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A TRANSITIONAL STRATEGY FOR SYSTEM B:

CONSTRUCTION TO PRODUCTION

A TECHNICAL ASSISTANCE PLAN FOR USAID SUPPORT

PROJECT NO. 383-0073

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BACKGROUND

Introduction

The Accelerated Mahaweli Plan (AMP) is the largest and most ambitious development effort ever undertaken by Sri Lanka. In under a decade, nearly $2 billion dollars will have been invested to harness the water of the nation's two largest rivers (Mahaweli Ganga and Maduru Oya) and put it to productive use on 400,000 hectares of agricultural land. At the same time, thousands of families will, for the first time, receive land of their own in newly irrigated areas, and the entire project will serve as a nucleus for growth and development in the sparsely populated nothern dry zone of Sri Lanka.

One of the four major reservoirs supplying water for the AMP is finished and two of the remaining three are nearing completion. Work proceeds apace on the network of link canals and main distribution systems supplying project areas, on the tertiary irrigation distribution systems, and the houses, schools, roads, hospitals, and other public buildings and facilities necessary to make newly-settled areas habitable.

In the very near future a day will be reached when the pace of construction activity on all of these facilities will have peaked. Building will continue--but at a decreasing rate. The tasks at hand will increasingly become those of managing and utilizing the raw physical potential created to meet the country's food and fiber needs and provide a livelihood for the men, women, and children producing that agricultural wealth.

This new set of tasks is less glamorous in some ways than the first set, but is equally important. In undertaking the AMP, Sri Lanka has incurred significant international financial obligations. To repay them, agricultural systems (and induced industrial- development) must perform at least as well as designers had expected. The many assumptions made during the design process will now be tested in a living laboratory, and the outcomes will determine the welfare of a large number of people. One of those assumptions is that irrigation and agricultural systems would be managed effectively and efficiently.

Managerial demands during the operational phase of the

Mahaweli Program will be very different than those of the construction and development stage. The latter is an effort that operates within an intensive mode during a relatively well-defined time interval. There is a heirarchical or bureaucratic structure to the entire operation that extends all the way down to the construction laborers and is responsive to decisions taken at different levels within the structure. There is a strong flavour of problem-solving to the entire process, from design through to operational testing. Supervision and control is thought of as construction "management" but never as construction "administration".

Operation and maintenance of irrigated agricultural systems, on the other hand, takes place during an extended and open-ended time period, at a much lower level of intensity. Attempts to create a heirarchical structure inevitably fail, for farmers to their everlasting credit, resolutely refuse to give up independent decision-making responsibilities on their own farms. There is a strong temptation for civil servants to administer an irrigation system rather than to treat it as a dynamic entity that requires continuing adjustment and problem solving.

Guiding Principals

The goal of the proposed program of work is to facilitate the transition from the construction phase of the AMP to the operational phase, where managerial and agricultural production concerns will predominate. This program is based on the four following principals which serve as guides to planning and implementation.

Strengthen Sri Lankan institutions

The program cannot create a dependency on expatriate insitutions and personnel. It must aim at strengthening the MEA and the Sri Lanka institutions and organizations which support and facilitate its irrigation system operation and maintenance tasks. It should do this through a combination of training and collaborative research, applied studies, and monitoring activities.

Action--not reaction

The program should result in O&M institutions that take a leadership role in managing and maintaining water and system facilities and equipment and do not simply react to problems and crises as they arise. In the maintenance area, this means an

emphasis on preventative maintenance to improve system reliability and reduce the risk of major failures, which should at the same time reduce overall system maintenance and repair costs. In the area of system operation and water management, it means developing a data collection and analysis system that will permit system decisionmakers to remain abreast of the status of irrigation and agriculture activities and identify potential problems before they reach crisis proportions. Such an active leadership will go far in developing good relations between farmers and the MEA authorities.

Management--not administration

The program should not create "A Plan" for Operations and Maintenance that will fix operational proceedures for all time. Rather it should result in a series of plans for both operations and maintenance that are tried, assessed and modified to function effectively to provide adequate, reliable and equitable water deliveries to farmers, reduce conflicts, provide sound and careful preventative maintenance, and be capable of rapid response to catestrophic structural failures. Plans for operations and maintenance are best thought of as rolling plans, which are regularly assessed and updated on the basis of prevailing conditions and an evaluation of their effectiveness and costs. This is particularly important early in the operational life of a project, especially one involving settlement of new lands, as water supply, area cropped, cropping patterns, farmer experience, and the experience of system mangers all change with time. Adjustments to plans are likely to be necessary relatively frequently in the early years of project implementation, and less so in later years.

To achieve this type of an active operational control, there must be a focus on the management of irrigation systems. Management is different from administration. The latter is concerned with adherence to policies, prescribed proceedures and rules. It is input oriented. Mangement, on the other hand, is concerned with solving problems. It is output oriented.

Collaboration--not dictation

Farmers cannot be treated simply as the bottom rung on an organizational ladder. Effective systems operations and maintenance programs must recognize farmers' status as independent farm decisionmakers who will cooperate with reasonable plans in which they are involved, but who will not typically carry out instructions from authorities which are not perceived as being in their best interest. As a result, the system management structure must be seen as reaching downward to

link with farmer organizations which reach upward. The meeting ground is a set of meetings and regular forums where mutual problems are discussed and mutually acceptable solutions developed. Only if they are involved in the reaching of decisions can farmers be expected to give them unqualified support.

Existing Resources

There are five major resources on which the program can build in the System B area, and a number of other institutions and facilities that might also prove useful. The first of these is the Pimberatewa irrigation scheme located under the Pimberetewa Tank. Pimberetwea is embedded in System B and has been operating for more than 10 years. It has a full complement of settlers and, for the time being, is somewhat water-short. All of these factors make it a very natural demonstration site in which to introduce and test new system management techniques.

