

PROJECT ASSISTANCE COMPLETION REPORT

MAHARASHTRA MINOR IRRIGATION PROJECT

(386-0490)

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## I. INTRODUCTION

Irrigation is a critical factor in India's agriculture and rural economy. In order to feed the ever growing population, India must increase agricultural productivity. Very little additional land can be brought under cultivation so increases in production must come from increasing cropping densities and yields which depend primarily on reliable water supplies. It has been shown that the agricultural productivity of irrigated land is more than double that of unirrigated land. In July 1984, USAID/I initiated the Maharashtra Minor Irrigation (MMI) Project since there was considerable potential in the State of Maharashtra for the improvement of agricultural production and for enlarging the area of irrigated lands.

The MMI Project involved the implementation of improved institutional and physical practices on small irrigation schemes. Minor Irrigation Schemes (MIS) are projects which irrigate 2000 hectares or less and are unique in that they tend to occur in remote areas of the upper reaches of the watershed where land conditions are generally poor, water availability is limited, and beneficiaries are from among the lower range of the socio-economic structure. MISs take much less time to construct and deliver water to the beneficiaries than do the larger medium and major schemes and do not give rise to environmental problems as compared to those larger projects.

## II. PROJECT GOAL AND PURPOSE

The goal of the MMI Project was to increase food production and rural employment in India in general and in Maharashtra in particular. The purpose was to increase irrigation efficiency in Maharashtra by improving the management and the physical infrastructure of minor irrigation systems and by improving the distribution, application and utilization of water below the public outlet.

A major obstacle to the most efficient use of water in India has been the irrigation bureaucracy's emphasis on major construction with little attention to overall scheme development or reliable, sustainable water delivery to end users. The MMI Project was designed to address this problem and to increase the performance of canal systems by providing flexibility in the scheduling of water deliveries; involving farmers from the start in the layout, operation, and management of the systems; and improving the skills of engineers (traditionally trained only to design the infrastructure) to operate the system effectively from the farmer's point of view.

Four project components were identified as essential for achieving the project's goal and purpose.

- Construction of 90 new Minor Irrigation Schemes (MIS) and the renovation of 12 existing schemes were planned under this component.
- Institutional Support and Development was to include the strengthening and creation of organizational structures in the Government of Maharashtra (GOM) relating to minor irrigation, the establishment of a computer data management program, and training in technical, analytical and managerial skills to improve the capacity of irrigation institutions and training of farm families to increase the productivity of water, land and labor.
- Studies and Pilot Activities were to include improvements in basic data collection and analysis procedures; the development and use of a computerized minor irrigation model; and the diagnostic analysis of 12 existing minor schemes, 6 special studies, 4 sets of baseline surveys, and 30 pilot activities to concentrate on key planning and technical design issues and to ensure the participation and involvement of the farmers.

- Hydrologic Data Base improvement was envisioned under this component with the establishment of 52 hydro-meteorological stations in the state in order to establish a more accurate data base for improved design of all types of irrigation projects.

By July 1991, when a USAID sponsored evaluation was completed, all 90 MISs had been planned and designed with farmer participation, 75 had been completed, and ten were near completion. Three new Government of Maharashtra/Irrigation Department (GOM/ID) institutions had been created and one reorganized. Two thousand four hundred Irrigation and Agriculture Department personnel, farmers and other scheme personnel had attended training courses in various water management related subjects. In addition, five special studies, seven pilot activities, and diagnostic analysis of the twelve schemes were completed. Of the 52 hydro-meteorological stations to be constructed, 51 have been completed and one was near completion. In the 13 months of implementation following the evaluation, additional accomplishments were added to the already impressive list. (See Attachment G for a summary of planned versus actual outputs.)

The evaluation team also found that the potential for economic benefit created by the project was very high. The higher cropping intensities, interest of farmers in growing high valued crops, and the increased use of groundwater are among the numerous factors that will result in improved economic benefits in the future. In addition, the rapid growth of irrigation created by the project is likely to create an increase in agriculture and agriculturally-related employment.

