EVALUATION REVIEW OF THE WATER MANAGEMENT PROJECT NO. 383-0057

SRI LANKA
USAID

WATER MANAGEMENT SYNTHESIS PROJECT
WMS REPORT 10

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EVALUATION REVIEW
OF THE
WATER MANAGEMENT PROJECT
USAID/SRI LANKA
PROJECT NO. 383-0057

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authors (contractors) and not those of the funding
agency or the United States government

Prepared by

Jack Keller* - Team Leader, Civil & Irrigation Engineer

Thomas Weaver - Resource Economist
University of Rhode Island

J. Alwis - Director, Water Resources Development
Ministry of Lands and Land Development

N. Kumarasamy - Deputy Director, Water Management Project
Irrigation Department

Ken Lyvers - Project Officer, USAID

*Utah State University
Agricultural and Irrigation Engineering
Logan, Utah 84322

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WMS Report 10

PREFACE

This study was conducted as part of the Water Management Synthesis Project, a program funded and assisted by the United States Agency for International Development through the Consortium for International Development. Utah State University and Colorado State University serve as lead universities for the project.

The key objective is to provide services in irrigated regions of the world for improving the design and operation of existing and future irrigation projects and give guidance to USAID for selecting and implementing development options and investment strategies.

For more information, contact the Water Management Synthesis Project for information about the project and any of its services.

Jack Keller, WMS Coordinator
Agricultural & Irrigation Engr.
Utah State University
Logan, Utah 84322
(801) 750-2785

Wayne Clyma, WMS Coordinator
Engineering Research Center
Colorado State University
Fort Collins, Colorado 80523
(303) 491-8285

FOREWORD

This study of the Water Management Project was conducted at the request of USAID/Sri Lanka. It is intended to serve as a project review document and includes the Team's conclusions and recommendations with supporting background statement. It also contains recommendations for the future in anticipation of continuing and extending the Project as a model for improving irrigator water management throughout Sri Lanka.

The Review Team visited Sri Lanka between May 27 and June 13, 1982. The Team members were:

Jack Keller	- Team Leader, Civil & Irrigation Engineer
Thomas Weaver	- Resource Economist, University of Rhode Island
J. Alwis	- Director, Water Resources Development, Ministry of Lands and Land Development
N. Kumarasamy	- Deputy Director, Water Management Project, Irrigation Department
Ken Lyvers	- Project Officer, USAID

The Team did not attempt to evaluate the Project in a traditional manner and concentrate on criticizing the activities and outcomes to date. We realized the more important purpose of our mission was to pinpoint the restraints which have slowed the Projects development and reduced its effectiveness and to develop a set of recommendations for overcoming these restraints. The Team approached the task by first studying the various documents which proceeded the Project. The Project paper and contract and numerous reports and papers produced to document Project activities. The Team held discussions with associated personnel (administrators, planners, technicians, consultants, farm leaders, farmers, and critics). We carefully toured the Gal Oya Left Bank Irrigation System and made a quick stop visit of Tract No. 3 of the Uda Walawe Project. During the field visits we: reviewed rehabilitation plans and procedures; inspected the design, machinery and construction activities; studied the ID's irrigation system management strategies; observed irrigation performance and water reuse activities; and queried farmers concerning their water user organization.

We then developed a set of conclusions and recommendations for improving project performance. The background for arriving at these recommendations plus other pertinent informaion for carrying them out was organized and is the body of this report.

The Team appreciated the assistance received from the GSL Irrigation Department. We especially appreciated the support we

received from Mr. A.J.P. Ponrajah, Director of ID, and Mr. S. Senthinathan, DD of Irrigation, Amparai Range, plus the intense interest and long discussions we had with them and other professionals from the ID.

The Team also appreciated the open and candid discussions we had with: Mr. Gilford Rogers, Resident Manager for the PRC/ECI Consultants and members of his staff; and Mr. C.M. Wijayaratna, Chairman, Water Management Group of ARTI and his staff.

In addition the Team appreciates the thoughtful and cordial assistance received from the many USAID Mission personnel who helped us. We give special thanks to Mr. Mike J. Korin, ARD and Mr. Herb Blank, the new Project Officer for their assistance with communications and the development of this report. We particularly enjoyed the hospitality extended to the Team by Mr. and Mrs. Korin. We also appreciate the backing and support we received from Ms. Sara Jane Littlefield, Mission Director.

Following is a brief recap of the Team's itinerary.

Itinerary

May 27, 1982	Arrive Colombo about 9:00 a.m. Had briefing meeting at Irrigation Department with: Mr. A.J.P. Ponrajah, Director Mr. N. Kumarasamy, DD (WMP) Herb Blank, USAID Tom Weaver Jack Keller Had briefing sessions with USAID and picked up a big stack of reading material and began studying the Project documents.
May 28, 1982	Had meeting at Ministry of Land and Land Development with: Mr. Joe Alwis, Director, Water Development/-Ministry of Land and Land Development Mr. C.M. Wijayaratna, Chairman, WM Group ARTI Mr. M.L.J. Wickramasingle, DDM/L&LD Mr. Sena Ganewatta, Cornell/ARTI Consultant Herb Blank, Tom Weaver, Jack Keller Meeting in USAID to discuss the Team's charge and Project activities with: Mis. Sara Jane Littlefield, Mission Director Mr. Leroy Purifay, Engr. - Prof. Div. & Sup. Mr. Mike Korin, Chief Office of Rural Devel. Jack Miller, Program Office Alice Shimosura, Asst. Project Officer Herb Blank, Tom Weaver, Jack Keller Dinner meeting at Mike Korin's home with Herb Blank, Tom Weaver and Jack Keller to review program and set up field trip schedule.
May 29-30, 1982	Reviewed reports in Colombo. Leave for Uda Walawe Irrigation Project with Kumarasamy, Weaver and Keller on May 30 at 2:00 p.m. Then toured No. 3 for a couple of hours.
May 31, 1982	Short visit with Colonel Raja Wijesinghe, Resident Project Manager for the Uda Walawe Irrigation Project. Had lunch and headed for Amparai and arrived before sunset.

Itinerary (cont)

June 1, 1982	Spent entire day in field reviewing the upper and lower portions of the Gal Oya Left Bank Canal Irrigation System with Mr. S. Senthinanthan, DD for the Amaparai Range, Kumarasamy, Weaver and Keller. We inspected for water losses, irrigation quality, reuse activities, and rehabilitation progress. Returned to the guest house and were joined by the other two team members, Lyvers and Alwis for lengthy discussions concerning the Project.
June 2, 1982	Keller visited with Mr. G. Rogers, Resident Manager for PRC/ECI Consutlants. Tom Weaver went out to field to see what I.O.'s doing plus talk to Mr. Douglas Merrey, Sociologist for PRC/ECI. Field trip in afternoon with: Mr. G. Rogers, Mr. Godofredo N. Iglesia, the Design Engineer, and Mr. Benard Corpus, Machinery Maintenance Specialist for the Consultants. We toured in the vicinity of the Uhana Birch Canal distributaries, UB-2.2, UB-2.4. Asked Mr. Rogers to write report on PRC/ECI progress and recommendations. Returned to guest house - had discussions with group. Made assignments for each to do part of the report and come up with a set of recommendations.
June 3, 1982	Carefully reviewed 1:20,000 aerial maps taken for the whole Left Bank area taken Feb. 11, 1981. Then went through the whole on-farm channel rehabilitation design procedure with Mr. Iglesia. Keller and Weaver went out on a field trip with an interpreter and visited with several farmers.
June 4, 1982	Visited tobacco growing area with Mr. Senthenathan. Also visited with Tito Cerdan (ECI) O&M Advisor and read the O&M manual he developed. Then headed for Kandy, arriving at 7:30 p.m.