The second important existing resource is the MEA operational staff which is already in place throughout System B. This is significant because often there is little or no overlap between the tenure of the system construction personnel and the fielding of the operations and maintenance staff. The presence of the MEA staff, of around 200 now, will allow them to become thouroughly familiar with the system and the settlers by the time that irrigation water begins to arrive later this year. In addition, knowing which individuals will perform particular tasks allows the tailoring of training programs to specific functions and permits training to begin well in advance of the commencement of system operations.

The third major resource is the MEA supported agricultural experiment station located at Aralaganwila in the System B area. The station currently has staff housing, 100 acres of experimental fields, some equipment and a partial complement of staff. A laboratory/office building is under construction and land has been set aside for a training center. In addition to its primary role in applied agronomic research, training and demonstrations,the station's mandate could easily be expanded to include research and training in farm-level water management. Studies could be conducted both on and off the experiment station in the areas of water mangement techniques, seepage and percolation rates for various soils, and farmer water management practices. Training could be provided for both farmers and MEA personnel on these same topics employing the results of the studies conducted. Such an applied study and training capacity is essential in solving problems as they arise and in filling in gaps in the information base necessary to manage a modern irrigation system effectively.

The fourth resource is the Zachery-Dillingham construction camp located near the Maduru Oya dam. This camp includes administration and engineering offices, a fully equipped repair and maintenance shop, soil and materials laboratories, a large warehouse, dining/recreation facilities, and housing for families and dormatories for bachelors. The camp also has elaborate utility systems (water, power, sanitation) and is centrally located and easily accessable through a good system of roads. With minor modifications, it could be transformed from a temporary construction camp into a permanent maintenance station.

The fifth major resource is a $2 Million line item for commodities and equipment in the Mahaweli Basin Development II loan agreement. This item will be used to provide most of the commodities and equipment necessary to develop effective operations and maintenance procedures in System B.

In addition to these major resources, there are a number of others that could prove useful in implementing the proposed program. Among these are (a) local construction firms having useful expertise in equipment maintenance and operation, (b) the Agrarian Research and Training Institute (ARTI) in Colombo which has a solid base of experience in water management studies including baseline surveys and system monitoring activities, and in the area of farmer organizations and training of farm-level workers, (c) university faculties and facilities at Peradeniya and Moratuwa, (d) the Irrigation Department water management training facility at Galgamuwa, (e) the Agricultural Department research and training facility at Maha Illupalama, and (f) The National Institute of Business Management and the Institute of Administrative Studies of the Ministry of Home Affairs.

In addition, the USAID Water Management Synthesis II Project (WMS-II), which has already staged one "Diagnostic Analysis" Training Course for MASL staff, has the ability to provide assistance in a wide range of fields connected with irrigation management. This capacity includes technical assistance for assessing, defining, and solving particular problems; field-based training in multi-disciplinary approaches to problem identification and water measurement; and assistance with special studies and applied research. One activity of particular interest is the effort being undertaken by Utah State University on behalf of the WMS-II project which is designed to develop a micro-computer-based simulation model to be used in operating the main, branch, and distributary channels of an irrigation system. Linkage with this activity, which is currently stated to take place in Thailand and one or two additional countries, could prove very productive.

TECHNICAL ASSISTANCE

General

It is imperative to put together an effective organiztion to operate and maintain the system of irrigation canals in System B. Such operation and maintenance (O&M) organization should be gradually introduced as the construction contractor completes portions of the work so that it would be in place, fully staffed and trained, when the contractor completes all work. Otherwise, the system will not function properly and these expensive facilities will not produce the anticipated benefits. More investment will be needed to repair them and put them in use, and the cycle will repeat iteself until an effective O&M organization is put in place.

In order to build and train such an O&M organization, expatriate technical assistance (TA) will be needed to assist the GSL. A team of expatriate TA personnel in conjunction with local support institutions will assist the Mahaweli Authority of Sri Lanka (MASL) in this effort by working directly with the personnel of the Mahaweli Economic Authority (MEA) stationed in the field. The TA team will provide guidance, collaborative assistance, and extensive training to the O&M organization in all aspects of its work. At the completion of the TA team's work, it is envisioned that a well-trained, well-staffed, and well-equipped lean and agressive O&M organization will be left behind. The TA team and associated institutions will provide the necessary skills and personnel to achieve this purpose.

Central to the TA team's effort will be the team leader. Experience has shown that the degree of success of any TA effort depends on the qualities and skills of the person charged with organizing and directing the effort. No other single action in the procurement of TA services is as critical as selecting the right teamleader. His extensive experience and knowledge of irrigation systems and their operation is crucial to the effort, but just as crucial would be his human skills, his resourcefulness, imagination, dedication and drive. The team leader would be the motivating force and will direct the team's effort, coordinate with AID and the GSL, make assignments, set deadlines and provide overall leadership and inspiration. He must be a civil or agricultural engineer with extensive exprience in water resources. Preferably he should have some experience in the third world and some experience in the operation and/or maintenance of large-scale irrigation sysems. He must have served as team leader or deputy team leader in

similar projects and must have demonstrated leadership and mnagement qualities.

The team leader will supervise the efforts of the four professionals who will be on his staff and reside in Sri Lanka for the life of the contract. This long-term effort will be augmented with the services of perhaps ten other skilled professionals who will visit Sri Lanka for short durations (1-4 months) as needed.

Operations

Organizational Structure

The organizational structure for System B operations and maintenance is still evolving. Currently, it consists of a chain extending from a Resident Project Manager (RPM) for the entire system, to a Block Manager responsible for both irrigation and settlement activities in a 2500 hectare block, to a unit manager responsible for around 250 hectares. A variety of supporting specialists are attached to each of these three levels. It is not yet clear how the necessary linkages between those responsible for water management, from the farmer upward through these three levels, will be established. Such linkages are essential if there is to be a smooth flow of information and direction both upward and downward in the system.

Output

The following is a listing of five major sets of outputs which the technical assistance program for system operations is expected to produce.