### III. PROJECT HISTORY

Initiated in 1984, the six-year MMI Project had original funding of \$88.7 million (AID contribution of \$46 million in loan funds and

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\$4 million in grant funds, with the Government of India (GOI) contributing the equivalent of \$38.7 million). In 1989, \$3 million was deobligated from AID loan funds. Due to the time taken to resolve procedural issues, i.e., establishing performance benchmarks linked to project payments and having the policies, operational procedures and benchmarks adopted by GOI/GOM, the project had a start-up delay of about 18 months. Unavoidable time was also lost in the initial identification of minor irrigation systems and land acquisition problems that required lengthy negotiations with both private parties and the state forest service. As a result, by the original project completion date, there would have been only four and a half years of actual work, compared to a planned six years, so the project was extended for two years until August 1992.

Since the objective of the project was not purely construction of MISs but also institutional development and improved irrigation performance, a system of disbursement, based on the performance of project goals, was adopted. The Performance Based Disbursement (PBD) System focused on better quality project planning, a more effective water delivery system and improved use of irrigation water below the public outlet. The following four benchmarks were identified as conditions for disbursement:

- 1) Scheme planned/designed by Regional Chief Engineer, appraised by Special Appraisal and Supervision Cell, approved by Minor Irrigation Committee and concurred to by USAID.
- 2) Design completed for the distribution system and Part I works supported by detailed maps and soil survey reports. Farmers participate in determining layout and accept the final plan.
- 3) Completion of preliminary work, 75 percent of the irrigation and drainage system, and 30 percent of Part I works of the command area. Completion of land acquisition.

4) Completion of the remaining 25 percent of irrigation and drainage system, remaining 70 percent of Part I works, resettlement of displaced land owners and organization of outlet committees in at least half of the command area.

In early 1991, an analysis of project status indicated that some project components, notably the catchment area treatment pilot and the rehabilitation of 12 existing MISs, were not feasible, and they were dropped from the project. Funds were reallocated and three supplementary benchmarks were designed and approved to solidify the institutional and policy orientation and impact of the project. The purpose of the recommitted funds was related to the formation and effective functioning of water user associations and the adoption of improved design criteria developed under the MMI Project to the entire minor irrigation sector in Maharashtra. The three supplemental benchmarks were:

- 1) GOM/ID supporting formation of water user associations to participate in operation and maintenance procedures and ultimately handing over the MIS to farmers' organizations.
- 2) Adoption of MMI Project's design criteria in the entire minor irrigation sector.
- 3) Adoption of performance and operation testing procedures in the entire minor irrigation sector. Creation of a cell in each of the six regions to assist in and monitor project implementation.

#### IV. PROJECT STATUS AND ACCOMPLISHMENTS

The evaluation noted that the early results of the MMI Project were extremely encouraging. The evaluation noted that the project had established itself as an excellent example of how innovative development assistance can be extended to small irrigation schemes. Relatively robust irrigation systems had been constructed and water

user groups had been formed that expressed confidence in their capacity to take over, operate and maintain the field channels as well as a willingness to consider managing and maintaining the entire water distribution system. The infrastructure was created to operate these systems at efficiency levels previously unknown in MISs. Evidence suggests application efficiencies far greater than in MISs not sponsored under this project.

One of the members of the evaluation team was so impressed by the results of the MMI Project that he wrote to the chairman of the Senate Foreign Relations Committee, Senator Claiborne Pell, to advise him of some of the project's accomplishments. "The conduct of this project has resulted in the development of a set of practices which will revolutionize small scale irrigation system development and operation in Maharashtra, and perhaps all across India. The project resulted, among other things, in new laws regulating the procedures for building and operating systems and for creating institutions to serve the farmers. The result is small scale irrigation systems which will be more efficient and environmentally sensitive. The key to the project was involving the farmers at the very first design stages and then having them work with the government through completion and operation. The procedures developed challenged and destroyed stereotypes that have been in place for over a 100 years. It is easy to pour concrete, (but) it is another matter to change the institutions that determine where and to what extent concrete will be poured, and this project did just that. Also, the project managers were wise enough to change and adjust goals and procedures as the project matured and new information became available. It is an amazing and exciting accomplishment."



#### A. Program Achievements

The evaluation team noted that a truly innovative approach to irrigation development evolved out of the project. "The project, when viewed as a whole, has established a 'package of practices' which may be essential for achieving dramatic increases in the productivity of investment in irrigation and coincidentally for managing minor irrigation schemes in an environmentally sustainable way. None of the elements in this package were new. What was new is the manner in which they were joined to produce a different approach to minor irrigation development in Maharashtra."