Itinerary (cont)

June 5-6, 1982 — Keller and Weaver remained in Kandy - reading reports and writing recommendations. We also had long visit with Dr. Cory concerning his activities with water management on the Mahaweli Irrigation Project.

June 7, 1982 — Met with whole Review Team in Colombo and began discussion of final recommendations and report writing.

June 8, 1982 — Had meeting with Tom Kajer, Training Advisor for PRC/ECI - discussed training programs, etc. (Tom took details). Also visited with Mr. P.D. Mahinda, Irrigation Engineer for the Mahaweli Authority who is doing research in the efficiency and farmer response to irrigation water on demand in a pilot area of the Mahaweli Project.

Mr. and Mrs. Mike Korin had a large reception for the Review Team (and also the Sector Study Team who had just arrived).

June 9-10, 1982 — Team met and discussed recommendations, also had meeting at ARTI to discuss I.O. Program and farmer response to Project with: C.M. Wijayaratna, M.L. Wickramasinghe, Sena Ganewatta, and I. Ranasinghe Perero.

Worked hard on reports and recommendations - finished reading all materials (about 1000 pages) and worked up first draft of the recommendations.

June 11, 1982 — Had debriefing meetings with:

9:00 - 10:45 Mission
- S.J. Littlefield, Director
- J.R. Brady, Assistant Director
- L. Purijay
- M.J. Korin
- Herb Blank
- Keller, Weaver, Lyvers

11:00 - 13:30 Irrigation Department
- A.J.P. Ponrajah, Director
- N. Kumarasamy, DD (WMP)
- S. Senthinathan, DD of Irrig. Amparai Range
- T. Weaver, J. Keller, K. Lyvers, M. Korin, H. Blank, Joe Alivio

Itinerary (concl)

13:45 - 15:00 (Lunch meeting) Ministry of Land & Land Development

Nanda Abeywickrema, Secretary, plus same group as above from the ID meeting

15:45 - 19:00 Irrigation Department

Same group as before at department plus G. Rogers. This was the most important meeting. In effect we reached a concensus agreement on a set of recommendations (mainly with Mr. Penrajah, Director of ID).

June 12-13, 1982 The entire Team met and finalized the Draft Recommendations. Then Weaver, Keller and Lyvers worked on finishing rest of Report.

June 13, 1982 Weaver and Keller departed from Colombo at 13:15.

EXECUTIVE SUMMARY AND RECOMMENDATIONS

The Review Team views the Gal Oya Irrigation System as a mature paddy irrigation system in which in general the farm fields are nicely leveled and the major part of the deep percolation and runoff from the directly irrigated areas is now being utilized through reuse systems. Cultivators have developed these systems and lands to utilize this so-called waste water using their own resources. These indirectly irrigated lands now compete with plans to extend the directly irrigated lands to the "official" area.

The above efficient hydro-ecology which has evolved would not have happened without sufficient time, suitable topography, and paddy irrigation. Therefore, one can conclude that the Gal Oya Irrigation System as it has now evolved is somewhat unique. The following provides a brief summary of the major conclusions and recommendations of the Evaluation. More details are provided in the text.

Planning

The Master Plan which has been prepared for the Gal Oya Irrigation System provides good historical and other data, and fits the requirements as specified in the Consultants Work Plan. However, a considerably more comprehensive master plan is needed for the task at hand.

Recommendation 1

We recommend that the following be included: a careful estimate and detailed description of the areas irrigated (both the official and encroachment, direct and return flow, irrigated lands); a detailed description of how the system is working now which should include the meteorological and hydrological information necessary for developing a water balance model to evaluate the effect planned changes might have on the system; a detailed plan for rehabilitation; and more specific recommendations for domestic water supplies and raising the Navakiri Dam.

Rehabilitation Design and Construction

Rehabilitation is essential, however, the current plans (survey and design through construction) are overly optimistic in terms of the value of the activities, the human resources to carry them out, and the time and money involved.

Recommendation 2

The rehabilitation plans should specify a more pragmatic approach directed toward: 1) system safety; 2) adequate ability to deliver available water in an efficient manner; and 3) ease of operation,

management and maintenance. Detailed design drawings are prepared but these are not followed in the field. This is especially true for the canal section rehabilitation activities. Furthermore, it does not appear that the heavy equipment is being effectively and efficiently utilized.

Recommendation 3

Design activities should be minimized to what sections need work; the general specifications and the form of work to be done; and the expected finished project.

Recommendation 4

It is recommended that scheduling of construction activities be better organized.

The Training Programs

The Training Program at Galgamuwa is a priority activity which is behind schedule in construction, staffing and curriculum development. Training of Farmer Leaders and Village Level Workers is also behind schedule and must proceed with a curriculum based on a sound knowledge of the rehabilitation scheme and the agricultural economy of the region. Care must be taken to coordinate this curriculum with changes in the overall program which are occurring as a result of the evaluation.

The training of Institutional Organizers, although it will need considerable expansion, seems basically sound. The Cornell University training activities with ARTI are well measured and on track.

The overseas component of the training has generally been acceptable but a consistant vigil must be maintained so that as far as possible the overseas experience is relevant to the Gal Oya Project.

Recommendation 5

It is recommended that the indicated deficiencies in staffing, curriculum and facilities be corrected as soon as possible as one of the highest project priorities.

The Institutional Organizer (I.O.) Program

The I.O. Program has had considerable acceptance by cultivators. More experience in working in other community types, in expanding the function of the turn out groups, and in federating these groups into larger units, and better understanding of the motivations of the

farmers should be gathered before a total commitment is made to the present model. The I.O. Program may eventually need a permanent agency home. There are strong reasons for considering the Irrigation Department in this role.

Recommendation 6

It is recommended that the I.O. Program continue in an experimental mode as a high priority activity.

Research and Technical Assistance

The data collected and analysis as it is being conducted by ARTI seems satisfactory and on a reasonable tract. Cornell University's assistance has been quite useful in this regard.

Recommendation 7

The research on controlling flows through farm turnouts should be considered complete and further consideration should not be given to rotational irrigation without a carefully controlled and documented experiment covering a number of water courses with various return flow, soil and topographic circumstances.

Recommendation 8

A detailed operational water balance model should be developed and run to determine what system changes are feasible and have a potential for improving agricultural output from the Project in an economical manner.

Recommendation 9

Technical assistance should be reoriented in accord with the above recommendations.

Future Technical Assistance

While the original concept of the Project is valid, there are serious shortcomings in terms of master planning, design, and rehabilitation activities. As indicated by the above recommendations, major project realignment is necessary in these areas.

Recommendation 10

To accommodate the needed Project reorientation more clearly, the existing contract between the consultant (PRC/ECI) and the Irrigation Department (ID) should be terminated as of March 31, 1983. In the

meantime plans and negotiations for a re-directed new contract which would still fall within the scope of the initial Project paper should be initiated.

We make this recommendation because we feel this is the most appropriate way to obtain the needed prioritization of the Project activities. We would hope the new contract would be underway by April 1, 1983 and encourage the present contractor to actively pursue it.

Extension of Project

In reviewing the implementation plan, other aspects of the Project paper and status of the Project to date, it is evident that the Project must be extended in order to meet the Project objectives. While initially the Project remained on schedule in terms of putting the Contractor on-board and in procuring and obtaining Project equipment and other commodities, the other aspects of the Project are seriously behind schedule. Two major reasons for this slow implementation are lack of adequate personnel within the Irrigation Department and the racial problems which occurred in the Project area last year.