I. A listing of lessons learned drawn from a comprehensive review of existing literature, reports and evaluations covering Sri Lankan experience with water management and system operations. Particular reference to be given to experience in System H, the Gal Oya Irrigation System, the Minipe Irrigation System and the Uda Walawe System.

II. A set of tested plans and practices for water management within System B. Component outputs would include the following:

1. An updated system operations plan with annexes including:

a. A listing of skills required for implementation.

b. A flowchart of the decision-making and water control process.

c. A listing of data requirements for implementing the operations plan, data collection proceedures, instrument calibration procedures and recommended locations for discharge measuring points, rainfall and evaporation measurements, and a sampling plan for any other data required.

2. A micro-computer-based water budget model which would match water available with demand for water use in implementing the system operations plan within the Pimberetewa portion of System B.

3. A functional monitoring, assessment, and decision-making system which is capable of making necessary modifications in the system operations plan and the water budget model described in items 1 and 2. Monitoring would include the following items:

   a. Baseline data on conditions in the Pimberetewa scheme prior to program implementation.

   b. A record of key indicators of water adequacy, equity of water distribution, agricultural production, and water-related conflicts as the operations plan is implemented and adjusted.

   c. Recommendations to an Implementation Steering Committee on appropriate changes in operating proceedures based on 3.b.

4. Four distinct cadres of people trained in micro-computer use as follows:

   a. A small group of engineers or agricultural water management specialists trained to modify and debug the water budget model and to extend it to additional zones as they come on-stream.

   b. A larger group, including the Resident

Project Manager (RPM), the Deputy RPM and the irrigation Technical Assistants (TAs), trained to run the model on the micro-computer and to test alternative management scenarios.

c. All other System B professional personnel given brief hands-on familiarization training with the model to convey an appreciation of the model's uses and limitations, and its data requirements.

d. Clerical staff trained to key in data to the model.

5. TAs and other appropriate personnel (possibly including selected farmers) capable of collecting data to calibrate and operate the water balance model after being trained to:

a. Install, calibrate, read, clean and maintain measurements devices in the field including raingages, evaporation pans, gaging stakes, flumes, weirs, and other rated measurement structures.

b. Analyze and reduce data collected to a useful form and to report it to the appropriate office as outlined in 1.b.

c. Obtain, record, and report agricultural data to the appropriated office as in 5.b. including areas planted to various crops, estimated yields, stages of crop growth expected harvest dates, etc.

III. A trained cadre of MEA Community Development Officers (CDOs) and unit-level personnel, particularly those in Pimberetewa, able to work with farmers to facilitate the formation of farmer organizations. This training would draw heavily on the experience gained by the Agrarian Research and Training Institute in a number of other systems and projects in Sri Lanka.

IV. Established capacity at the agricultural research station at Aralaganwila to conduct farm-level water management and water use studies both on and off the research station and to provide training to MEA personnel and farmers in water measurement and water management techniques.

V. Two workshops held in Sri Lanka for selected MASL personnel and other irrigaiton management professionals in Sri Lanka reporting on:

1. The development of the "rolling" system operations plan.

2. The results of the CDO's work to form farmers' organisations for water management.

3. The use of the computer-based water budget model for system operations.

4. The results of the monitoring and impact evaluations in the Pimberetewa pilot demonstration area.

Skills

The skills necessary for producing the outputs listed above will require the services of two long-term specialists and several short-term ones. In developing this list, it is assumed that supplementary local expertise will be accessed through linkages with Sri Lanka institutions and organizations such as ARTI. Such a linkage is explicitly assumed in producing output III above. If such linkages are not established, one important aim of the activity--to strengthen both MASL and supporting institutions--will not be met. In addition, by itself the expatriate consultant team proposed will not have adequate manpower resources to carry out all of the scheduled tasks. As a consequence, one very important characteristic required in team members will be the ability to seek out appropriate supporting institutions within Sri Lanka in his/her own area of specialization and work closely with them in carrying out project tasks. In addition to the team leader, the following two sets of skills will be required on a long-term basis for developing and strengthening system operations proceedures.

(1) Water Management Engineer: Oversee the development, implementation, and readjustment of a system operations plan. Take primary responsibility for developing a micro-computer-based water budget model for system operaigons. Work with MEA engineers and Technical Assistants to developing hydrologic and agricultural data collection systems to feed the model. Together with the training specialist, develop training designs for various cadres and participate in water management training activities as an instructor and resource person. He/She would work with the agricultural experiment station at Aralaganwila to develop a water management research and training program. The Water Management Engineer should be an

agricultural engineer with a specialiation in soil and water engineering and water management. Some experience in developing countries and an ability to work in a collaborative fashion with host country engineers as well as agronomists, social scientists and economists is essential. Experience with training is desirable. Specialist must be familiar with variety of open channel flow measuring devices, water budgeting procedures and the use of micro-computers.

(2) Training Specialist: Plan, organize and coordinate short-term training programs for water measurement, data collection and analysis, data processing and reporting tasks. The training specialist will also plan and stage training courses in support of the maintenance program described in a separate section. He/She will work closely with technical area specialists--both American and Sri Lankan--in defining the technical content of the courses. The training specialist should have background and experience in planning and coordinating short-term training courses. Training in non-formal education techniques is desirable. Experience with the technical areas of irrigation and water management is desirable but not essential. Must be able to work effectively with technical specialists in a variety of disciplines.

(1) Micro-computer Specialist: Provide programming and data organization expertise necessary to support the Water Management Engineer and counterpart personnel in developing the system water budget model. This specialist should be an experienced and accomplished micro-computer programmer familiar with BASIC and other relevant computer languages. Experience with water mangement or water resources engineering is highly desirable.

(2) Agronomist: Develop a data collection plan and proceedures for generating the agronomic data necessary to calibrate and operate the system water budgter model. In addition he would work closely with the Water Management Engineer and the Micro-computer Specialist in developing the agronomic portions of the model. He may also be called on to provide advice and assistance to staff at the agricultural experiment station in carrying out applied cropping research. Specialist should have a degree in agronomy and experience in the rice-growing tropics.