The elements in the package include: (1) a series of benchmarks which tie disbursements to defined stages of both works and institutional development, including the involvement of farmers' organizations; (2) performance testing of the distribution system; (3) a computerized crop planning and water scheduling system including the participation of the farmer; (4) the formation of farmers' organizations; and (5) a set of activities to facilitate the introduction of irrigated agriculture and follow up support by the Irrigation Department. While none of the components of the package is by itself sufficient to achieve the output potential inherent in the irrigation system, taken together there is evidence that they may revolutionize water application efficiency and the net returns from investment in MISs. There is the additional potential that this package can be transferred to medium and major schemes as well.

The use of performance oriented conditions and goals has proven to be very effective in the project. The PBD system was introduced for the first time in USAID/India in the MMI Project. Disbursements made on the basis of performance oriented goals or benchmarks to

achieve project objectives were very successful. The benchmarks were demarcated so as to serve as crucial monitoring points to ensure systematic execution of the MISs in accordance with improved standards. The four benchmarks, with their clear objectives, achieved improved project planning, design, construction, irrigation practices and efficiencies, balanced implementation, and farmer organization and participation. The PBD system had a marked effect in getting the message across that it is the final results and satisfied clients, not the money spent, that counts. In addition, the GOM/ID staff responded to the benchmark system's standards and procedures in an enthusiastic manner. According to the final evaluation, the staff felt satisfaction in that for the first time they had constructed a system that ensures supply of water to every single cultivator in the command area.

Performance and operational testing introduced to project farmers for the first time by the project also proved very effective and resulted in establishing farmers' confidence by assuring them that adequate irrigation streams can reach their holdings. It assured water delivery to the farthest farmer in the command area, helped to clarify public and private roles in natural resource management and linked benefits (resulting from improved management) to the user groups who are responsible for implementation. Assurance of water supply is the product of being able to precisely measure travel time and amount of water loss at all points in the system. This can only be done through a full dress rehearsal. The full dress rehearsal method was not confined to the main canal but also was extended to the tertiary canals where it was most observable to the farmers.

The PBD system and performance testing introduced under the project have demonstrated a powerful methodology for systematically implementing projects in a way that results in more reliable and assured water delivery. Because of its proven success, the GOM/ID

is considering institutionalizing of this methodology in the entire MIS sector. As per the supplemental benchmark, the GOM is requiring performance testing on all newly constructed minor irrigation projects in Maharashtra. In addition, in Bombay and Pune, performance testing is being extended to smaller units of larger irrigation projects. The 1991 evaluation team observed that if adopted country-wide, performance testing will rectify many of the maladies from which the irrigation sector suffers.

#### B. Physical Achievements

Construction: A system of constructing relatively robust MISs capable of delivering water at design standards was achieved under the project. By project completion, 84 MISs had been fully completed and six more had been completed up to the second benchmark. A number of the completed project schemes have reached 100 percent coverage of the planned irrigable command area during the first season that the full complement of water was available from the reservoir -- an outstanding achievement.

A trend emerged as early as 1990 in that while traditionally optimal utilization of water could be ensured only after a minimum of five years from the date of scheme construction, in the USAID MISs, 80 percent of the clients were utilizing the delivered water within two years. All of the data available by project completion indicate that the rate of utilization of irrigation on MMI schemes and thus production, income and employment potential is considerably better than on non-MMI project schemes. Because of this, the GOM is adopting practices introduced by the project in design criteria and construction quality control in non-USAID schemes. The impact of the project will not be limited to improved irrigation water delivery alone but will require the use of improved irrigation practices on farmers' fields prepared for these new and more efficient methods of water application. (See Attachment 'B' for the list of MISs completed under the project.)

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Hydro-Meteorological Stations: A total of 52 hydro-meteorological stations (Attachment E) were established under the project. The stations are yielding data and adopting the latest available analytical techniques which are being utilized in predicting crop water requirements. The data are also effective in improving the scheduling of irrigation supplies to meet the specific requirements of the crops and the soil. In addition, the project provided computers to facilitate the recording and analysis of data from 542 raingauge stations and 82 river gauging stations in five districts in the state. The data generated will be valuable in predicting water requirement for crops and the monsoon rainfall which will enable improved crop planning with a resultant increase in crop yields.