Recommendation 11

It is recommended that the Project be extended by two years to April 31, 1986 by which time Project work should be completed.

Additional Funding

Another constraint to Project implementation has been lack of funding, especially the lack of GSL inputs. This has resulted in delays in upgrading the training facilities at Galgamuwa for example. The details on both the U.S. dollar contribution to the Project as well as the GSL contribution are outlined in the report. Also, due to major and severe financial constraints within the GSL, it is unlikely that they will be in a position to provide 46% of the Project funding as envisioned when the Project paper was prepared. Also, due to inflation as well as an increase in the total length of canals to be rehabilitated, the overall cost of the Project has increased.

Recommendation 12

The Team recommends that USAID consider providing additional loan and grant funding (up to 75% of Project requirements) as needed to modify and complete the Project based on the above recommendations.

BASIC PROJECT IDENTIFICATION DATA

1.	Country:	Sri Lanka
2.	Project Title:	Water Management
3.	Project Number:	383-0057 with Loan T-023
4.	Project Dates:	
	a. First Project Agreement:	August 30, 1979
	b. Final Obligation:	December 30, 1980
	c. Project Activity Completion Date (PACD):	April 30, 1984
5.	Project Funding ($ million)	
	a. A.I.D. Bilateral Funding:	$6.8 Loan and $3 Grant
	b. Other Major Donors:	None
	c. Host Country Counterpart Funds	$8.54
	TOTAL	$18.34
6.	Mode of Implementation: Contract	PRC/ECI Host Country dated March 21, 1980 Cornell University Contract, AID/ta-CA-1, Amendment II
7.	Project Design (A.I.D. and Contractor):	CH 2 M HILL Consultant Firm
8.	Responsible Mission Officials:	
	a. Mission Director:	S.J. Littlefield
	b. Project Officer:	F. Ken Lyvers
9.	Previous Evaluation and Reviews:	None
10.	Cost of Present Evaluation:	
	a. Direct Hire:	Water Management Synthesis
	b. Contract:	$26,000
	c. Other:	
	TOTAL	$26,000

TABLE OF CONTENTS

Section		Page
	PREFACE	ii
	FOREWORD	iii
	ITINERARY	v
	EXECUTIVE SUMMARY AND RECOMMENDATIONS	ix
I.	PROJECT DESCRIPTION	1
II.	BACKGROUND	2
III.	PHYSICAL ASPECTS OF PROJECT	4
	Planning	4
	Additional Planning	5
	Operational Model	5
	Rehabilitation	7
	Rehabilitation Design and Construction	9
	Physically Related Research	11
	PRC/ECI Technical Assistance	12
	Irrigation Department Organization	13
IV.	INSTITUIONAL ASPECTS	14
	WM Training and the Galgamuwa Irrigation Training Institute	14
	Training for Farm Leaders and Village Level Workers	15
	Institutional Organizers	16
	Research and Data Collection - ARTI	18
	Cornell University	19
	The Value of Irrigation Water and Equity Issues	20
	Within Project Coordination	21
V.	FINANCIAL ASPECTS OF PROJECT	23
	Financial	23
	Status of Project Implementation	28
	Extension of Project	28
APPENDIX A	PHYSICAL ASPECTS OF THE LEFT-BANK CANAL PORTION OF THE GAL OYA IRRIGATION SYSTEM	A-1
APPENDIX B	COMMENTS ON PROJECT ORGANIZATION AND COORDINATION	B-1
APPENDIX C	FIELD VISIT WITH THE CULTIVATORS	C-1
APPENDIX D	STATUS OF PROJECT	D-1

I. PROJECT DESCRIPTION

The concept for water management for Sri Lanka began to take form and substance about 1952, when the World Bank reported that such a program was of prime importance to the country. In 1972, the UNDP sponsored a water management project with the Gal Oya Project selected as the working nucleus for project activities. The conclusions reached on the UNDP project were published in 1974, and they confirmed the earlier reports of the World Bank. The Government of Sri Lanka (GSL), taking note of the repeated calls for a program to improve water management in Sri Lanka, decided to take action, and in 1978 requested assistance from the United States Agency for International Development (USAID) to help define a policy and program for future water management practice for the nation. USAID subsequently commissioned several studies and the culmination of these efforts was the preparation of the project paper titled, "Sri Lanka - Water Management" (383-0057) dated July, 1979.

On 30 August 1979, officials of the two governments involved signed the Project Agreement which formally initiated the Sri Lanka Water Management Project. USAID provided grant funds for technical assistance and loan funds (in concert with GSL contributions) for other project operations. The Project Agreement stated that the purpose of the Project was:

Development of an institutional capability which can be replicated to manage large irrigation schemes in Sri Lanka in a more effective manner with active farmer assistance.

The Agreement defined the Project as consisting of the following principal elements.

- Modernization and rehabilitation of the Left Bank System of the Gal Oya scheme;
- Develop master plans and conduct on-farm water management research at both Gal Oya and Uda Walawe;
- Conduct other socio-economic water management research;
- Provide an improved country-wide irrigation training program;
- Improve central support to be provided by the Irrigation Department in maintenance and operation of major irrigation systems;
- Improve the extension program; and
- Assist the Borrower/Grantee to formulate irrigation organizers whereby farmers will participate in the rebuilding, operation, and maintenance of field channels, and in management of water use for growing crops.

II. BACKGROUND

Before going into the recommendations a word about the entire agricultural environment that has been affected by the Gal Oya Irrigation System is in order. It is evident that the system development has not followed the original plan. Areas at the ends of the branch canals and outer distributaries receive little or no water from the Project. Some 25 years ago when irrigation development was just getting underway settlement began in the head reaches of the Project command area. Naturally during the early development years there was considerably more water than necessary for the relatively few acres under irrigation.

During the early project development stage there was little incentives to conserve water and so called wasteful irrigation practices were institutionalized. As development proceeded, the demand for water increased which increased both the human and physical tension within the system. However, in parallel with irrigation development along the directly commanded reaches of the Project, irrigation development also took place along the Project's drainways. This was possible by indigenous means because the lands have sufficient slope to make reuse practical. Undoubtedly, at an earlier time there was a great deal of waste water during all seasons. But now, after many intervening years this is far less so. Apparently the irrigation development based on return flow is now using very substantiated proportions of the runoff and deep percolation waters from the directly irrigated paddies. On June 2, 1982 the Review Team noted that there was essentially no water flowing past the last anicuts on Andella Oya and Navakiri Aru. This was even after a very substantial rain over much of the project area.

In effect, project releases of water and wasteful irrigation practices within the directly irrigated reaches of the Project have resulted in dependable flows through the drain systems. Cultivators have noted that these "new" flowing streams are dependable throughout the dry periods of Maha (wet) and Yala (dry). Realizing the value of the water that have invested their own resources (with little GSL help) to develop it and their paddy lands to use it on. So in effect, the Project's water resources have continued to be developed and we feel that at this late date they are probably quite efficiently utilized during the latter part of Maha and during Yala.

Although there are no accurate estimates of the extent of the extra irrigated areas (the directly irrigated encroachment areas plus the return flow irrigated areas) the Team members heard estimates as high as 30,000 additional acres under the Left Bank System alone. So, in effect, we appear to have as much irrigated land as would be practical given the water resources at hand - the irrigated lands just are not where they officially are supposed to be!

In summary, what we find is a mature irrigation system. Individual cultivators acting in their own interest have worked to obtain maximum benefits under the water environment they have encountered. It is important not to extend conclusions drawn on this mature system of paddy irrigation on relatively steep lands to other less mature projects on upland crops or different topographic conditions.