(3) Economist: Provide input to the Water Management Engineer and the Micro-computer Specialist in developing the system water budget model. His input would bear on the priorities which would be assigned to alternative water distribution scenarios under conditions of water scarcity. The economist must have a degree in agricultural economics and practical experience in the rice-growing tropics. Experience

with upland crops and familiarity with micro-computer modeling are also desirable.

(4) Institutional Specialist: Survey and inventory the range of Sri Lankan institutions and organizations, both governmental and non-governmental, available to support and complement the skills of the long-term technical assistance team. He/she would also work with the expatriate specialists to assit them in establishing contact with appropriate institutions and in effectively utilizing their skills and expertise. The Institutional Specialist should be a social scientist with field experience in Sri Lanka in the general area of agricultural development. It is proposed that such a survey be carried out in advance of team arrival, with a subsequent visit after the team is established. Such services could be provided prior to the awarding of a TA contract thorugh the WMS-II project.

(5) Water Mangement Specialist: Survey available reports, literature, studies and evaluations and extract lessons learned regarding water management and irrigation system operation and maintenance in Sri Lanka. Special attention would be given to MASL experience in System H and Uda Walawe, and to experience in Gal Oya and Minipe. He/she may also be called upon to assist the staff of the agricultural experiment station in developing an applied research program in water management. The Water Management Specialist should have graduate-level training in agricultural engineering, or agricultural economics with a primary emphasis on Asian water management. Previous experience in Sri Lanka is highly desirable. This set of skills could also be readily obtained thorugh the WMS-II project.

(6) Procurement/Contracting Specialist, Planner, Manual Writing Specialist: It is expected that the skills of these short-term specialists as described in the section on "Maintenance" would be utilized for the "Operations" work as well.

Maintenance

Outline of a Maintenance Organization

Perhaps the best way to outline the basic structure of a miantenance organization is by function. A maintenance organization for System B should carry out six functions.

- Maintenance Planning: Projecting a revolving mintenance plan responsive to the preventive and correction maintenance needs of the project; costing out such a plan in terms of personnel, equipment and funds; and liaising with pertinent

government entities in order to obtain the resources needed.

- Field Maintenance: Implementing the maintenance plan as projected including routine continuous maintenance work as well as prompt reaction to emergencies by providing corrective action; supervising contractor personnel in carrying out portions of the maintenance plan that may be contracted out; and monitoring the system for weaknesses, vulnerabilities and other indicators in order to project better maintenance planning.

- Engineering: Design engineering works needed for proper maintenance; prepare drawings, specifications and bid documents for letting to private Contractors; and prepare cost estimates and similar engineering inputs for the planning and maintenance functions.

- Administrative/Financial: Provide administrative support such as personnel matters, payroll etc, supply and procurement of goods and services; accounting and financial controls; and budget preparation.

- Equipment Shop: Equipment operation, equipment repair, equipment routine maintenance and field support such as greasing and fueling; warehousing of spare parts, consumables and combustibles, stock and invetory control and specification preparation and procurement documents.

- Training: Training cuts across all other functions. A training program should be an integral part of the maintenance effort to maintain and upgrade skills as well as bring in replacement and new personnel. Training should primarily be hand-on, on the job training, augmented as needed with courses within the organization or from associated organizations.

Existing Organization

No discrete maintenance organization exists at present in System B. The maintenance function is currently the responsibility of the engineers on the field staff of the resident project manager (the highest MEA functionary located in the filed). However, there are plans for setting up an operations and maintenance organization in System B, although the exact structure of such organization remains fluid. Preliminary organizational plans that we have seen do not assign to maintenance the priority it deserves. The projected staffing also appears inadequate, without any real depth. It consists of a maintenance foreman, a shop foreman, and several skilled and semi-skilled tradesmen and labourers.

Thus the TA team will probably have to start from scratch

putting together and training a cadre of individuals who can carry out the outlined functions.

TA Team Skills

In addition to the team leader who will supervise both operations and maintenance, the following is a listing of TA team skills that will be required for the projected maintenance effort. Some of these skills may be required for short periods of time and others long term. The following two skills will be required long term:

(1) Maintenance Engineer: Oversee the maintenance effort. Put together a cadre of maintenance personnel. Conceive a training plan to bring these personnel up to par and supervise the effort. Act as advisor/consultant/and resource person and collaborate closely with the maintenance personnel. Candidate must be a Water resources/civil engineer with extensive experience in irrigation system management, operation or maintenance. Experience in third world countries desirable. Training and hands-on experience also desirable.

(2) Master Mechanic/Equipment Specialist: Profeciency in the operation, repair and maintenance of heavy construciton equipment and vehicles based on long-term experience. Familiarity with all types of equipment and ability to write specificaitons, work with handbooks and spare parts manuals; experience in supervising a shop operation including providing systematic support to equipment working in the field. Experience in warehousing and handling of equipment related spare parts and materials and their requisition, receipt, storage issuance and control. Ability to write well and to keep files and records. The equipment specialist must have extensive experience (20 years) in working with heavy construction equipment. Experience a s a supervisory equipment specialist with full responsiblity for all equipment on a construction contract. Experience in providing training to others particularly in a third world environment highly desirable.

The following skills to be short-term:

3) - Financial Controls Specialist: to provide assistance in financial matters including budget projections and management of funds actually budgeted. Initiating a system of financial accountability, reporting and maintenance of financial records in an automated form. The candidate must be an accountant or financial management major with experience as controller or deputy controller in a public or private organization.

4) - Warehousing Specialist: to set up a system of supply

(procurement, requisition etc.) storage and issuance of materials, fuel and spare parts. Institute inventory and stock control measures and a system of self-audit and accountability. Also procedures for retirement of obsolete equipment and parts. Experience in warehousing and supply management, particularly in operations requiring significant heavy equipment involvement, is required.