The systematic efforts in hydro-meteorological and hydrological data generation and computer aided data processing are of vital importance in any attempt to improve minor irrigation system performance. The models introduced in the project have added to Maharashtra's ability to modernize century old runoff equations, to use computerized models for design and water management, and to provide the scope for wider adaptability in the irrigation sector in Maharashtra and other states.

Special Studies and Pilot Activities: The special studies component increased the professional contact between GOM/ID and other institutions and built professional competence in support institutions from which the GOM/ID will undoubtedly find itself drawing assistance more regularly in the future. The special studies and pilot projects have provided data and information to improve the design and operational criteria of MISs and the application of alternative procedures to solve situation specific problems.

By project completion, eight special studies, diagnostic analysis for 12 schemes and four sets of baseline surveys for 10 schemes had

been completed. (Attachment 'C' lists the studies completed under the project.) They were conducted by leading institutions and provide valuable information for improving the criteria for MIS design, operation and management and the improvement of staff capabilities. The pilot activities were undertaken to provide an in-depth analysis and evaluation of design and operation alternatives in MIS and water utilization practices. Seven of the eight pilots were also completed. (A list of the pilots can be found in Attachment 'D'.)

Results from some of the special studies, such as the one on organizing farmer groups, were incorporated into the project. The studies cover some of the vital areas in irrigation system design, canal scheduling, irrigation application methods, farmer participation and socio-economic consequences. Results included the ability to evaluate the influence on the MIS of ground water recharge, planning conjunctive use of surface and ground water in MISs, revised design silt allowance, revised dead storage capacity of the reservoir, information on canal regulation for efficient water management, and a means of assessing the influence of irrigation systems on improving the social life and economic level of farmers. The results of the diagnostic analysis of the 12 existing MISs which contributed to the decision to discontinue the rehabilitation of those MISs as originally envisioned in the project paper.

Demonstration Chaks: The Project Paper envisioned that all schemes financed under the project would be required to develop demonstration chaks (an area of about 40 hectares served by a single canal outlet) which would show farmers the latest agricultural development technology including optimum water utilization. All pilot schemes were also included in the program. During project implementation the establishment of two chaks in each scheme was delayed. A few, however, have been established and the state

universities did conduct demonstrations of improved crop varieties and better cultural practices. New crops like sunflowers were introduced and greatly appreciated by the farmers who could realize substantial gains in farm income. Simple animal drawn implements were also introduced.

C. Institutional Development Achievements:

The organization improvements, special studies, pilot activities and training programs organized under the project have played a major role in the improvement of MIS design and operation and in improving staff capabilities for these schemes. The project developed staff capabilities in irrigation, agriculture and related areas to ensure an efficient irrigation water management program for a high level of agricultural productivity on a sustainable basis. Three new organizations were created in the Government of Maharashtra Irrigation Department (GOM/ID), one was reorganized and all are working effectively. The final evaluation team found excellent organizational and staff capabilities within the GOM/ID, which had developed a useful organizational structure at the state and regional levels to support the intensive program of improvement in MIS design, construction, evaluation, operation and management. In addition, USAID established an unusually productive and collaborative relationship with GOM/ID. Although the GOM/ID was initially indifferent to many project inputs, particularly technical assistance, by project completion, GOM/ID was looking to USAID for collegial professional exchanges and for technical support. This development promotes project purposes as well as modernizes the GOM/ID. This rapport offered an important opportunity to attain the project objectives, to internalize project concepts and to apply them more widely. Moreover, it provided fertile ground for additional opportunities to use science and technology to improve water resource utilization and open markets, not requiring USAID

assistance. Although the Government of Maharashtra Agriculture Department (GOM/AD) involvement was never as full as envisioned, by project completion, some linkages had been established among the various participating agencies, GOM/ID, GOM/AD, the state universities, and non-governmental organizations.

Farmers' Organizations: The establishment of farmers' organizations to participate in the operation and management of the MIS was a key element in the project. The project sought to break the power of institutionalized bureaucratic decision making for the benefit of the bureaucracy and to empower local users to effectively demand needed services for production purposes. Efforts to establish and strengthen farmers' organizations were strategically incorporated throughout the project, and to a large extent, were successful. This is evident in that Benchmark 2 required that farmers accept the design of the MIS which guaranteed that they would have an early awareness of the project and perhaps begin to build a sense of ownership and responsibility. Benchmark 4 then ensured the establishment of the outlet committees to assure that the scheme was effectively utilized.