III. PHYSICAL ASPECTS OF PROJECT

A general description of physical aspect of the Left Bank Canal portion of the Project is presented as Appendix A. Comments, conclusions, and recommendations concerning the specific areas follow.

Planning

The draft Master Plan for the Gal Oya Project which has been developed by the Consultant (PRC/ECI) is a historical review and is a reconnaissance level plan. The next round of activities should include:

1. A detailed survey indicating the areas (and acreage) receiving direct and indirect (return flow) water from the Left Bank Canal during both Yala 1982 and Maha (from the existing early February 1981 photos or for the 1983) seasons. These should be made from aerial photographs and they should include estimates of the return flow areas associated with each distribution.

2. A detailed analysis of how the system is now being operated in terms of discharge rates and flows into the various main and distributary canals and through the drainage systems.

3. The establishment of an operational model as discussed below as time and finances become available.

4. The development of design standards for the various levels of rehabilitation discussed earlier. In addition: at least the main, submain and major distributaries should be "stationed;" the head profiles taken; and a listing of rehabilitation needs made (station by station) based on a system walk through by experienced designers.

Specific plans should be included for installing a few UNICEF hardrock deep wells located in accordance with recommendations from the GSL Water Resources Board studies.

Specific plans for any needed anicuts along Andolla Oya should be included along with recommendations concerning drainage needs.

Position scope and extent of Master Planning and on-farm research activity at Uda Walawe is under review owing to a request by the Mahaweli Authority of Sri Lanka (which has now assumed responsibility for the Uda Walawe Project). It is recommended that this aspect of the Project work be taken out of the revised project scope and handled under other USAID arrangements, and the Mahaweli Authority of Sri Lanka.

The data already collected by PRC/ECI together with an annotated cross referenced bibliography with one paragraph long abstract of the pertinent literature of the project should be handed over to the Mahaweli Authority.

There appears to be room for more innovative studies concerning the use of water which is captured by the low-lying lagoons. Such possibilities as pump back systems even to the extent of raising the water to upper canals might be considered. This input may be particularly useful for domestic supplies. The power for this purpose could potentially be generated within the project.

Additional Planning

A full feasibility study should be completed for either raising the Navakiri Aru Tank Dam or constructing a new dam upstream from it. This study should be detailed enough to form the basis for cost estimates. It should also contain sufficient information on hydrology site selection and irrigation potential to decide on either building the new dam, raising Navakiri or both (or neither). It might be worth mentioning that perhaps one-third of the water stored in an upstream dam may end up as return flow in Navakiri.

PRC/ECI suggests that increasing Navakiri storage and consequent discharge would aid in aleviating domestic water shortages in the area, especially if pumping through pipelines were used to supply water to the various villages.

While not necessarily a part of this Project it would be interesting to study the possibility for adding a low-head generator to the existing discharge facilities in order to capture power from all water releases from Senanayake Samudra.

Operational Model

It is essential that a thorough understanding be achieved concerning the extent of return-flow acreage irrigated as well as direct acreage irrigated (official and encroachment) before spending extensive efforts on water conservation matters. In the directly irrigated acreage it is important to know what areas are actually being irrigated from the releases from a given portion of a system as well as the total areas irrigated from project water.

The PRC/ECI reservoir operational model should be extended to include full system operation design to deal with rainfall variations throughout the project as well as side canal inflows and potentials for controlling D-canal inputs to reduce system losses which are not essential for return flow uses. This is necessary in order to

evaluate the potential for better system operation in terms of expanded areas irrigated or more intensity of double cropping. System improvements should not be arbitrarily dealt with unless it can be demonstrated, at least through a complete systems modeling and economic study, that such improvements in fact will produce net system wide benefits which exceed both the construction and operating cost of the so called improvements.

The operational model complete with detailed canal operation and spacial rainfall inputs should be run assuming perfect coordination to determine whether water can be saved during the Maha season for later use without affecting overall production when return flow and encroachment acreage are considered.

The relative value of irrigation water during the Maha (wet) and the Yala (dry) seasons must be determined. This is necessary so that the water which is saved from any water saving practices which are determined appropriate can be allocated to irrigation within the season in which it has the highest values.

Differences in soil characteristics as they are relevant to water management must be determined. The present practice of assuming a uniform soil characteristic across the area is not appropriate.

Before recommending turning the operation of the D-canal level over to farmers, an operational model should be constructed which evaluates the effect on the total system and the need for system communications of farmer operations at the D-canal level.

In view of the rising cost of energy it would seem appropriate to use the operational model to study how to better accommodate water releases for power generation as well as irrigation. There seems to be considerable opportunity for doing this in view of the in-line storage along the canal systems.

Data needs for modeling. The data needed for the water balance model include: system flow and capacities at various locations along with flow routing; hydraulic characteristics of the channels and structures, runoff inputs to reservoirs and canals; spacial rainfall data; runoff and drainage flows; and a detailed irrigated land use survey (both direct and indirect irrigated areas). Basically this information has been requested under the section on planning.

To assure that the essential information is obtained in the most efficient manner a two-man team of system modeling consultants should be engaged to draw up and plan the modeling and data gathering

activities. The modeling team could possibly be contracted under the USAID Water Management Synthesis Project and will require from 1.5 to 3 person months and should be engaged as soon as practical.

The Review Team recommends that the data gathering also be initiated as soon as practical under the PRC/ECI consulting contract. The data gathering will require:

1. Photo interpreter for 3 months.
2. Hydrologist and modeler for 6 months.
3. Hydrographer (advise on and measure flows) for 6 months.

Rehabilitation

Rehabilitation should be thought of as a combination of deferred maintenance and modernization. For the most part we are dealing with deferred maintenance, which on this project should be essentially confined to repairing the main and branch distributary canal systems to full safety and operating conditions.

Gates and flow measurement capability should only be installed at D-channel headworks. Only the minimum number of control structures should be installed so that the major portions of the main and branch system can be in continuous operation and rotation carried out by controlling inflows to distributories or minor branches. In operating with such rotations the basic balance which has been established from historic operation of the system should be maintained to accommodate the established re-use and encroachment areas. Thus, existing flow characteristics must be known before the headworks are altered and as mentioned in Appendix A, flow level changes from historical practices should only be done incrementally over several years. It is important in putting in or installing such control structures that the number of structures be minimized to simplify both maintenance and operational activities.

The lowest level of potential ID rotation controls would be to the point where rotation can be made between D-channel, leaving the major branches and mains in full operation rather than making rotations between major branches. Any other rotations within the systems should be the reponsibility of the farmers and the ID should only assist in terms of presenting the farmers with reliable operational rules.

The proposed program for using a seven day rotation at the field channel level should be abolished. While this may appear to be a noble exercise, it will upset the established balance of the system of down-stream users and encroachment acreage. Since the system is now

operated on a massive rotational basis (between main branches), any change from this general mode of operation should be entered into with great caution. Furthermore, eliminating the ID's responsibility for providing new and special field channel hardware for rotational irrigation will reduce rehabilitation costs and design effort immensely.

Rehabilitation program. The rehabilitation program should be re-prioritized to stress the following order of activities.

A. Main and Submain Canals

1. Repair weak sections as needed to assume safety and full operability.

2. Repair major structures to full design standards and re-calibrate discharge relationships of gates.

3. Place permanent station markers at 500 m intervals along the main and branch canals.

4. Bring entire system up to some practical design standard to facilitate ease of maintenance. This will not require rehabilitation of all reaches or bringing the cross sections back to original standards. What is needed is to do the minimum work necessary to reduce sluffing bank areas, erosion at the outside of bends, reduce silt intake, and removal of major silt deposits.

