - 3260-IN dated February 18, 1981). Income and expenditure figures for a farm family without irrigation assume a cropping intensity equal to 100 percent. Figures for a farm family with irrigation assume a cropping intensity of 160 percent which is below the current national average for irrigated agriculture (170 percent). On the whole, the use of with and without cropping intensities tends to make the calculation of net-farm income, as shown below, to be conservative.

Illustrative Comparison of Income and Expenditures

For a two Hectare Farm

a. INCOME

CROP		Without Irrigation			With Irrigation		
		Area Cropped	Output 100 kgs	G.Income Rs.	Area Cropped	Output 100 kgs	G.Income Rs.
Kharif:	Sorghum	0.5	4.3	550	0.2	5.4	692
	Pulses	0.5	3.0	666	0.2	2.0	444
	Paddy	0.5	6.5	1,020	1.0	27.0	3,321
Rabi :	Wheat	0.5	3.0	528	1.0	35.0	5.320
	Gram	-	-	-	0.[illegible]	3.6	720
	Fodder	-	-	-	0.0[illegible]	8.0	168
Perennial:							
	Sugarcane	-	-		0.5	35.0	455
				2,764			11,120

b. EXPENDITURE

	Without Irrigation Rs	With Irrigation Rs
Seed	300	1,370
Fertilizer	-	1,035
Water Charges	-	225
Others1/	650	2,000
	950	4,630
c. NET INCOME	1,814	6,490

1/ Cost of labour and interest etc.

The above analysis suggests that a two hectare farmer, with an increase in cropping intensity of only 60% and addition of some cash crops to his annual crop mix, can increase his net income by 256%, from Rs.1,814 ($181) to Rs.6,490 ($649). The development of this irrigation project will not only benefit the small farmer by raising his net income through relatively assured water supply but will also offer more employment opportunities to the unemployed rural labor force.

2. Financial Effect on Implementing Agency

The Irrigation Department of the Government of Madhya Pradesh receives an allocation of funds annually, under the Five Year Plan of the Government of India. Most of these funds are used for the construction of irrigation facilities. As a matter of policy, capital costs are not recovered from users. However, the state does seek to recover annual recurring costs for operation and maintenance through water charges. The present rate of water charges averages approximately Rs. 140 per ha. depending on the cropping pattern. In addition, other CESS and taxes bring the total charges to approximately Rs. 170 per ha. irrigated area. It is estimated that these charges are sufficient to cover the O&M costs related to the minor irrigation schemes.

C. Economic Analysis

1. GOMP Project Appraisal

Estimates of benefits and costs are currently developed by the GOMP Irrigation Department for major and medium irrigation projects. However, in the case of minor irrigation schemes (MIS)

economic feasibility considerations are totally ignored. Under existing procedures, only the percentage of cost recovery at the end of the twentieth year is calculated. Included as costs in this calculation are capital costs of dams and canals plus interest on invested capital (4.5%). Returns are calculated as the sum of revenue from the betterment levy, water taxes and irrigation cess minus annual operation and maintenance costs. The undiscounted costs and revenues are then summed over 20 years. The percentage capital cost recovered equals the sum of the revenues divided by the sum of costs, multiplied by 100.

2. Project MIS Appraisal

The shortcomings of the above procedure have been noted by GOMP and AID during intensive project review. Therefore, under this project, more rigorous economic feasibility criteria will be applied to determine MIS subproject eligibility for AID loan financing. To accomplish this, the project will establish the Special Appraisal and Supervision Cell (SASC) supported by an appraisal division. This division will evaluate benefits/costs with and without the project. Where appropriate, shadow pricing will be used where market prices are either distorted or non-existent. The estimated net project benefit stream is then discounted by the discount rate necessary to yield a present value of zero. The economic rate of return (ERR) is equal to this discount rate and permits comparisons among projects. The ERR for a proposed MIS subproject is considered acceptable when it is equal to at least 12 percent. However, in the case or tribal or scheduled caste areas this approval threshold may be lowered to 10 percent. The Minor Irrigation Committee (MIC) will have subproject approval authority, based on conventional economic feasibility criteria and recommendations of SASC.

3. Indicative Economic Returns

In order to demonstrate the economic feasibility of the project, an economic analysis was carried-out using a sample of four proposed MIS subprojects and three existing projects within the general project area. The agroclimatic characteristics and crop patterns are similar to those contemplated under this project. The useful life of MIS was estimated to be 25 years with adjustment for salvage value in the final year. The value of future crop production with irrigation was estimated using conservative yield assumptions, appropriately lagged over a transition period. These higher level outputs were multiplied by IBRD projected farm gate prices to obtain total gross income or total revenues. The opportunity cost of labor was estimated between Rs.2.1-2.7 per day and the unskilled labor component of MIS construction was estimated to be 60 percent. This

shadow pricing procedure favors the use of underemployed labor in subproject selection. For existing MIS projects, historical capital costs were used. Using the above methodology, the following economic rates of return (ERR) were calculated:

a. Proposed Subprojects	ERR%
Sironj	15.6
Ranipur	11.8
Sangwa	15.2
Richhai	8.4
b. Actual Subprojects	
Dhuwadhar	13.1
Dhukrikheda	12.6
Kunda	4.0

Based on this sample, there appears to be significant variation in the economic rates of return for minor irrigation schemes in Madhya Pradesh. Some of the reasons for the low rates of return include long transition periods in adopting irrigated agricultural techniques, delays in system construction, inadequate infrastructure below the main canals and inequitable water distribution.