According to the 1991 evaluation, the success of the farmers' organizations can be attributed to five factors: 1) the early involvement of the farmer in the planning process; 2) the training given, under the guidance of the Liaison and Coordination Unit (LCU), to the engineers who were responsible for motivating the formation of the outlet committees; 3) the positive response of the senior and junior officers in the irrigation districts; 4) the performance and operation testing which added to farmers' confidence in the system; and 5) the total level of activity generated by the MMI project. The university and subject matter specialists, the sectional officers' organizational activities, the visits by LCU members, and in some cases, the activities of the AD, all added to an atmosphere of positive expectations that motivated the farmers' organizations.

The Liaison and Coordination Unit (Kirloskar Consultants, Ltd.):

The LCU functioning as an extended arm of USAID, was a catalyst in the success of the project. Initially regarded with skepticism by project officials, the LCU was ultimately awarded contracts for design of new systems, and the GOM has provided permanent office space for private sector, "LCU-type" firms. The LCU produced major achievements in planning, design and testing of water distribution systems. It also has supported the development of micro-computer programs, assisted in the creation of irrigation design and management programs, created organizational requirements for water user associations, and designed training and requirements for agricultural support programs for farmers.

Computerization: Under the responsibility of the Special Analysis and Evaluation Cell and the LCU, the MMI project developed a number of computer programs which include: (1) a hydrological data base management system, (2) an irrigation management information system, (3) a minor irrigation database management system, and (4) the highly regarded Minor Irrigation Model for use in scheduling irrigation in accordance with soil and plant, water use requirements. The irrigation management information system has been vigorously adopted by the project and has yielded immense results with the potential to benefit the management of all irrigation schemes in Maharashtra. It created the capability to plan and manage the season-to-season and day-to-day operation of MISs. Performance testing was also greatly facilitated by computerization of data and problem location. The system has the potential to increase irrigation efficiency and to make the irrigation systems more responsive to the needs of the cultivators and the crops which they are growing. In addition, the project has created a body of young engineers who have gained computer skills that will be important in their careers. Furthermore, the senior administrators have taken pride in the young engineers' accomplishments and have given them enthusiastic support. This was a meaningful contribution

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to the total capacity and morale of the GOM/ID. Because of its proven success and usefulness, the GOM is extending the MMI project computer system statewide.

Training: The training courses, organized by the GOM/ID have been beneficial to the GOM/ID staff in improving their MIS capability. The LCU provided major assistance in the organization of computer training courses which helped the GOM/ID staff gain expertise in computer applications to irrigation, particularly MIS, projects. In addition, special training programs were conducted for subject matter specialists, canal inspectors and security guards of the MMI project schemes. A training workshop in quality control was conducted and training was provided to farmers in irrigated agriculture. GOM staff and farmers received training in water management, improvement of irrigation practices and related subjects. (See Attachment 'F' for the list of courses sponsored by the MMI project.)

Finally, it is expected that the new policies and practices introduced in the project will be extended to other states since Maharashtra is viewed as the most dynamic (and private sector oriented) of India's states. Because Maharashtra is considered one of the more advanced states by other parts of India, any success there carries the potential of establishing a model for future national water resource activities.

#### V. LESSONS LEARNED

1. The Performance Based Disbursement (PBD) system proved to be very effective in the project for achieving improved irrigation goals. The PBD system accomplished improved planning and design; early involvement of the farmers; accelerated completion of the distribution system, Part I works, and land acquisition; and performance testing. Employing the PBD system on projects with a

primary purpose of achieving improved performance, e.g., improving the management and physical infrastructure of irrigation systems or improving the distribution, application and utilization of water below the public outlet, can be the most effective means of producing a successful project.

2. It should be noted that when introducing the PBD mechanism, delays can still be caused due to complexities of the project or other factors that hinder the government's ability to complete benchmarks, which could adversely affect timely disbursements. For example, because of land acquisition difficulties, benchmarks could not be reached on six MISs. Complications such as these need to be taken into consideration when designing a project (in this case the strategy for selecting the schemes) using the benchmark system.