5. After data on how the system is now operating has been collected, gates and flow measuring flumes could then be installed (or repaired) on the D-channel headworks.

B. Distributory Channels

The D-channel rehabilitation program should be carried out simultaneously with the above program, but priority in terms of equipment and human resource usage should be given to the main channel rehabilitation program.

1. Repair weak sections as needed to assure safety and full operability.

2. Repair main structures to medium design standards.

3. Place permanent stations markers every 500 m.

4. Bring entire D-channel system up to minimum practical design standards to facilitate ease of operation and maintenance. Remove major silt deposits.

5. Install on-off gates at the field channel headworks only if the operational model demonstrates that gates at the field channel headworks are economically and operationally sound. This must be demonstrated in terms of both the direct and indirect irrigation served from the system. Such gates should also be proven (in a pilot area) to be practical from the standpoint of organizational ability to operate them in a beneficial way and never in a detrimental way which places the canal or adjacent property in jeopardy.

6. Field channels should only be constructed parallel to the D-channels to eliminate illegal outlets in the D-channels if and where their economic and operational practicability can be demonstrated. Where parallel field channels would serve widely spaced outlets individual small diameter outlets in the D-channels should be installed as the farm turnout to the encroachment areas.

C. Field Channels

Field channel rehabilitation should be restricted to about $2,800 per km of channel. The work performed should be as requested and approved by the user groups and may include checks, field turnouts, drop structures, division boxes, culverts, and roads. In addition repairs should be made in existing structures as required for operability. Farmer groups should provide as much assistance as practical on their channel improvements.

D. Drainage

Rehabilitation of drainage ways should be restricted to providing safety from unreasonable flooding and water logging where significant areas are involved.

Rehabilitation Design and Construction

The rehabilitation program is far behind schedule. A major reason for this is because the current plans (survey and design through construction) are overly optimistic and not entirely appropriate in terms of the value of the activities as compared to the financial and human resources required.

The rehabilitation plans should specify a more pragmatic approach. A critical path approach to the whole rehabilitation

program should be followed as outlined earlier. The contractor should field an expert and experienced team made up of a design engineer and a construction engineer who have extensive experience in canal rehabilitation. This team should be assisted by two sets of ID counterparts who have had considerable general field experience on the system. In addition to getting the work done, attention should be given to training the counterpart engineers in the "art" of rehabilitation engineering. This rehabilitation design team should first review the entire system and locate critical areas needing immediate rehabilitation work for canal safety and to maintain carrying capacity. After the station markers have been placed and the longitudinal survey completed the team should "work" the entire system and specify and prioritize what and where rehabilitation is required for improved system performance and reasonable ease of operation and maintenance.

Instead of using the present "textbook approach" to specifying rehabilitation requirements, a more relaxed design approach should be utilized. Now "as is" cross-sections are made at every station and detailed designs are drawn up. Moreover, these are rarely followed in the field. The relaxed approach is to set up standards indicating approximately how and what work should be done for the various types of problems encountered and then along with the "walk through" indicating what standards should be applied at the various locations. In setting up the general set of standards, attention should be given to not disturbing existing stable canal banks and banks which already have some form of bank protection such as bushes, grass or rock. Consideration should also be given to the trade-offs between raising canal banks and desilting. The main criteria is to do as little work as possible to get the desired results in terms of canal safety, stability and carrying capacity. After all, the purpose of rehabilitation is entirely functional, being neither cosmetic or an academic engineering exercise.

The above approach to rehabilitation will reduce surveying, design and construction costs in a number of ways. First of all, only the more critically deficient sections and structures need to be dealt with, versus starting at a point and making a cross section and design drawing for each station. Then, even at the sections requiring attention, such as heavy bank protection on the outsides of bends, only "as is" sections need be drawn up, because rehabilitation construction need only follow a standard general plan which is appropriate for the type of problem area, size of canal, and general characteristics of the "as is" section.

The Review Team observed in the field and noted from discussion with PRC/ECI (the consultants) that there were difficulties with the effective and efficient use of the heavy construction equipment. From

and efficient use of the heavy construction equipment. From our brief visit and discussions concerning this area of activity it would appear that even the most needed equipment on hand (such as the dragline) is not efficiently utilized. Based on reasonable expectations, equipment use and production efficiency is low. The actual usage hours are only about half of what they should be because of: scheduling problems; and down time due to fuel shortage and poor scheduling of maintenance.

Operator efficiency is also apparently low because the ID's heavy equipment operator pay scale is not realistic. As soon as operators get skilled, apparently they can find much more lucrative opportunities elsewhere and leave. According to discussions with the consultant, operator efficiencies range from perhaps 30 to 90 percent (based on potential operator output standards) depending on operator experience and the skill needed to operate the particular piece of equipment.

In view of the above, the scheduling of construction activities should be better organized, a much more appropriate operator incentives system must be incorporated, and additional training efforts are needed for construction supervisors, equipment operators and equipment maintenance personnel.

It would be appropriate to request special technical assistance from the Water Management Synthesis Project for setting up the above program.

Physically Related Research

The specified physical research activities related to demonstration type applied research concerning rigid rotational irrigation on a completely rehabilitated pilot area has not been carried out. However, as discussed elsewhere, the Review Team does not recommend that this be done as a high priority effort as discussed elsewhere.

The Team feels that high priority should be given to developing the detailed water balance model described herein. As discussed above and in appendix A this is necessary to determine what system changes are feasible and have a potential for improving agricultural output in an economical manner from all of the area receiving water from the irrigation systems.

The research on controlling flows through the farm turnouts should be considered complete and further consideration should not be given to rotational irrigation without a carefully controlled and documented experiment covering a number of irrigation channels with various return flow, soil and topographic circumstances.

In conjunction with this project a long term program for developing appropriate husbandry and WM techniques on crops other than paddy should be encouraged. The relative value of irrigation water on these alternative crops should be determined and used as a basis for introducing new crops into the area.

The water management research which is now underway on Tract No. 3 of the Uda Walawe Irrigation System should be carried out as planned. The rehabilitation should be completed and the results evaluated while being careful to account for both direct and return flow water usage and the resulting changes in total agriculture in view of the capital and management expenses involved.

PRC/ECI Technical Assistance

As indicated in other sections of this Review, it appears that the technical assistance provided by the PRC/ECI Consultants has not been as effective as it might have been in helping resolve problems with project implementation and to push various project implementation activities. It appears that a possible reason for this is the somewhat loosely worded scope of work as well as the attitude of the field team itself, i.e., that they were here primarily to "advise and assist."

After detailed discussions with various parties it is evident that there is some sense of dissatisfaction with PRC/ECI. On the other hand, there are several valid reasons why the Consultant has had difficulties. These include: insufficient personnel back-up from the ID, inadequate facilities and inadequate directives from USAID.

The project purpose envisions the establishment of an institutional capability within the ID to more effectively manage the large irrigation schemes in Sri Lanka with active farmer assistance. From the Evaluation Team's Review of various documentations and the work done to date, it is evident that this purpose is not likely to be met unless the management capability of the ID is improved dramatically. While the PRC/ECI has provided input on the operations and maintenance, this work appears to have only marginally helped in improving the ID's overall capability because of the ID's staffing problems. Also, the initially envisioned central support element of the project has not been very effective in helping to obtain this major objective. While the original concept of the project is valid, there are serious shortcomings in terms of master planning, design, and rehabilitation activities. As indicated by the above recommendations, major project realignment is necessary in these areas.