The project will improve irrigation system planning and design as well as stimulate, through agricultural extension and local farmer groups, more rapid transition to irrigated agricultural practices. Therefore, the actual rates of return should be higher for the project than the sample rates shown above. In any case, only those subprojects which have an estimated economic return of 12 percent or more will qualify for project financing.

D. Social Soundness Analysis

1. Socio-Economic Setting

Madhya Pradesh is the largest state in India in terms of area, occupying the central portion of the country. Due to rapid demographic growth of 2.5% per annum, its population currently stands at 53.4 million. This population is predominantly rural (84 percent), with a high percentage of scheduled castes and tribes (33.2 percent). Despite the fact that the variation in rainfall makes irrigation a critical factor in influencing cropping intensity, only 11.6 percent of net sown area is irrigated at present. The median size farm in Madhya Pradesh is less than 2.0 hectares. Between

1970-77 the number of operational farms increased by 19 percent reducing the average size farm from 4.0 hectares to 3.6 hectares. The state is relatively poor with a per capita income of only about three-fourths the national average. Moreover, it is estimated that about 66 percent of the rural population lives below the domestic poverty line (US $80).

2. Social Consequences and Benefit Incidence

Irrigation Rules approved by the State in 1974 sought to establish an elected three-member "Irrigation Panchayat" in each village of a command area. However, farmer involvement especially in the planning and implementation of irrigation projects has been extremely limited. For example, in current M.P. minor irrigation schemes, the Panchayats scarcely exist. Part of the problem is that farmers seem reluctant to join such organizations until benefits become evident. Therefore, the reliable supply of water to the public outlet may be an important pre-condition for farmer involvement. Under this project model farm organizations will be established in the demonstration "chaks" to determine the feasibility of farmers taking a more active role in irrigation system management and operation.

At present, farmers located at the tailend of the system have had the least secure water supplies. Conveyance losses, maintenance problems and intervening irrigators may distort intended water distribution patterns to the detriment of the tailender. This problem tends to become more serious the larger the chak size. Therefore, in this project chak size will be relatively small, perhaps involving only 4-8 farm families. This is possible due to the smaller overall scale of minor irrigation systems. Thus MISs have the advantage that a relatively small number of farmers will have to cooperate to assure water supplies to farm fields and work out appropriate maintenance procedures. Improved extension services provided, under the project, will further increase yields within the command areas.

Finally, for this project the GOMP has agreed to adopt a Rotational Water Supply (RWS) or Demand system which provides water in a more predictable fashion and in an amount proportional to individual landholdings. The farmer will decide based on this allotment, how much of his land he wants irrigated and the relative moisture intensity of the crops grown.

In terms of employment, it is estimated that an irrigated and fertilized hectare requires about 122 person-days of labor per year as compared to 74 days for a rainfed hectare of land.

Therefore, this project should increase annual employment by 7,216 workyears. In addition, there will be approximately 30,000 personyears of employment required to construct 50 minor irrigation schemes.

3. Spread Effects

Although AID financed minor irrigation schemes in Madhya Pradesh will be a small fraction of the total number of such systems, their significance lies in the fact that they will serve as models for replication and a focal point for irrigation technology development. A major innovative aspect of the project will be the setting up of demonstration chaks. Farmers will be shown the value of land development for optimal water utilization, the importance of timely sowing and use of high yielding seed varieties, together with complementary inputs such as fertilizers.

4. Effects on Women

In India, women constitute approximately 35 percent of agricultural labor force. In Madhya Pradesh, and particularly in the Narmada Basin, women's participation in agricultural activities may be expected to be higher due to tribal cultural norms. The proposed project plans to have a model water management organization to be initially set up in the demonstration chaks. This organization would include women so that women's role in the operation and maintenance of the irrigation system will be adequately recognized.

To develop additional baseline information on the effects of irrigation on women and to identify possible adverse effects and remedial measures, socio-economic surveys will be carried out. In terms of professional development, the project proposes training programs and workshops. Where appropriate, all these training programs and workshops will invite the participation of women.

E. Administrative Analysis

The successful implementation of the project will require close coordination, at the state level, between the Departments of Irrigation (ID) and Agriculture (AD). The responsibility for planning, design and construction of Minor Irrigation Schemes (MIS) rests with the Irrigation Department. This department has overall responsibility for surface irrigation development within the state and promotes groundwater development activities as well. The Agriculture Department is responsible for extension services including soil surveys and land development activities as well as ensuring that agricultural inputs such as improved seeds, fertilizers

and pesticides are available to the farmer. Coordination between these departments in implementing the project will be carried out through joint administrative arrangements. The Minor Irrigation Committee (MIC) which approves all subprojects will be composed of high ranking officials from each department. A Special Appraisal and Supervision Cell (SASC) also set-up under the project, will similarly consist of both irrigation engineers and agricultural officials who will actually monitor project implementation on a day-to-day basis.