3. Involving the farmers from the initial planning stage and continuing through to the completion and performance testing of the schemes, as in the MMI project, creates a receptive environment for building well functioning farmer organizations, which are crucial to sustaining any irrigation scheme. Similarly, personnel of the irrigation department appear to have the interest and capacity, with minimal training, to establish productive working relations with the farm community. Together, these factors auger well for sustainable development of MISs in Maharashtra.

4. The MMI project did encounter difficulties in obtaining adequate support from the AD initially. Activities in the irrigation and agricultural sector need to be given separate funding and defined performance requirements in order to function well. An integrated approach involving senior levels of concerned organizations and with appropriate funding and incentives could contribute to an even more successful implementation of a water resources project.

5. The MMI project clearly demonstrated that there is a capacity within the GOM/ID to computerize components of their planning, design, and day-to-day operations. This capacity depends on both the willingness to accept the technology and the capacity of the private sector to provide training, repair, and maintenance facilities. It was found that the introduction of a computerized management information system for managing irrigation systems is a complex process requiring a lengthy period of trial and error and adjustment, and this process should be allocated adequate time to be fully implemented.

6. Under the MMI project, Fixed Amount Reimbursement (FAR) was incorporated along with the PBD mechanism. This meant that cost-overruns on any scheme were to be borne by the implementing agency. Due to inflation, the cost of completion of several approved schemes far exceeded the originally approved and mutually agreed upon estimates. This put extra-budgetary pressures on the GOM. If the FAR mechanism is used, adequate safeguards should be provided to meet inflationary pressures.

#### VI. MISSION FOLLOW UP ACTIONS

There are no mission follow up actions.

SPECIAL COVENANTS

Section 6.1 Except as the Parties may otherwise agree in writing, the Cooperating Country agrees to make all reasonable efforts to assure the availability of sufficient funds to the Agriculture Department to complete the On-Farm Part II works in accordance with the schedules to be established by the GOI and USAID for that work.

STATUS: The Agricultural Department did not actively support the project, but the Irrigation Department took responsibility for carrying out the required support to the project.

Section 6.2 Except as the Parties may otherwise agree in writing, the Cooperating Country agrees to establish an adequate number of positions and post experienced qualified staff to these positions as necessary to effectively implement all project activities in accordance with project schedules and budgets to be established, from time to time, by the GOI and USAID for the approved schemes.

STATUS: Adequate positions were established and experienced, qualified staff were posted to them.

Section 6.3 Except as the parties may otherwise agree in writing, the Cooperating Country agrees that within two years from initiation of the project, a plan shall be submitted, satisfactory to AID in form and substance, describing the organizations, authorities, and responsibilities of water users committees at the outlet level, and a schedule for activation of such committees in those areas involved in the project. AID reimbursement for costs connected with completion of irrigation schemes shall take into account activation of such committees in an appropriate number of project areas.

STATUS: This covenant was made a requirement of Benchmark 4. As such, the guidelines for formation and functioning of water user committees were issued in November 1990 and were extended to cover the entire minor irrigation sector in March 1991.

Section 6.4 Except as the parties may otherwise agree in writing, the Cooperating Country agrees to require and enforce that all persons trained abroad under this project be required, immediately upon completion of said training, to work in irrigation related activities for a minimum period of not less than two times the length of the training abroad. AID reserves the right, in consultation with the GOI, to disallow costs for training abroad for those persons who without good cause do not work in irrigation related activities in accord with the terms of this covenant.

STATUS: All persons trained under the project are continuing to work in irrigation related activities as envisioned.

Section 6.5 The Parties agree to establish an evaluation program as part of the project. Except as the parties otherwise agree in writing, the program will include, during the implementation of the project and at one or more points thereafter: (a) evaluation of progress toward attainment of the objectives of the project; (b) identification and evaluation of problem areas or constraints which may inhibit such attainment; (c) assessment of how such information may be used to help overcome such problems; and (d) evaluation, to the degree feasible, of the overall development impact of the project.

STATUS: This was done.