To more clearly accommodate the needed project reorientation, the existing contract between the consultant (PRC/ECI) and the Irrigation Department should be either terminated as of March 31, 1983 (or revised considerably).

In the meantime, plans and negotiations for a re-directed new contract which would still fall within the scope of the initial project paper should be initiated. We make this recommendation because we feel this is the most appropriate way to obtain the needed prioritization of the project activities. If this new contract route is chosen we would hope it would be underway by April 1, 1983 and encourage the present Contractor to actively pursue it.

Throughout the remainder of the current contract technical assistance should be reoriented in accordance with the above recommendation.

Irrigation Department Organization

The Review Team made no attempt to study this issue but it is obvious that a number of management, organizational and support staff changes are necessary in the ID in order to successfully cope with improving irrigation performance and carrying out this type of project. The Team felt that in view of the Irrigation Sector Study which was begun during this Project Review that a study and recommendation concerning the organization of the ID would be forthcoming shortly.

IV. INSTITUTIONAL ASPECTS

Some general comments on the Project organization and coordination are presented in Appendix B. Additional comments, conclusions and recommendations concerning the specific institutional aspects of the Project follow.

WM Training and the Galgamuwa Irrigation Training Institute

The water management Training Program and associated upgrading of the facility at Galgamuwa Irrigation Training Institute (GITI) was seen as an integral and important part of the original Project. In the opinion of the Evaluation Team, this was and should remain an important dimension of the Project. Both dimensions of the Training Program, upgrading of the facility, and development of curriculum are behind schedule. The original plans for construction were scaled down to what participants consider a minimum level. Within the past five months construction activity has quickened and enough buildings are underway to allow planning for the introduction of the new curriculums to proceed. The Program Planners seem well attuned and oriented to the need for developing a curriculum which will be factually correct and relevant to the needs of the participants and to the country.

The necessary increased staff required to teach the new water management component of: 1) the regular T.A. (Technical Assistants) two year training program; and 2) inservice training for irrigation field personnel (including engineers and T.A's) has not yet been contracted. Difficulties with providing adequate living quarters, lack of career opportunities, and salary schedules are all cited as reasons for delays. At the same time, however, it is recognized that and aggressive recruitment program might well produce results.

The Training Program Planners show an appropriate concern that the instructors eventually hired are of high quality. In their words, they do not have the time to spend several years training the trainers. The Evaluation Team agrees with this assessment and recommendation.

The Review Team recommends that the Galgamuwa training component of the scheme be encouraged and that construction of needed facilities and provision of staff be given a high priority within the larger Project. Some specific suggestions for staff improvement and curriculum development include:

1. It is recommended that as staff development is an important aspect of work, priority be given in selection and transfer of staff to Galgamuwa and that at least two engineers be added to the staff.

2. It is recommended that to overcome the shortage of engineering staff the possibility of obtaining expatriate engineers through UN or any other volunteer programs be looked-into.

3. It is recommended that the curriculums which are developed at GITI on water management for in-service training, for the regular T.A. programs, and for any other water management training program be sent by the Consultant to the International Irrigation Center at Utah State University, Logan Utah for constructive review.

   It is felt that the considerable experience which the Water Management Synthesis Project has had with training and curriculum development would be useful for the training efforts at GITI.

Broad-based water management and irrigation training for policy makers, officials, operators, farm leaders and farmers is a felt need for which development of a long range program should be given a high priority. At present with needed such training public facilities appear to be well organized. However, in the case of irrigation management, this is still a marginal activity.

It is recommended that this opportunity may be seized by the GSL to embark on expanding training by instituting a national level central water management training division in the Ministry of Lands and Land Development to formulate training programs and utilize the existing facilities in other sectors to enhance the quality of the training already provided. Such an organization would be in a better position to coordinate a nationwide water management training program and even examine the Secondary and University curricula for necessary amendments and cater to the larger needs of the country. Such a unit will require the services of qualified professionals in communication and training strategies to make use of the resources available in the country.

Training for Farm Leaders and Village Level Workers

The component of project training which is to provide training for farm leaders from the turnout group and for village level works has been particularly slow in getting underway. Staffing problems are cited as the main reason although it has also been recognized by the project personnel that it would be ill advised to proceed with a training before the rehabilitation of Gal Oya was well formed and on tract. Failure to do this could result in passing out misinformation that might be difficult to retract.

The present solution to the staffing problems has been to form a three man training team composed of an Agricultural Officer, a T.A. and an I.O. chosen by ARTI. This team is expected to proceed slowly to develop a training curriculum by identifying and combining perceived training needs on the part of those to be trained with training objectives identified by the curriculum planners.

The Review Team cautions that great care be taken that the training program developed by the team for the farm leaders and village level workers be factually correct. Given that the broader project can be expected to change program elements and generate new information and insights, it is vital that the training program be kept current.

The Team encountered several items of information which were being used within the project programs which seemed questionable. For example: the suggestion that rice plants had greater fungus problems when irrigated by continuous flow rather than standing water; and the suggestion that too much irrigation water by itself dramatically reduces yields. Both of these notions are questionable. Needless to say considerable care should be taken that the information given to farmers be that which is currently accepted in the field. Any uncertainty in causality should be part of such information packages.

Institutional organizers

The establishment of the turn out groups and the work which had been going on for the past year on farmer organizations are among the more encouraging aspects of the project. It appears that major steps have been taken to create a cadre of "Institutional Organizers" (I.O.'s) who are highly motivated and are actively involved in working with the farmers in various project work. An initial 30 I.O.'s have been working in the field since early 1981 and another group has now been recruited and will begin training next month.

The Evaluation Team spent considerable time attempting to determine a reality for the I.O. program. The primary objective of the Team was to attempt to understand why farmers were joining the turn-out groups. It seemed to us that it was important to know why farmers were participating for two reasons: first as an aid to determining whether or not the turn-out group concept might be applicable to other irrigated project areas within the country; and secondly to determine whether or not it might be appropriate to expand the functions of the turn-out groups at some later stage in the project.

A substantial body of evidence is available to show that farmers have indeed joined the turn-out groups. There is considerable

documentation to suggest that at least one of the motivations of the cultivators is a sense of social and moral responsibility, i.e., genuine concerns that tail-enders have not received an equitable share of the irrigation waters. It is likely that this is not the single motivating factor for participation within the group. It is quite possible that other factors are more important. A narrative account of a field trip to a turn-out group area to talk with cultivators is included in appendix C. As a reason for membership the following hypotheses were suggested during the course of our inquiry.

1. Rotating water within the group reduces tension and conflicts between group members who are neighbors and therefore is of considerable value.

2. Rotation has value because it allows at least some farmers to apply inputs in a more timely way.

3. Membership in the group brings about rotation which in turn supplies water more easily during critical periods of the growth of the rice plant.

4. Membership in the group is seen as a way of assuring a flow of benefits which is perceived to be available from the rehabilitation scheme.

5. It is perceived that the group is more effective in bringing pressure at the appropriate pressure points in the system for obtaining a greater quantity of a limited supply of water.

6. Membership in the group enhances the members sense of recognition and importance.

It is important to note that all of these possibilities are unproven hypotheses which could be tested to provide a basis for future expansion of the program.

The Team recommends that ARTI in consultation with Cornell begin an investigation into the motivations and benefits associated with the turn-out groups.

As of the evaluation date, the I.O. Program had only been operating in one of the two ethnic communities in the Project area. However, there are plans to expand into the other area in the coming months. There have also been suggestions that the turn-out groups should be federated up to the D-channel level.