1. Irrigation Department (ID)

Irrigation in Madhya Pradesh is administered by three Ministers as follows:

- Minister for Major and Medium Irrigation Projects,
- Minister for Minor Irrigation Projects, and
- Minister for Narmada Valley Development(major Projects only).

There are two Secretaries, one for the Major and Medium Projects and the other for Narmada Valley Development. A Special Secretary looks after Minor Irrigation works in the entire state. The three Secretaries receive technical support from an Engineer-in-Chief (E-in-C) and 20 Chief Engineers (CE). The Chief Engineers oversee survey, investigation, planning, design, implementation, operation and maintenance activities of irrigation schemes. At the field level, the basic implementation unit is referred to as a "circle" and is headed by a Superintending Engineer (SE). This unit is responsible for irrigation activities down to the public outlet. The existing ID staff consists of 11,724 engineers, of which, 877 engineers have been assigned to MIS subprojects in the Narmada Basin.

For subprojects financed by AID, the Irrigation Department will provide staff and budgets in conformity with agreed upon counterpart contribution. Both ID and USAID will review the capabilities of staff assigned and carry out professional development and training programs, as appropriate.

2. Agriculture Development (AD)

The Agriculture Department is headed by an Agricultural Production Commissioner who is assisted by the Director of Agriculture. There are three Additional Directors; one each for extension; minor irrigation and dry farming; and project preparation planning and monitoring of externally aided projects respectively. For the Narmada Basin area, there are four Regional Joint Directors

who are supported by Subject-Matter Specialists and Extension Officers including Village Agricultural Extension Officer (VAEO). The major activities of AD include agricultural extension, applied research, supply of improved seeds, supply of fertilizer and pesticide inputs as well as soil and water conservation programs. In general, the existing organizational set-up is not adequate for intensive irrigated agricultural development and will be strengthened in the Narmada Basin project area.

An important AD activity, under the project, will be land development works to make more effective use of irrigation water. Initially, this will be carried out on demonstration chaks and replicated by farmers using credit financing. The land development activities will include land leveling or shaping, construction of field drainage networks and field access roads. At present, the soil conservation units deployed in the Narmada Basin are engaged in carrying out conventional soil conservation activities and, therefore, are not being utilized for on-farm land development activities on minor irrigation schemes.

There are forty-five districts within the state of Madhya Pradesh, of which, fifteen are part of the Intensive Agricultural Extension Program (PhaseI) supported by a World Bank financed Agricultural Extension Project. These districts are being reorganized with World Bank assistance to provide intensive agricultural extension programs geared to irrigation farming. The remaining 30 districts will be covered by a follow-on Agricultural Extension Project.

With the establishment of a State Seed and Farm Corporation, 121 improved seed producing farms will be consolidated and a network of sales outlets set-up. Fertilizers, on the other hand, are distributed through cooperatives and private channels which together have 6,900 retailers. Similarly, the marketing of pesticides is handled by the Agro Industries Development Corporation and a network of private dealers. Finally, the Madhya Pradesh State Cooperative Land Development Bank disburses long-term credit to farmers and 45 affiliated District Land Development Banks with 260 branches throughout the State.

3. Project Implementation

While the Irrigation Department will be responsible for the design and construction of civil works, the Agriculture Department will provide appropriate information and support to the farmers for on-farm development works, agricultural extension, cropping pattern recommendations, soil surveys, supply of inputs (seeds, fertilizers

and pesticides) and credit. There will be a special cell established under the project to coordinate MIS planning, design and appraisal. This cell will monitor implementation and operational effectiveness of completed MISs. This cell, the Special Appraisal and Supervision Cell (SASC) will be headed by a superintending engineer, selected from ID staff.

To streamline and accelerate the appraisal and approval process for MIS subprojects, ID will establish, within the SASC, an Appraisal Division. The Appraisal Division will coordinate and prepare MIS appraisal reports to be submitted to the Minor Irrigation Committee (MIC) for approval. The MIC will be chaired by the E-in-C and will have representatives from the departments of Irrigation, Finance and Agriculture. The ID will be responsible for MIS implementation from headworks (dam) down to the construction of field channels leading to individual farms or 2 ha. blocks whichever is larger.

In addition to the appraisal divisions, an Implementation, Operation, Monitoring and Evaluation Division (IOMED) will be established under the SASC. This unit will be headed by an Executive Engineer assisted by an interdisciplinary team which will include an agronomist, engineer, social scientist, and an agricultural economist. The IOMED will be responsible for monitoring all planning and construction phases of the project. In addition, the IOMED will monitor and evaluate MISs as they become operational and suggest possible improvements in the operating and maintenance procedures.

To improve construction quality under this scheme, quality control units will be established at the field level.