5) - Specialized Mechanics: two or more mechanics specialized in particular aspects of equipment operation, repair or maintenance. Such specialists could be in engines, transmissions, hydraulic systems or others. They would assist in starting up specialized operations in the shop and will train specialized shop foremen to run these specialized operations. Candidates must be proficient in their areas, such profeciency having been gained through extensive hands-on experience. Training experience in the U.S. or the third world would be highly desirable.

6) - Safety Engineer: to set the foundation of a safety program that covers all operatin and maintenance activities in order to protect human life and property and reduce the risk of injury and loss of property. Operating heavy equipment around people and around relatively fragile facilities, handling of combustibles, and working with shop equipment and tools come to mind as activities that are potentially hazardous. The candidate must have had experience in the design and implementation of safety programs in industrial or agricultural settings.

7) - Procurement/Contracting Specialist: to assist in developing model bid packages and contracts for the procurement of goods and services needed for operating and maintaining the system. To outline procedures for competitive public bidding consistent with GSL regulations and to provide practical guidelines for contract negotiations, additional work orders, charge orders etc. Candidate must have had extensive experience as a contracting or procurement officer, particularly in the administration of small supply contracts.

8) - Systems Planner: to lay the foundations of system planning in all O&M activities, including projecting operational and maintenance plans several years into the future. Identification of the levels of needed resources and plans to obtain them introducing a flexible but systematic mode to the functions of the O&M organization in all areas (personnel, financial, day-to-day operations, revolving maintenance plan). Candidate must have had extensive experience in planning and programming.

9) - Manual Writing Specialist: to gather and put together

operatigonal, training, informational manuals, and papers that may emerge from the efforts of others. To provide general guidance and supervision to the collection, orderly organization, needed illustrtation and editing of materials provided by others. To contribute sections to tie materials together and present them to the reader or user in simple, coherent, understandable language. Candidate must have extensive experience in manual and/or pamphlet writing and editing. Experience in writing on technical matter preferable.

Financial Plan

The TA team will consist of 5 long-term, resident advisors (including the team leader) and 12 short-term advisors. The long-term advisors have been estimated to cost, on average, $13,000 per person-month. The short-term advisors were estimated to cost $15,000. In both cases, about $3,000 could be funded in rupees. Following is a financial breakdown of costs of the TA team:

Specialty/skill	Months services	($000)	(Rs 000)
a. Long-term Advisors			
Team leader	24	240	1,800
Water Management Engineer	24	240	1,800
Maintenance Engineer	24	240	1,800
Equipment Specialist	24	240	1,800
Training Specialist	24	240	1,800
Sub-total-long term	120	1,200	9,000
b. Short-term Advisors			
Financial Controls Specialist	6	72	450
Warehousing Specialist	6	72	450
Micro-Computer Programmer	6	72	450
Agronomist	4	48	300
Specialized Mechanics	8	96	600
Agricultural Economist	3	36	225
Safety Engineer	3	36	225
Institutional Analyst	2	24	150
Water Management Specialist	6	72	450
Procurement/Contracting Officer	4	48	300
Systems Planner	6	72	450
Manual Writing Specialist	6	72	450

Sub-total Short-term	60	720	4,500
c. Total - all expatriate TA	180	1,920	13,500
(Estimated at $1.0 = RS. 25.00)			
d. Local organizations	-	-	1,250
e. Commodities			
O&M equipment/Spare parts	-	280	
Training Aids		180	
Water Management Equipment		70	
Office/Classroom Equipment		60	
Laboratory Equipment		60	
Consumables		47	
Subtotal-Commodities		697	
f. Nominal Total-All costs		2,617	14,750
g. Reserve/Contingency/Inflationary		383	
h. Reserve/Conting./Inflation (if no rupees available)		(207)	

Budget Summary

a. Summary Costs in dollars:

Long-term TA: 120 pm x 13,000	=	1,560,000
Short-term TA: 60 pm x 15,000	=	900,000
Local Institutions	=	50,000
Subtotal - All TA		2,510,000
Commodities/equipment		697,000
Total		3,207,000
15% Contingency/inflation/reserve		493,000
Grand Total		3,700,000
Available in AID grant		3,000,000
Required in Rupees		700,000

b. Breakdown of Dollar & Rupee Costs(in dollar equivalent)

	$	Rs (in $ Equiv.)
Long-term TA	1,200,000	360,000
Short-term TA	720,000	180,000
Local Institutions	0	50,000
Commodities/ Equipment	697,000	0
Subtotals	2,617,000	590,000
15% Contingency/ inflation/ reserve	383,000	110,000
GRAND TOTALS	3,000,000	700,000

Procurement Plan

Procurement Sources of TA Team

Procuring all skills required for the TA team from one supply source under one contract appears the most attractive option. Possible exceptions are small, well-defined pieces of work that could most-effectively be carried out through the Water Management Sythesis II Project. Such procurement would be easy to undertake and the resulting contract would be relatively easy to administer. Although it is unlikely that all required skills would come from one firm, that should not discourage the one-contract approach. AID's recent experience is that two or more firms will associate together to meet the needs of the procurement. Such firms may include traditional A & E firms, management consultants, small businesses, minority firms, universities and other types of private sector entities. Additionally, there are several local institutions that could contribute to this effort, and which should be tapped either as associates of U.S. firms or as sub-contractors.

Procurement Methodology

The PP indicates that this is to be a direct AID contract. Thus the contractual parties would be the firm or firms providing the services and the USAID Mission to Sri Lanka, acting on behalf of the GSL.

The first step in the procurement process is the preparation of a request for proposals (RFP). This booklet

could be prepared in the Mission with the assistance of the regional contracting officer. It would include opening and closing dates for the technical proposals, a scope of work for the TA team, a discription and background materials for the project, and boiler plate instructions and forms to be filled by proposers.

The level of effort contemplated (what skills, how many people, how long etc.), could either be explicitly included in the RFP or it could be left up to the propponers to indicate how they would meet the requirements of the scope of work in terms of an operational plan and a level of effort.