Given the lack of broadbase experience in communities of varying indigenous social structure, a lack of understanding of farmer motivation for participation, uncertainty as to the possibility of additional functions for the groups and the possibility of federating the groups into larger organizational units. It is recommended that the I.O. program continue in an experimental mode. It is recognized that if the program continues to prove effective that it will have to be integrated into a department and that there is strong reasoned support for the Irrigation Department in that role.

The present program of encouraging formation of farmer associations at the field channel level with the assistance of institutional organizers is out of phase with the rehabilitation construction program within the project implementation time frame. It is expected that the rehabilitation program will soon exceed the trained I.O.'s at the current I.O. training rate.

It is recommended that ARTI, in order to meet the demand for I.O.'s consider an increased training rate and/or increased area of responsibility for individual I.O.'s.

In addition to the on ground institutional work the Review Team recognizes that the GSL has proceeded, as noted in the Project Agreement to develop legal and institutional changes which are necessary to improve water management. The Team highly commends this work and strongly encourages continued efforts in this direction.

Research and Data Collection - ARTI

Overall the research and data collection program undertaken by ARTI seems well in hand. The Team visited the data collection center at Ampari and was impressed with the integrity of the program and the quality of the personnel. Work was proceeding in an organized and timely manner.

The data produced by the program has been used in a number of useful analyses so far and will be available for further studies relevant to measuring the impacts of the program. It is important that sufficient manpower be made available to take advantage of the wealth of data coming from the project.

The Team noted that there was considerable interest in the reports of the process documentors but that they had not been made available. We recommend that the reports of the process documentor be made available in summary form to the other project participants particularly the Project Director, Department of Irrigation, the Project Consultant Group, USAID and the Ministry of Lands and Land Development.

Cornell University

The Cornell University association with ARTI seems to have been useful and productive. Their input appears to have been appropriate and timely in setting up the base-line and monitoring data collection system carried out by ARTI. Cornell helped with data analysis for the baseline study and a report has been published.

Cornell Consultants have played a key role in developing the philosophy of the I.O. Program and in setting up the training program. They have provided extensive narrative reports on the program to date.

In the opinion of the Review Team the only missing ingredient in the Cornell involvement in the I.O. Program has been the absence so far of an analysis or process for determining why the farmers have become involved in the turn-out group organizations. A system has been developed to document the I.O. field process and the reports of the process documents are translated and sent to Cornell. This however has not supplied clear insights into the benefit streams which the participants feel they are receiving from membership in the turn-out groups. In our opinion this type of information would be useful for deciding on the appropriateness of extending the I.O. Program to other project areas.

The analysis carried out by the Cornell Consultant on the difference of within and between variation in paddy yields along the distributaries was particularly useful for providing direction.

Overall it was the impression of the Team that Cornell has been sensitive to the training needs of ARTI and was responding to the needs of the institution as was called for in the original Project Agreement.

The Cornell assistance to the Irrigation Department has been less well integrated into the overall Project. Although the advice has been sound, there has been no overall system or process to coordinate the efforts and work of all of the participants in the Project. This issue is covered elsewhere in this report. We note here that since many of the comments and suggestions from Cornell Consultants potentially effected other participants, an overall management process could have increased the value of the Cornell contribution.

The studies carried out by the Cornell student Hammond Murry-Rust have been particularly well received. Mr. Rust established good relations with all parties and the results of his work have provided useful insights into the irrigation system.

The Team recommends that the Cornell effort be continued as an integral component of the Project and that the nature of that role continue to be generally the same except for suggested expansions noted elsewhere in this report.

The Value of Irrigation Water and Equity Issues

The initial conception of the Water Management Project is based largely in part on an increase in cropping intensity. This increase was to result from a more efficient use of irrigation water including improvements in on farm water management. This and increases in other input levels would result in increased per acre yields. In addition, certain institutional developments within the Irrigation Department and within ARTI were expected to generate benefits. Leaving these benefits aside it is clear that the water saving aspects are a primary focal point of the Project.

The Water Management Project is important in the broader Sri Lankan context given the expected completion of other major systems over the next decade; and an increased emphasis on water management within existing systems. This is because improved water management maintains the efficiency of the system or increases the efficiency and thereby maintains or increases the benefit streams derived from a project. Therefore, this Water Management Project may set the stage for similar activities in other projects for years to come. Given this, it seems important to establish in a comprehensible and understandable way the manner in which the benefits will be achieved.

The farm monitoring program set up by the ARTI with Cornell University assistance and currently being operated by ARTI personnel seems quite adequate for measuring benefits as they might occur at the farm level on individual farms. If we allow that the sampling procedure as it has been set up, is capable of capturing increases in irrigated acreage, irrigation effectiveness inputs levels and yields the project is in a good position to identify the benefit streams when and if they do occur.

At the same time however, it would seem useful and possible particularly given an analysis of an operational plan for distributing water (to be discussed elsewhere in this report) to calculate to some degree of precision the increase in acreage which can occur as a result of the water which is actually going to be saved or realocated. Given this information, it should then be possible to devise an irrigation strategy which would maximize the benefits that might be obtained from the water which was saved or realocated through better water management. For example, it would then be possible to determine whether the best strategy was to provide additional increments of water to supplement effective rainfall on a broader acreage during

the wet season or whether or not that water might have higher value if it were retained in the reservoir and provided to farmers during the dry season. It is recommended that an analysis be carried out to determine the relative value of irrigation water in alternate distribution models, e.g., wet season versus dry season, between distributary redistribution, within distributary distribution and so forth.

By carrying out the suggested analysis it will then be possible to determine the costs which might be associated with a distributional program which focussed on equity considerations. For example, if it is decided to push irrigation water to tail-enders during the wet or Maha season, with water which might have been available to head-enders during the dry or Yala season, then the net effect of this equity program could be determined.

Within Project Coordination

In the opinion of the Review Team the Project has suffered from a lack of communication and coordination between the major participants. There has been no effective way of solving the inevitable difference in opinions and conflicts which have arisen over the life of the Project. We noted a considerable number of accounts of what in fact was often constructive criticism but it is apparent that such comments have not been communicated in a positive way between the participants.

There are a number of management committees which have been functioning to coordinate the Project within and between the line agencies which have roles in the Project and for the day to day functioning of the operation (i.e., Project Steering Committee, Project Coordinating Committee, and Staff Committee). These committees seem generally adequate and able to address the need for procedural changes as they become apparent (see Appendix A). However, these committees do not bring together for open discussion at the the operational level all of the organizations which are most directly involved in carrying out the Project.

The Team recommends that a Project Working Committee be formed. The members of this Committee would be: 1) the Irrigation Department Project Director; 2) the USAID Project Officer; 3) the PRC/ECI Resident Director; 4) a representative from Cornell University; 5) a representative from the Water Management Group - ARTI; 6) a representative from the Ministry of Lands and Land Development; and 7) the Deputy Director of Irrigation (Amparai). The primary purpose of this Committee would be to maintain a holistic overview of the Project and to provide internal coordination and communication between the

Committee members. The Committee would meet monthly in Colombo and would be hosted by the Irrigation Department and funded by USAID (under the Project). The Committee would devise its own internal working arrangements.

It is hoped by the Review Team that such a Project Working Committee could develop a spirit of comradery between the members and that a give and take atmosphere could be created which would serve to move the Project forward. It is recognized that the proposed committee members all currently have numerous committee responsibilities and that one more may seem burdensome. It is hoped however, that a Project Working Committee along the lines suggested here could overcome the obvious lack of effective communication which has existed among the participants.