Experience gained in the Maharashtra Irrigation Technology and Management Project in the use of farmer's organizations to manage water distribution below the outlet and maintain watercourses and field channels will be utilized in this project. Efforts will be made by AD and ID to encourage farmer's organizations to take up operation, management and maintenance of the system below the public outlet. Alternative participatory models will also be developed under the project and fully implemented on a pilot basis in at least two subprojects. Successful modes of local organization and participation developed in the prototype subprojects will be replicated through 200 demonstration chaks (four in each MIS).

The project will provide grant support for technical assistance in a Water Management Improvement Program for ID and AD staff as well as field studies. The latter will focus on such topics as technical problems related to seepage losses along channel alignments, farmer organizations, credit availability as well as

collect socio-economic baseline data. In addition, the project grant will provide for in-service training, in the form of workshops in such areas as quality control, operation and maintenance, soil survey investigations, economic analysis etc. There will also be training in the U.S. in such specialized fields as drainage, hydrology, sedimentation etc.

Finally, there will be two subprojects and 200 demonstration chaks for the testing and dissemination of new technologies and management systems. This feature of the project will facilitate technology transfer through testing under controlled conditions and by providing practical demonstrations for improving irrigation agriculture. The pilot subprojects will be used as research grounds to determine feasibility of demand irrigation systems using various kinds of water control and measurement equipment and water allocation schemes. The demonstration chaks will exhibit the impact of land development in improving irrigation water utilization; efficient water distribution and control techniques at the field level and farmer's involvement in sharing water and maintenance of water courses.

A Coordination Cell will be established under the SASC to assure full coordination of the above mentioned training, field studies and pilot project activities and proper dissemination of lessons learned.

F. Environmental Assessment

An Environmental Assessment (EA) is required for irrigation or water management projects as stated in AID's environmental regulations 22 CFR 216.3(3)d. Accordingly, the Mission has prepared a scoping statement which was approved in AID/W on June 17, 1982 (STATE 165757). A copy of the approved scoping statement is contained in Volume II of the project paper. The possible adverse impacts on the environment as identified by the scoping statement will be monitored and reviewed during project implementation. Where necessary, appropriate design changes will be made based on site specific conditions so as to prevent any serious environmental damage due to the project.

VIII. CONDITIONS AND COVENANTS

A. Conditions Precedent to Disbursement

Prior to the first disbursement of the loan assistance, or to the issuance of A.I.D. of documentation pursuant to which disbursement will be made, the Cooperating Country will, except as

A.I.D. may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(1) An opinion of counsel acceptable to A.I.D. that this Agreement has been duly authorized and/or ratified by, and executed on behalf on behalf of the Cooperating Country and that it constitutes a valid and legally binding obligation of the Cooperating Country in accordance with all of its of its terms;

(2) A statement of the names of the persons holding or acting in the office of the Cooperating Country specified in Section 9.2., and a specimen signature of each person specified in such statement;

(3) Evidence that the Minor Irrigation Committee (MIC) and a Special Appraisal and Supervision Cell (SASC) including the Appraisal Divisions and the Implementation Operation Monitoring and Evaluation Division (IOMED) unit have been established within the Irrigation Department of Madhya Pradesh and are sufficiently staffed to initiate project planning and implementation.

(4) Confirmation that sufficient budgetary resources are available to the State government of Madhya Pradesh under the Sixth Five Year Development Plan to meet counterpart requirements and begin effective implementation of the project.

B. Special Covenants

1. The Cooperating Country agrees to carry out and use detailed soil and topographical surveys for planning the irrigation and drainage network.

2. The Cooperating Country agrees to establish a special Demonstration Chak Unit within the Agriculture Department of the Government of Madhya Pradesh and to staff such unit to coordinate and manage the demonstration chaks.

3. The Cooperating Country agrees to establish an adequate number of positions within the Irrigation and Agriculture Departments and to post 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 apprroved subproject MISs.

4. The Cooperating Country agrees to appoint Project Managers from either Irrigation Department or Agriculture Department for the Operation and Management of subprojects (in groups of three or four) and ensure timely, reliable and equitable water deliveries.

IX. EVALUATION ARRANGEMENTS

1. Regular Evaluations

The GOMP and USAID will conduct regular annual project evaluations following the signing of the project agreement. These evaluations will cover the physical and financial progress of the project, extent of farmer involvement, progress of in-country and U.S. training, and the progress of special studies, pilot projects and demonstration chaks. The evaluations will be carried out using GOMP and USAID officers and will identify constraints to progress and recommend remedies and follow-up action.

2. Baseline Surveys

Detailed socio-economic baseline surveys for selected subprojects will be conducted by the GOMP, either directly or with contract assistance. AID will provide grant financing of these studies as part of the project. Particular attention will be paid to assessing the situation in the market town or towns serving the command areas of subprojects. This will include an assessment of the off-site employment generating effects of irrigation development as well as the adequacy of input systems. Baseline data will be used in the mid-project evaluation and for post-project evaluations.