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ATTACHMENT 'B'

USAID ASSISTED  
MAHARASHTRA MINOR IRRIGATION PROJECT (386-0490)  
STATUS OF MINOR IRRIGATION SCHEMES (MIS)

AUGUST 30, 1992

S.NO.	REGION	MIS	ICA Ha	NO. OF MIS WHICH WERE ABLE TO ACHIEVE THE BENCHMARKS				REMARKS
				BM I	BM II	BM III	BM IV	
1.	BOMBAY	13	2165	13	13	9	9	4 Dropped
2.	NASHIK	16	3852	16	16	14	14	2 Dropped
3.	AMRAVATI	11	4142	11	11	11	11	0
4.	NAGPUR	6	1484	6	6	6	6	0
5.	AURANGABAD	24	9361	24	24	24	24	0
6.	PUNE	20	5434	20	20	20	20	0
	TOTAL	90	26438	90	90	84	84	6

ICA: Irrigable Command Area

Ha: Hectares

BM: Benchmarks

Note: Details of Benchmarks provided in Section III (Page 4) of the report

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## SPECIAL STUDIES COMPLETED UNDER THE MMI PROJECT

Study No.	Name of Study	Approval Date	Status
1	Data Collection & Processing	1/86	Completed
2	Development of Computer Model	1/86	Completed
3	Setting of Skill Levels	1/86	Completed
4	Sizing of Reservoirs	1/86	Completed
5	Analysis of Rotational Water Supply System	1/90	Completed
6	Documentation of Farmers Participation	1/86	Completed
7	How to Organize Farmers	11/88	Completed
8	Pipe Distribution System	1/87	Completed

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## PILOT PROJECTS COMPLETED UNDER THE MMI PROJECT

No	Name of Pilot	Approval Date	Status
1	Cropping Pattern Selection	9/88	Completed
2	Development of Groundwater	2/87	Completed
3	Conjunctive Use of Canal and Well Water	2/87	Completed
4	Closed Distribution System	3/89	Completed
5	Demand Scheduling	3/89	Completed
6	Adoptive Demonstrations	12/89	Completed
7	Catchment Area Treatment	--	Discontd.
8	Women's Pilot	2/87	Completed

Note: Pilots 2 and 3 and Pilots 1 and 6 were combined into joint activities.

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HYDRO-METEOROLOGICAL STATIONS ESTABLISHED  
UNDER THE MMI PROJECT

Region	No. of Planned Stations		Stations Completed		Total	
	**Type A	*Type B	Type A	Type B	Plan.	Comp.
1 Pune	7	4	7	4	11	11
2 Konkan	4	4	4	4	8	8
3 Aurangabad	7	6	7	6	13	13
4 Amravati	12	8	12	8	20	20
<b>Total:</b>	<b>30</b>	<b>22</b>	<b>30</b>	<b>22</b>	<b>52</b>	<b>52</b>

\*\*Type A Stations have arrangements for river discharge measurements with a current meter.

\*Type B Stations are equipped to measure discharge with floats.

Note: Hydro-meteorological stations incorporate instrumentation for measurements of evaporation and evapotranspiration, temperature, wind velocity and direction, sunshine hours, humidity, water quality and silt load. Ordinary and automatic rain gauges are included.

**BEST AVAILABLE DOCUMENT**

## TRAINING PROGRAMS SPONSORED UNDER THE MMI PROJECT

Statement showing details of subjectwise Vs. Regionwise no. of persons trained under USAID Assisted M.M.I. Project Training Activities

Sr. No.	Name of training course	Officer to be trained (Target)	Total
1.	Orientation training course on Water Management for JEs & DEs at WALMI Aurangabad	30	23
2.	Distribution system & planning (BM II) i.e. planning & layout of Minor water course and field channels etc. for JEs and DEs	240	244
3.	Training in construction methods of Part-I works i.e. BM III for JEs and DEs.	210	168
4.	Hydrometeorological Instrument operation and observation recording for staff working on M.I. Schemes.	210	206
5.	Training to DEs and JEs for operation and maintenance of M.I. Tanks		
	a) 9 days training course	150	123
	b) 5 days training course	150	96
6.	Training to DEs and JEs from Irrigation Department on Motivational and Attitudinal Training	240	225
7.	Training to Canal Inspector working on M. I. Schemes.	180	171
8.	Training to Chowkidar working on M.I. Schemes.	150	121
9.	Work-shop on "Rock-Mechanics" conducted at Engineering Staff College Nashik	25	23
	TOTAL (A)	<u>1,585</u>	<u>1,400</u>