Concurrent with the preparation of the RFP, it would be possible to pre-qualify firms or associations of firms to submit proposals. Recent Asia Bureau experience is that pre-qualification for relatively complex TA contracts is not needed since a limited number of responses (5-10) has been the norm. Therefore, it is recommended that the RFP be made available to all comers.

Once the RFP is complete, a notice will be published in the Commerce Business Daily (CBD) to that effect. Firms will then obtain the RFP from Asia/PD in AID/W either by telephone or through written request. AID/W will tabulate the names and addresses of those requesting RFPs and will keep the Mission posted.

Receipt of proposals could either be in AID/W or in Colombo. If it is decided on the latter, then more time should be allowed before the closing date.

If receipt of proposals is in Colombo, the the evaluation would take place in Colombo with the GSL and possibly AID/W participating. If receipt of proposals is in AID/W then evaluation of proposals could be in AID/W (with Mission and possible GSL participation) or the proposals could be sent to Colombo for evaluation.

After a short list of the top three firms is obtained, financial proposals are requested and negotiations are completed. This could be accomplished by contracting officers in AID/W or in Colombo.

Time Frame for TA Procurement

The following table represents a reasonable, although perhaps a bit optimistic, time frame for the TA procurement. Following are the major events and projected date for each event:

Complete the RFP and dispatch to AID/W for duplication	By April 1, 1984
Publish synopsis with CBD stating availability of RFP	April 1, 1984
Closing date for receipt of porposals in AID/W	May 15, 1984
Technical Board completes evaluation of proposals and arrives at a short list of the top-ranked firms	June 15, 1984
Contracting officer issues call to short-listed firms for financial proposals and negotiations	June 20, 1984
Negotiations concluded, final selections made and contract signed	August 1, 1984
Technical Assistance Team personnel arrive in Sri Lanka	October 1,1984

It is important to limit slippage in this schedule to no more than one month so that TA team personnel would arrive in Sri Lanka not later than November 1, 1984. Otherwise, with the Thanksgiving and Christmas Holidays on the horizon, it is most likely that team members would temporize and postpone arrival until after the new year has begun.

NOTES and OBSERVATIONS

In our discussions with the Mission and GSL in Colombo while working on the TA package, several items surfaced that warrant the Mission's immediate attention. These are listed below:

GSL Rupee Counterpart Contribution to the Grant

In order to stretch the $3.0 dollar grant, it would be most desirable to have the GSL contribute some rupees. Such counterpart contribution would go to the TA team's local costs (rent, in-country per diem, utilities, education allowances, and even airline passage). Based on our analysis of the cost of TA, we feel that about $3,000 per person-month of TA could be paid in rupees. Also, all funds requirreed for contracting with local institutions, estimated at $50,000, could be paid in rupees. Total rupee costs are estimated at the equivalent of $700,000.

Equipment and Commodity Procurment

Mahaweli Basin Development II loan funds include $2.0 million for the procurement of O & M equipment and commodities. It appears reasonable to make this procurement part of the TA team's scope of work. Upon further reflection, however, we feel that such delay would be a great mistake. We recommend that work begin immediately on this procurement. The equipment and commodities in question will be needed by the TA team in its work, early on, particularly in the training aspects. Therefore, every effort should be made to have it in country as early as possible. We estimate it would take from one year to fifteen months for the preparation of bidding documents, bidding, contract signature and delivery. If this process is begun now, these commodities and equipment would arrive several months after the TA team's arrival. If it is left to the TA team to initiative procurement, their arrival would coincide with team departure. The TA effort will not be nearly as effective without these commodities and equipment.

O & M Organization

The current O & M organization does not appear adequate for the task at hand. Significant increases in the manpower and resources will be required to bring it up to par and, most importantly, its position within hiararchy of the MEA in system B must be enhanced. We recommend that the O & M operation be under the direction of a deputy resident project manager with direct links to O & M personnel in the field (without having to go through block and unit managers)who answers directly to the Resident Project Manager. This is simply in recognition that unless the canal system is properly maintained and operable, and that water is delivered to the farmer-settler, then all other activities and services within the system will suffer.

Maintenance Organization Growth

The current thinking is to contract some of the routine maintenance chores to local contractors. This is a resonable approach for such chores as weeding of the unpaved canals, grass cutting of banks, cleaning the accumulated silt, and so forth where it would be easy to judge whether the work has been done properly and where contractors are paid per mile of canal or some such measure. We endorse this approach strongly. We believe it would limit the size of the maintenance organization, and keep it a lean, relatively skilled organization. Every effort should be made to monitor the natural tendency to saturate the maintenance operation with laborers and other non-skilled persons and keep it a small, vigorous force.

Shakedown of Tertiary Level Canals

Some tertiary level structures (on the D and DS canals) will have to be relocated or their elevations will have to be modified or adjusted during the shakedown period of the system. It is important to recognize that this a common occurance in all large irrigation systems and that it is not due to engineering or construction mistakes. The reason is that at the tertiary level tolerences are small, field data used in the design is normally poor, and the quality of construction materials and methods is poor to keep costs down. However, adjustments or relocation of structures after the first water flows is one of the most critical actions that an irrigation orgnization can take. This is true because if the farmer-settler fails to receive his allotted water relatively quickly his perception will be that the organization is not responsive to his needs. Obviously, care should be taken not to permit such perception to take root at that early stage of the relationship. Therefore, adequate manpower and other resources should be directed at making such corrections forthwith.

RFP Background Information

In addition to the descriptive material on MASL, System B and the Pimberetewa tank area, it would be useful to proposers to have a brief description of the several local institutions that are potential support resources. This would enable prospective contractors to begin thinking about how to utilize these institutions at the outset of their planning processes. Kari has promised to send to Gil descriptive information on the M.S. program in water management at Kelaniya. A short blurb on the ARTI program could be obtained from Jeff, Sena or Jayantha. Charlie Uphaus will be visiting NIBM in connection with another project soon and could probably get some materials on their

program. Other possibilities, are left to your discretion. Please note that one of the proposed short-term consultancies would prepare a more comprehensive listing (with background) on such supporting institutions at a later date.