3. In-Depth Evaluations

An in-depth evaluation is scheduled for the end of the third project year. It will examine the results of the special studies; effectiveness of training and progress thus far in planning, designing and construction of physical works. The role and effectiveness of the Irrigation Management and Training Project in the training and studies will be evaluated. Further training and studies required for the implementation of the project will be identified

At the end of the project, an in-depth evaluation will be carried out to assess the impact that the project has on the irrigation sector in Madhya Pradesh and the replication potential. Special attention will be directed to whether further AID assistance is needed in the irrigation sector to consolidate and institutionalize the technology gains and to assure their spread throughout Madhya Pradesh. The success and general applicability of the pilot projects will also be given special attention.

The two in-depth evaluations will be carried out utilizing outside contract assistance as necessary, combined with appropriate staff resources from GOMP, GOI and USAID.

Annex A

RESPONSES TO PID ISSUES

From STATE 203550

1. Social Criteria in Scheme Selection: Scheme appraisal reports submitted to the Government of Madhya Pradesh (GOMP) for approval and inclusion in AID funded projects should include social indicators measuring motivation, cooperativeness and capacity for self management of farmers who receive irrigation. Mission might consider social readiness pre-conditions or tests which could reveal more deserving claimants. How can we direct irrigation investment to those likely to use it well? We realize this is and ambitious field for innovation and exploration with the GOMP, especially with counterpart organizations dominated by an engineering perspective, but, in past, selection of hydrological, rate of return or political grounds has in some cases not resulted in effective irrigation.

While the use of social indicators is still evolving,they have been used in forestry,irrigation, soil conservation and watershed management projects.

In Pakistan, the social criteria used included size of holdings, land tenure, previous history of dealing with collective goods and services e.g.schools, mosques, roads, health, extension and cooperatives which can indicate the level of community interest and commitment.

Data from various studies suggest that past behavior in terms of cooperation and conflict related to collective goods and services provide some indication of likely community response. Thus it is inprobable, in an area where conflict prevails, that cohesive social groups can easily be formed when irrigation water becomes available. Since water is a collective or publicly-owned goods it could easily increase levels of conflict. One approach would be to test the level of interest and commitment for an irrigation project before it is approved. For example, how much do farmers want irrigation? How much are farmers willing to commit to the program? Commitment can be translated into a substantive contribution of labor, materials and services. In Pakistan and the Philippines, sites and systems were selected where farmers agreed to do the following:

- provide labor for developing the on-farm system;
- provide materials for structures and watercourses;
- provide or borrow funds for precision land leveling and farm developlment;
- settle disputes over land, trees, water or other significant matters;
- supervise local improvements;
- form an informal or formal committee for project activities and for a common voice to relevant authorities;
- establish a method for maintenance and discipline of offenders.

The mission intends to seek help early in the project, from the WMSP II, or other sources as appropriate to provide TA assistance for on the job training to collect and interpret appropriate social data (Vol. II, Chapter 1 Section C.5(b). Under the project, minor irrigation scheme (MIS) subproject approval will be the responsibility of the Minor Irrigation Committee (MIC) consisting of representatives from the Irrigation, Agriculture and Finance Departments. The Appraisal Division within the Special Appraisal and Supervision Cell (SASC) will prepare subproject proposals for MIC consideration, incorporating a variety of feasibility criteria. These criteria will include engineering design considerations related to local topography and soil characteristics; value of agricultural output; caste and tribal characteristics of the area and the economic rate of return on irrigation investment as well as other criteria deemed important for successful subproject implementation and operation. To assure that agricultural development aspects of the project are properly evaluated, a high level agricultural officer from the Agriculture Department will be appointed to the Appraisal Division. Thus, the selection and approval of subprojects will avoid some of the limitations associated with a narrow engineering perspective through the above administrative process (Vol. II, Chapter 1, Section B.3).

In addition, the project will carryout a number of field studies on experimental MIS subprojects and various demonstration chaks. These studies will collect baseline socio-economic data which can be used to test the validity of social indicators in order to identify more objectively the level of community readiness. As various social indicators are tested and correlated with successful local participation, they can be incorporated into the MIS selection and approval process, as described above. This approach will gradually institutionalize social criteria into irrigation system design. This will increase the probability of effective community utilization and maintenance of irrigation systems (Vol. II, Chapter 1, Section C.2 and 3).

2. Farmer Contribution: PP should indicate the portion of investment to be made by beneficiaries in selected schemes. Farmers' participation in canal layout, construction and operation could enhance project benefits and likelihood of debt repayment. Forms of participation such as labor contributions, water user groups, waribundi should be examined, especially for on-going operations and maintenance below the public outlet.

This project provides for the active participation of farmers in the alignment and location of individual turnouts. In addition, the Agriculture Department will form a special coordinating cell to establish four demonstration chaks in each of the MISs. This cell will have as one of its responsibilities working with the farmers in the individual demonstration chaks to assist in the formation of water user groups or committees. These committees will be responsible for the operation, distribution and maintenance of the irrigation system within the demonstration chaks. As experience is gained in working with the committees, additional chak committees will be formed within the same minor scheme. Gradually a minor committee might be formed for the operation and maintenance of a entire minor canal serving approximately 100 ha of land. If successful, the minor committees could be further aggregated into distributary committees and eventually into a full canal command organization based on practical lessons learned in the field. These various committees would then take over the responsibility for the operation and maintenance of the MIS systems, using funds derived from water user charges and/or labor provided in-kind (Section Vol. II Chapter I.C.3, Chapter II.E.5 and H, Chapter III.E. and Chapter IV.B. for more discussion on farmer participation).