Sr. No.	Name of training course	Officer to be trained (Target)	Total
10.	<u>Computer Training:</u>		
	a) Fundamental Micro Computer operation	180	181
	b) Irrigation data and project Management	180	171
	c) Micro Computer programming in Quick basics	80	81
	d) M.I.S. Concept and development	80	80
	e) Computer assisted design and Mapping Autocard and Autoslips (3 weeks)	60	59
	f) Geographic information system (2 weeks)	40	37
	g) Workshop on usage of MIDBMS software package - one week	20	20
	h) Workshop on usage of M.I. Model software package - one week	20	20
	<b>Total (B)</b>	<b>660</b>	<b>649</b>
11.A	<u>In Country Study Tours</u>		
	a) Catchment area Treatment	16	15
	b) Remote sensing in Management	16	15
	c) Large Lift Irrigation Schemes	16	16
	d) Piped distribution Network	16	16
11.B	<u>Additional Incountry Study Tours</u>		
	a) Farmers participation	16	14
	b) Irrigation development and Management	16	15
	c) Dam Safety and instrumentation	16	
	d) Optimisation of water use	16	15
	e) Irrigation system operation practices	16	15
	f) Inter basin transfer	16	16
	<b>Total (C)</b>	<b>160</b>	<b>137</b>
12.	Training to SMS and VEW in on farm water	400	166
	<b>Total (D)</b>	<b>400</b>	<b>166</b>
13.	Training to Irrigated farmers and ID/AD field staff at India Institute of Education, Pune (for Pune region)		

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Sr. No.	Name of training course	Officer to be trained (Target)	Total
	a) Training to chak trainers VEW, Canal Inspector, etc.	40	27
	b) Orientation course to field officers	25	25
	c) Workshop of field officers and	50	
	Total (E)	115	52
	Grand Total	2920	2404

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PLANNED VERSUS ACTUAL OUTPUT

Planned Output	Objectively Verifiable Indicators	Actual Output
Minor Irrigation schemes constructed	90 schemes completed	84 MISs completed
Existing minor irrigation schemes rehabilitated	12 schemes completed	As this was not feasible Mission & GOM dropped this item
Hydrological stations established	52 stations established	All 52 stations have been established (Details in Attachment 'E')
Staff capabilities improved	1805 staff trained	2404 staff trained [Attachment 'F']
Demonstration "chaks" disseminating tested technologies	2 demonstration chaks functioning per AID financed schemes	Performance testing undertaken in few MIS constructed with AID funds.
Problems identified and solutions tested	6 studies, 12 diagnostic analyses, and 4 sets of baseline surveys, 30 pilot activities completed	8 special studies, diagnostic analyses for 12 schemes and baseline surveys for 10 schemes done. Also 7 Pilots completed [Attachments C&D]
Farmer participation increased	Farmers participating in determining layout of channels and assuming increased responsibility for operation and maintenance	Farmers participated in design & operation & maintenance

5444C

**MAHARASHTRA MINOR IRRIGATION PROJECT - 386-0490**  
**SUMMARY STATEMENT OF USAID CONTRIBUTION**  
**(Figures in U.S.Dollars)**

PROJECT ELEMENT DESCRIPTION	USAID CONTRIBUTION		
	Obligation* (As of 12/31/85)	Commitment (As of 9/30/92)	Disbursement
<u>Grant:</u>			
Hydrological Stations	-	172,104	172,104
Training	875,000	412,121	412,121
Pilot Experiments and Demonstration	540,000	314,281	314,281
Studies and Diagnostic Analyses	745,000	1,273,437	1,273,437
Liaison and Coordination	1,046,000	1,548,800	1,548,800
Commodities	215,000	-	-
Evaluation	200,000	-	-
Inflation and Contingency	379,000	-	-
<u>Loan:</u>			
Pilot Experiments and Demonstration	1,755,000	-	-
Construction of MIS	43,045,000	133,105,738	133,105,738
Hydrological stations	-	1,776,337	1,776,337
Commodities	1,200,000	-	-
<b>TOTAL</b>	<b>50,000,000</b>	<b>38,602,818</b>	<b>38,602,818</b>

\* The obligation and allocations have been subsequently revised and \$11,397,182 has been deobligated as of 9/30/92

Note: The Host Country Contribution for the project is Rs.532 Million.