Utah State University Special Study (WMS-II)

Utah State currently has underway a WMS-II funded special study to develop a computer-based simulation model for managing irrigation systems. This model will be developed and tested in 2 or 3 Asian countries and local personnel will receive long-term training at USU in a Masters program. Depending on USU, USAID, and MASL interest, it might be mutually beneficial to try to link the proposed program of work with the USU special study in some way. AID/W will be happy to try to facilitate this.

STATEMENT OF WORK

A. INTRODUCTION

The Government of Sri Lanka (GSL) is in the process of building a complex irrigatigon infrastructure in System B of the Mahaweli Basin. This irrigation infrastructure will consist of four levels of canals: main, branch, distributary and field canals. The main and branch canals will be paved and will serve to convey the water from the Maduru Oya reservoir into the downstream areas on left side of the river. The distributary canals will serve to take the water further into the areas to be irrigated. The main and branch canals are being built by U.S. Construction Contractor. The distributary and field canals are being built by the GSL. This canal system will be completed in late 1985 or early 1986.

The irrigated areas will be settled with new farmers. The Mahaweli Economic Agency (MEA) will administer these newly irrigated and settled areas, will be responsible for social

services and agricultural activities. MEA's effort will be under the direction of a resident project manager (RPM) who will be supported by subordinate organizations in the social (health, education), agricultural (extension, inputs) and operation and maintenance (O&M). These services will focus on the development of the O&M organization.

B. OBJECTIVE

The objective of the services required is to develop, train, equip and have in place an integrated organization to assume responsibility for the operatin and maintenance of the above irrigation system. Building and training such, an organization is to proceed carefully and gradually in order to be able to assume responsibility for portions that may be completed and turned over to the GSL. But the O&M organization is to be in place, fully staffed, equipped and trained, to take over the whole system when the construction contractor completes his work and leaves the site.

C. DUTIES OF THE CONTRACTOR

The Contractor shall serve as resident consultant to the Mahaweli Authority of Sri Lanka (MASL) and to the MEA, particularly the MEA resident project manager in System B in all aspects of the development, staffing, equipping and training am integrated O&M organization for System B. The contractor shall furnish all advisory, management, training and other relevant services and implementation actions in a workmanship and professional manner as may be necessary to attain the Contract objective. The contractor shall complete the scope of work indicated on time and in a manner acceptable to AID and to the MASL.

D. SCOPE OF WORK

The contractor shall carry out the following specific tasks and actions:

1. Review Existing Irrigation Literature

a. The contractor shall collect and review all existing reports, evaluations and other documents dealing with the development of irrigation and water management systems in Sri

Lanka. This desk survey is to include all documents prepared by consultants, international lending institutions and GSL entities. Of specific interest in such a review shall be the operations and maintenance efforts that have evolved. Particular emphasis is to be given recent MASL experience in System H, but the survey shall cover all efforts in Sri Lanka such as the Gal Oya, Minipe and Uda Walawe irrigation systems.

b. Upon completion of this review, the contractor shall prepare a summary report of its findings in terms of lessons learned from the experience. The report shall, outline successful and relatively unsuccessful initiations in the irrigation area and, to the maximum extent possible, provide a listing of "dos" abd don'ts".

c. The contractor shall build these lesons into his own effort and shall use them as a checklist to minimize possibility of making the same mistakes and to avoid duplicating initatives that have proved unsuccessful or unworkable.

2. Develop Water Management Plan

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a. The contractor shall develop a set of system management

procedures and practices for application in System B. These shall include an operational plan including specific skills and implementation actions required. The shall also include a flow chart for water delivery and control, a listing of data to be completed for the operational plan, instrument location for discharge measuring points, instrument calibration procedures and rainfall and evapporation measurements.

b. The contractor shall develop a micro-computer-based water budget model for the receipt, conveyance and delivery of water volumes required. He shall also develop a functional monitoring, assessment and feedback system, and shall develop procedures for making adjustments and modification in the model on continuous basis. The monitoring effort shall include baseline data as well as a record of key indicators such as water adequacy, water-related conflicts, water losses, and the responsiveness of agriculture production to water distribution.

c. The contractor shall train four different cadres in the use of micro computers. The first group of relatively senior specialists (engineers, water managers) to be trained to be able to program, work and modify the water budget model and expand it as new areas come into the picture. The second group, including the resident project manager and his deputies shall be trained

to run the water budget model and to test alternative water management scenrois. The third group, to include all professional staff at System B, to receive a general familiarization course in the use of micro-computers including data requirements and limitations. The fourth group, the clerical staff, shall be trained in putting data into the computer.

d. The contractor shall train the operational staff in the collection of data and in the proper calkibration and maintenance of water instruments and measuring devices. This shall include the installation, calibration, reading, cleaning and maintaining in operable conditions in field locations such instruments as raingages, evaporation pans, gaging stakes flumes, weirs and other rated measurement structure. The operations staff shall also be trained in the analysis and raw data collection and reduction to useful forms. Finally, the staff shall be trained in obtaining, recording and reporting agricultural data including areas planted to various crops, estimated yeilds, stages of crop growth, expected harvest dates and so forth.

3. Develop Capability to work with Farmer Organizations

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a. The contractor shall provide advisory services and guidance to the MEA operational staff to work with farmers and farmer organizations and to faclitate the formation of such organizations.

b. The contractor shall provide guidance and assistance in establishing a capacity for agricultural research, particulary at the Agricultural Research Station at Aralaganwila, to conduct farm level water-use studies at the station and in the field and to provide training and demonstrations to farmers and farmer organizations in water management techniques.

c. The contractor shall conduct at least two workshops for selected MASL personnel and other water management professionals reporting on (1) the development of a "rolling" operational plan that is continously evaluated and updated, (2) progress in the formation of farmer organizations and (3) the use of the computer water budget model.