3. Design of Schemes: The PID indicates that minor irrigation schemes can be understood, designed and managed as smaller versions of medium schemes, i.e. that significant differences in concept, technical sophistication, managerial complexity and operations do not appear until the level of village tank irrigation is reached. APAC discussed whether medium irrigation assumptions especially regarding participation, investment by benfeciaries and the role of Panchayats are valid for minor irrigation. PP should discuss this point, particularly whether domination by the irrigation department in design, construction and maintenance above the public outlets, as practiced in medium irrigation, is appropriate for this project.

Farmer participation in chak, minor, distributary and main canal committees is a valid concept regardless of the type of irrigation system (minor, medium or major). At this stage of development in India and with the degree of technical expertise available, it is appropriate for the Irrigation and Agriculture Departments to continue to be involved in the design,

construction and maintenance of the projects above the public outlet (Vol. II, Chapter 1, Section B.2). Nevertheless, it is recognized that the current planning and design approach of ending the distribution system at the 40-100 ha. outlet often results in systems that are unable to deliver water to individual farmers. The project is designed to extend the physical system down to the farm gate. This will require additional effort in the planning and design of the systems. One of the objectives of the project will be to lessen the burden (financial and manpower) on the public system by having private consultants begin to take over the role of planning and design of some of these MISs, by relying more on users for management, operation and maintenance, etc. As private sector capacity grows in these types of activities, government involvement can be reduced.

4. Pilot Schemes: Request Mission consider whether one or two schemes can be exempted from selection criteria for experimentation in design, Qte ownership unqte, contracting and maintenance. For example, on a small scheme, say 200 hectares, could a panchayat be the owner and contractor for design and construction services from the irrigation department or a private contractor, as an experiment?

Two control pilot schemes have been included in this project. The purpose of the control pilot projects is to demonstrate the feasibility of utilizing sophisticated design and water control equipment coupled with improved management from the planning through the operation stages thereby optimizing irrigated agricultural production. One of the control projects will focus on utilizing different management modes, including ownership of facilities, to contract for the design, operation and maintenance of projects or project components. In addition, the same types of management models will be tested on a control project utilizing the latest sophisticated designs and equipment to provide a mechanism for supplying water to individual farmers when they need it. The management modes, devices and equipment that are found to be most successful during this process can then be replicated on other irrigation projects throughout the region and with some adaptation throughout Madhya Pradesh (Vol. II, Chapter 1, Section C.5).

5. Ancillary Services: The PP must show that the state government and other agencies can deliver necessary ancillary inputs (credit, warehouses, etc.) in a timely and effective fashion. A careful analysis of the experience in Madhya Pradesh of current minor irrigation initiatives should be undertaken.

Ancillary services including the timely provision of agricultural inputs are the responsibility the state Agriculture Department.

Agricultural credit, improved seed and chemical fertilizers are provided by public sector enterprises working with private sector wholesalers and retailers to ensure effective distribution to the farmer. There is also a network of buffer stock storage centers which serve to stablize input supply and harvested production. The marketing of pest control chemicals is normally carried-out by private dealers in conjunction with agriculture extension personnel who are introducing the use of plant protection equipment. Under the project, a monitoring and evaluation unit will be established to review periodically the availability and utilization of inputs as well as ancillary services in the project area. Furthermore, marketing facilities are being upgraded and improved to handle the expected increase in agricultural production as a result of irrigation development (Vol. II, Chapter III, Section D.3,4,5).

To date, experience with minor irrigation schemes in Madhya Pradesh has been limited. Traditionally, the state has allocated most of its irrigation resources to larger irrigation schemes. However, the World Bank has financed two major and medium irrigation schemes within the state and progress has been satisfactory. Moreover, the Bank is also upgrading the agricultural extension service to expedite the transition from rainfed to irrigated agriculture. Hence, there appears to be no serious difficulty either from a technical or financial view point to the successful implementation of minor irrigation schemes in Madhya Pradesh.

6. Monitoring and Evaluation: The PP should describe in detail what the management information system employed for minor irrigation schemes will be. For example, will cropping pattern, hectares watered and yields be monitored? Each season? In each scheme? Who will do this and how? How will the monitoring report get to decision makers? Who will carry out the decisions? Who is accountable at each stage in the system and for the system as a whole? Will multi-disciplinary teams for monitoring and evaluation by developed as on the Mahi Kadana project in Gujarat?

The monitoring and evaluation of this project will be mainly carried out by the Implementation Operation, Monitoring and Evaluation Division (IOMED) of the Special Appraisal and Supervisory Cell (SASC). The Mission staff time required to review and assist in implementation has been quantified, along with possible problem areas as outlined in the monitoring plan (Section VI). The project will be monitored and evaluated periodically to measure progress towards MIS development and resulting improvements in agricultural productivity in command areas. Field data will be obtained from irrigation engineers on

site as well as from agricultural extension agents working in the field. The evaluation plan (Section IX) shows the timing of indepth evaluation to measure attainment of project purpose. A management information system will be developed within the IOMED of the SASC. This unit will be staffed by a multi-disciplinary team consisting of an executive engineer/assistant engineers; agricultural economist; statistician and a social scientist. The information system will utilize socio-economic data collected in baseline studies, engineering reports, agricultural extension agents reports supplemented by direct field supervision. The IOMED will be responsible for evaluating the performance of the MISs as they become operational and to feed the results of the evaluation back into the design process. The IOMED will report directly to the Engineer in chief and the Minor Irrigation Committee (Vol. II, Chapter 1 Section B.4.c, B.5).

7. Training: Training of training and visitation (T&V) personnel would appear to be very important, as extension service is vital. This should be described in detail. This project if innovative might porovide a model to other projects where extension is a problem.

Improvement of the Madhya Pradesh extension service is already underway. The World Bank has in collaboration with GOMP developed a model for providing improved extension services to the farmer. The Mission has reviewed progress to date and finds the World Bank project to be both technically sound and supportive of this project. In addition, under this project the GOMP will intensify the extension effort even further by providing water management specialist for every 2000 ha and adding additional VAEO's and subdivisional officers. Training of extension personnel to be assigned to this project is also provided as project cost (Vol. II Chapter III, Section D.2).

8. Adequate technology: Given shortages of cement and different technological solutions to physical design problems that may be required, the PP must indicate how the planned investment and implementation schedule will be kept on course, i.e. that sufficient opportunities for scheme development will be present in which technological obstacles would not delay progress. At the same time, a contribution, through this project, to the solution to previously intractable problems in this field would be welcomed.

The relatively small scale of minor irrigation schemes suggests that large amounts of cement will not be required for headwork construction. Moreover, canal lining will only be undertaken where local soil conditions indicate severe seepage or canal wall deterioration without proper lining. There are ten special field studies identified (Chapter 1, Vol. II) which investigate

different technological solutions to identify possible problems. These studies will also include a review of similar studies being carried out by USAID and the World Bank in other states to benefit from lessons learned. The actual selection of MISs for this project will represent a small subset of GOMP planned scheme development over the next twenty years. The project will rigorously evaluate fifty of those minor schemes to determine suitability for AID financing under this loan. The actual construction of an MIS should take no longer than four years given the area commanded and required scale of infrastructure. Some of the design and construction work will be contracted to the private sector, with penalties for delayed performance of contract.

9. Environmental Assessment: APAC concurred with Mission's decision to conduct an environmental assessment based on issues identified in scoping statement. The scoping statement must be cleared by the Asia Bureau's environmental officer.

The Mission Environmental Assessment (Chapter V, Vol. II) found that no significant damage to the environment is likely to result from minor irrigation systems. The scoping statement was reviewed and approved by AID/W on June 17, 1982 (STATE 165757).

10. Mission Implementation: The PP's implementation plan should explain clearly the means by which the Mission's technical staff will implement the project, including monitoring and evaluation, since there will be numerous concurrent irrigation projects demanding staff attention in several states.

The Mission will devote the equivalent of one FSN technician and part-time USDH for the implementation, monitoring and evaluation of this project. Sections VI and IX of the project paper show estimated USAID staff requirements.

MADHYA PRADESH MINOR IRRIGATION LOGFRAME

ANNEX B

	Narrative Summary	Objectively Verifiable Indicators
Goal:	Increase rural production and incomes by providing improved on-farm employment opportunities. Increase food grain and fiber production for growing population	Value added of annual agricultural production before and after irrigation. Net incomes increased from US $1.25 million to US $8.5 million. Annual food and fiber production increased from 17,500 M.T. to 50,000 M.T. at full development.
Purpose:	Increase irrigation coverage and efficiency through improved technology and management	Minor irrigation systems using improved design, engineering and construction standards in operation and having water use efficiency of 60% as compared to current systems of 25 to 35%.
Outputs:	1. Minor irrigation systems planned, designed and constructed 2. Irrigation and agriculture department staff trained in 'service' management systems 3. Local farmers organized for operation and maintenance of minor irrigation systems 4. Pilot-projects using alternative technology and management modes 5. Demonstration "chaks" for dissimenation of tested technology and management systems 6. Socio-economic studies.	1. Fifty (50) minor irrigation systems completed 2. In-country training for 1525 ID and AD personnel plus 40 officers trained in the U.S. 3. Fifty (50) farmer groups organized. 4. Two pilot projects in different agro-climitic zones testing alternative technologies and management modes. 5. 200 demonstration "chaks" located in project area 6. Ten socio-economic studies completed using data drawn from sub-project sites.
Inputs:	1. Financial support for construction 2. Technical assistance 3. In-country and U.S. Training 4. Contractor support for field studies and pilot projects 5. Procurement of special equipment guides, reference books etc.	1. $41 million credit disbursed 2. 120 person month 3. 79 in-country training workshops and about six U.S. training courses/observation - study tours conducted 4. 18 person months of liason and coordination support for field studies and 70 person months of contractor support on pilot projects 5. Procurement action of $1.3 million 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 V Project Paper. (b) Yes, see Section IV 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?	Yes, see Annex E of Project Paper.
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.	No, because multilateral and other donors have similar projects and the GOI requested AID assistance in this case. However, the project will benefit other, similar projects in Madhya Pradesh and elsewhere in fields of irrigation and agricultural development. Regional development programs are not pertinent to minor irrigation projects.
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 construction and technical assistance contracts. (c) Yes, especially rural credit institutions and water-user cooperative committees. (d) Not applicable (e) Yes, especially irrigation as managed by the Government of Madhya Pradesh. (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(n). 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 participion 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