4. Develop a Maintenance Plan

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a. The contractor shall provide assistance and advisory

services in the development of a maintenance plan for the canal system and other ancillary structures and facilities. The maintenance plan shall be a continuous, cyclical plan that includes as its backbone a preventive, routine maintenance operaiton that includes a continuous monitoring and preventive repair. Develop a capability for maintenance planning and updating including use of field data in such planning.

b. The contractor shall develop an instantaneous response capability within the maintenance organization to meet any emergency in the System. Such capability is intended to provide curative maintenance measures such as preventing the collapse of major structure, removal of major blockages, limiting the damage where collapse is inivatable and effecting temporary repairs quickly.

c. The contractor shall develop a capability within the O&M organizations for engineering, administrative and financial support of the maintenance effort. This capability should focus on the preparation of bidding packages for contracting out maintenance chores, administration of such contracts, developing estimates of costs, controlling costs etc.

d. The contractor shall assist and provide advisory services

in developing, staffing, and equipping an equipment shop in support of the maintenance plan. This effort is to include equipment operation, equipment repair, routine maintenance, providing support to equipment working in the field, warehousing of spare parts, storage and control of consumables such as fuels, stock and inventory control, familiarity with specification, equipment manuals and parts books etc. The shop to have capability to service, repair and control all types of equipment including light vehicles, trucks, far modern construction equipment and heavy pieces of equipment such as dozen graders and scappers.

e. The contractor shall conceive and implement the maintenance plan with built-in safety measures to protect human life and property. These safety measures shall be incorporated in all contractor actions particularly demonstrations and training efforts. Of particular importance shall be equipment operation, fuel handling and storage and water and fire hazards.

5. Develop an In-house Training Capability

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a. The contractor shall develop an in-house O&M training capability within the MEA. The contractor shall train and leave

in place a cadre of trainers capable of training new personnel in all skills to that the O&M organization will be able to maintain the needed level of trained staff to carry out its work.

b. The contractor shall develop such capability while developing the O&M organization by identifying personnel suitable for training as trainers, and shall develop training modules, courses, pamphlets and other training aids that could be grouped together as a training library.

6. Equipment Specifications

a. The contractor shall prepare specifications for water management equipment and spare parts, and tools that the O&M organizaiton may need to purchase or for such equipment tna the contractor may recommend for purchasing to ennance the O&M effort.

b. The contractor shall provide advisory services and assistance in wanting specifications and developing bid packages in order for the O&M organizatgon to have such a capability upon completion of the contractor's services.

7. Prepare O&M Manuals

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a. The contractor shall prepare, or upgrade and update, manuals for the use of the operation and maintenance organization. Such manuals to include all levels, from the complex technical manuals to simple ones suitable for use by less skilled personnel and perhaps farmers. Training manuals shall be included.

b. Manuals shall include informational type publications; instructional or operational. Exact number of such manuals, and their lengths and content shall be recommended by the contractor for the consideration and approval of the MEA. Also, the contractor shall provide advise and evaluation on on the contents, structure and proposed use of any such manuals that may be proposed by the MEA.

8. Reports

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a. The contractor shall report on his activities, including quantitative data, on a quarterly basis. These quarterly

reports are to be submitted to AID and the MASL with 15 days after the end of the quarter. They shall be brief documents intended to bring the project managers in AID and the GSL up to date on the contractors efforts.

b. The contractor shall be required to submit a final report upon the completion of his services. This final report shall include a history of the contracto'rs effort and shall highlight benchmarks, successful efforts as well as those not so successful and perceived reasons for their failure. This final report will serve as a resource document and manual to enhance further development and growth of the O&M organization.

United States Agency for International
Development AID Mission to Sri Lanka

USAID Mission to Sri Lanka, American Embassy, Colombo Sri Lanka invites submission of expressions of interest and prequalification data from interested U.S. firms, and joint ventures of U.S. firms, who can qualify, through experience with projects of similar type and magnitude, for technical assistance services to the Mahaweli Authority of Sri Lanka (MASL). The services required include the provision of a Comprehensive package of technical assistance tasks for the operation and maintenance of an extensive irrigation system now under construction and which will be completed in late 1985 or early 1986. The services include the development of water management and system maintenance plans, the development of an equipment use service and repair capability, extensive training and the preparation of O&M manuals. (There are plans to extend this irrigation system later on, and it is the intention of AID and the MASL to retain the consultant selected for the current services for any similar or assiciated services that may be required in the future without competition). The services will be provided directly to the field staff of the Mahaweli Economic Agency, a subordinate entity of the MASL, located at System B of the Mahaweli Basin Development Phase II Project ( ). Funding will be from an AID grant under the same project. It is anticipated that the contract will be of about 24 month duration requiring the services of several professionals on a resident, long-term basis and a larger number of professionals on a short-term basis. A lump-sum (fixed priced) contract is anticipated, based on cost reimbursement with fee.

No prequalification questionnaire will be issued. Firms may, at minimum, submit standard forms 254 and 255 plus any other data or information that they may feel appropriate. However, all firms are encouraged to keep submissions brief and substantive and to refrain from submitting business promotion materials. If a joint venture seeks prequalification, qualification information must be supplied for all firms in the joint venture. Deadline for receipt of expressions of interest/qualification information will be close of business April 1, 1984. Submissions received after that date will not be considered. All submissions must be addressed to the attention of Mr. Gilber Haycock, USAID/Sri Lanka, American Embassy, Colombo, Sri Lanka. (44, Galle Road, Colombo 3, Sri Lanka). After receipt of qualifying information, a short list will be established by AID, in collaboration with the MASL, of those firms to whom requests for proposals (RFP) will be issued.

Firms with questions regarding this notice may call

Hasan A. Hasan or Jack LeMair in AID offices in Washington, D.C., telephone (202) 632-7367.