Section 611 (e) Certification
MADHYA PRADESH MINOR IRRIGATION SCHEMES PROJECT

This project will loan-finance 67 percent of eligible construction costs and grant-finance 100 percent of associated long and short-term technical assistance and coordination, training and research costs of fifty minor irrigation subprojects planned by the Government of Madhya Pradesh to test and demonstrate ways to improve the efficiency of irrigation in Madhya Pradesh.

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 Government of Madhya Pradesh 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

Annex E

GLOSSARY

GENERAL TERMS

Conjunctive Use:	Combined use of surface and groundwater in order to meet crop water requirements. Not only does the use of groundwater supplement surface water supplies, but also it reduces the likelihood of waterlogging.
Cropping Intensity:	Total area cropped in a year (all the seasons) expressed as a percent of CCA.
Mandi:	Market
Waterlogging:	Saturation of soil pores by excessive water, causing oxygen depletion and anerobic conditions which can adversely affect soil fertility and plant growth. The condition is usually associated with poor drainage, heavy soils and high water tables. It can often be mitigated by increasing use of groundwater through tubewells or dugwells.
Water Management:	The coordination of various public and private sector entities such as farmers and farmer organizations, irrigation and agriculture departments, markets and credit facilities to provide, when and in the quantity and form required, all information, inputs and facilities necessary to maximize the efficiency of water in the production of crops.

SEASONS

Kharif:	Monsoon (rainy season), mid-June to mid-October.
Hot Weather:	Summer, April to mid-June.
Rabi:	Winter, mid-October to March.

IRRIGATION AREAS

Chak:	Irrigation service area served by a single watercourse outlet. Chak size normally varies from 40 to 100 ha. on this project the average chak size will be 8 ha.
Culturable Command Area (CCA):	That portion of the gross command area which is cultivable.
Gross Command Area (GCA):	The total area within the boundaries of an irrigation project, including the areas covered by roads, villages, and both cultivable and uncultivable lands.
Gross Cropped Area:	An unofficial term, generally meaning the total area cropped during the three cropping seasons in a year. Three hectares, each cropped twice during the year, would be counted as six hectares.
Net Cropped Area:	Generally means land cropped at least once during a year. A given parcel of land cropped more than once would only be counted once.

IRRIGATION PROJECTS

Major:	Irrigation project commanding a CCA of more than 10,000 hectares.
Medium:	Irrigation project commanding a CCA ranging between 2,000 to 10,000 hectares.
Minor:	Irrigation schemes commanding a CCA ranging between 40 to 2,000 hectares.

DISTRIBUTION NETWORK

Main Canal:	Canal feeding directly from a reservoir or river.
Branch Canal:	Canal feeding directly from the main canal for distributing water throughout the command area.

Distributary Canal:	Tertiary level channel, taking water from either the main canal or from a branch canal, and supplying water to a minor canal.
Minor Canal:	Smaller canal receiving water from distributaries and supplyng outlets.
Watercourse:	Irrigation channel constructed to convey water from a canal outlet serving approximately 40 hectares to a five to eight hectare block.
Field Channel:	The water conveyance channel beginning at five to eight hectare outlet on the watercourse and ending at the farmgate.
On-farm Channel:	Water conveyance channel located without individual farm holding.
Outlet:	The outlet from the government controlled channel serving an area of 40 to 100 hectare chaks. On this project, the outlet will serve five to eight hectare chaks. The outlet will discharge into field channels or on-farm channels.
Turn-out:	Water inlet point for the individual farms from the field channels.

CROPS

Bajra:	Pearl Millet.
Jowar:	Sorghum.

MADHYA PRADESH MINOR IRRIGATION PROJECT, 386-0483
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 Madhya Pradesh Minor Irrigation Project.

Signature _____
M. Peter McPherson
Administrator

July 29, 1983
Date

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. .No.F.2(7)-BID/81-Vol.II

नई दिल्ली/New Delhi July 30, 1983

Dear Mrs. Boughton,

The Government of India hereby request for a loan of $ 31.4 Million and a grant of $ 3.7 Million for assisting the Madhya Pradesh Minor Irrigation Project in respect of which we have been having discussions in recent months. In terms of these discussions, the total cost of this project is estimated to be $ 62.5 Million. An amount of $ 27.4 Million would be provided or caused to be provided by the Government of India for this project.

I shall be grateful, if immediate action is taken for the authorisation of the amount specified above.

Yours sincerely,

(S. Sunder)

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