V. FINANCIAL ASPECTS OF PROJECT

This section provides information on the financial aspects of the Project along with the status of project implementation. An argument for a two year project extension is also included.

Financial

The Summary Cost Estimate and Financial Plan (revised 1982) is provided in Table 1. This table provides the latest revised budget for the Project and has been recently approved by the GSL/USAID under Project Implementation Letter No. 13 dated May 14, 1982. The overall status of funds provided by USAID is given in Table 2 which shows the amount committed, amount disbursed and the unliquidated balance along with the remaining funds which are uncommitted. Table 3 shows the funding provided by the GSL.

Table 4 includes the revised Project cost based on the recommendations of the Project Evaluation. Overall Project costs have increased from $18.3 million to $22.4 million. This is due primarily to inflation as well as an increase in the total length of canals to be rehabilitated. Also, the earlier technical assistance aspects of the Project were reduced considerably due to lack of funds when the PRC/ECI contract was negotiated. The Review Team strongly suggests that the capacity of Navakiri Aru Tank should be increased and that a small domestic water component or hand pumps should be added to the Project as described in other sections of this Report.

Project implementation has been constrained somewhat by the lack of funding and other inputs provided by the GSL. This has resulted in the training facilities at Galgamuwa not being constructed to date, and to a lesser extent, a slight decrease in rehabilitation work in Gal Oya. Due to major and severe financial constraints, it is unlikely that the GSL will be in a position to provide 46% of the project requirements as envisioned when the project paper was prepared. In order to help the GSL to overcome this problem, AID should consider funding not just 54% of the Project initially envisioned but up to the full 75% which is allowed under AID regulations.

The Review Team recommends that USAID consider providing additional loan funding as necessitated by the recommendation herein for the rehabilitation and other work, and that adequate grant monies be provided for the additional technical assistance required to complete implementation of the Project.

TABLE 1
WATER MANAGEMENT PROJECT (383-0057)
SUMMARY COST ESTIMATE AND FINANCIAL PLAN (REVISED 1982)
(U.S. $ '000)

	AID										
	LOAN				GRANT				TOTAL		
	Foreign Exchange		Local Costs		Foreign Exchange		Local Costs			Borrower/ Grantee (Local Cost)	TOTAL
	Initial Budget	Revised Budget	Initial Budget	Revised Budget	Initial Budget	Revised Budget	Initial Budget	Revised Budget		Budget	
Technical Assistance	–	–	–	–	2,320	2,500	130[2]	130[2]	2,630	180[4]	2,810
Commodities	3,670	3,470	500[1]	400[1]	-	-	-	-	3,870	2,080	5,950
Training	700	700	-	-	-	-	-	-	700	230	230
Personnel	-	-	-	-	-	-	-	-	-	1,540	1,540
Other Costs	230	-	230[1]	-	-	-	280[3]	180[3]	180	1,470	1,650
Rehabilitation	-	-	-	2,000	-	-	-	-	2,000	3,000	5,000
Contingencies	1,470	230	-	-	270	190	-	-	420	-	420
	6,070	4,400	730	2,400	2,590	2,690	410	310	9,800	8,500	18,300

[1] Includes cost of locally procurred goods and services (shop, office and other equipment; spare parts; cement; support for irrigation associations).

[2] Includes some cost of local consultants (rent for housing, education allowance, etc.). Housing is being provided in kind by Borrower/Grantee at field locations (Amparai, Uda Walawe and Galgamuwa).

[3] Includes cost of water management studies/seminars.

[4] Includes local cost of consultants (office rent, personnel, per diem, in-country travel costs, etc.)

TABLE 2
WATER MANAGEMENT PROJECT
STATUS OF USAID FUNDING (APRIL/MARCH 1982)
(U.S. $)

Input	Amount Committed		Amount Disbursed		Unliquidated	
	Loan	Grant	Loan (April 30, 1981)	Grant (March 31, 1982)	Loan	Grant
1. Technical Assistance	-	2,549,700	-	997,219	-	1,537,781
2. Commodities	3,479,350	-	2,962,288	-	517,063	-
3. Training/Travel	646,000	-	84,721	-	441,279	-
4. Other Costs (Rehabilitation Substudies, etc.)	2,000,000	201,100	-	3,750	2,000,000	171,250
Total	6,125,350	2,750,800[1]	3,047,009	1,000,969	2,950,342	1,709,031
Uncommitted	674,650	249,200				
TOTAL	6,800,000	3,000,000				

[1] Of this amount $396,000 approved for GSL/ECI contract (under Contract Amendment No.1), and $175,000 by GSL/USAID for ARTI Substudies and Workshop (PIL 8). Therefore $249,200 remains from Grant Funds.

TABLE 3
GOVERNMENT OF SRI LANKA GSL RUPEE EXPENDITURES
FOR WATER MANAGEMENT PROJECT
(15 JUNE 1982)

	1980	1981	1982 (up to April)
1. I.D. Personnel	400,000*	690,000*	230,000*
2. Capital (Bldgs., etc.)	2,877,700	10,255,300	3,678,000
3. Consultants	403,700	782,400	1,094,600
4. Inkind Estimate*	100,000*	200,000*	75,000*
5. Other (Pol, Supplies, etc.)	25,000*	50,000*	10,000*
6. Survey Dept./Water Res. Board	-	658,000* 512,000	107,000* 41,800
7. Equipment/Other Commodities	-	372,300	53,300
8. ARTI	892,600	1,512,000	1,026,400
TOTALS	4,699,000	15,032,000	6,316,100

*Rent, salaries and other cost of staff building/rest houses/offices, etc. in Galombo, Gal Oya, Uda Walawe, Galgamuwa which is not covered in above items but are costs directly attributed to Water Management Project.

TABLE 4
REVISED SUMMARY PROJECT BUDGET
(U.S. $1000)

	USAID[1] Grant	USAID[1] Loan	GSL	TOTAL
1. Gal Oya Rehabilitation				
Rehabilitation Construction	-	4,386	4,760	9,146
Surveys and Investigations	-	-	66	66
Misc. Support Construction	-	-	519	519
Domestic Water Pilot	-	125	-	125
Totals	-	4,511	5,345	9,856
2. Equipment		3,870	21	3,891
3. Master Planning and On-Farm Research (GSL)	-	-	130	130
4. Technical Assistance				
PRC Contract	2,396	-	180	2,576
Contract Extension	1,104	-	76	1,180
Cornell Contract	149	-	4	153
Cornell Extension	250	-	11	261
Other	36	-	-	36
Final Evaluation	45	-	-	45
Totals	3,980	-	271	4,251
5. Training				
Long and Short-term	-	700	230	930
Facilities Construction	-	164	246	410
Totals		864	476	1,340
6. Socio-Economic Research	175	-	363	538
7. Inflation	-	-	2,438	2,438
TOTALS	4,155	9,245	9,044	22,444

[1] Assumes additional USAID commitment of $3.6 million which is tentatively planned in addition to $9.8 committed to date. GSL contribution contributing increase from $8.5 to $9.04 million.

Status of Project Implementation

The overall status of current versus planned implementation is summarized in Figure 1. The scheduled progress at the end of March 1982 was estimated to be 40% versus an actual progress of 29%. While additional progress was made in April/May, the PRC/ECI Consultants estimates that overall progress is about 30%.

This figure provides the weighted proportion and percent completed of each of the major components of the Project, as well as the actual versus scheduled completion. Additional details are provided in Appendix D, Status of Project Implementation.

Extension of Project

In reviewing the Implementation Plan as well as other aspects of the Project including current status of project implementation to date, it is evident that the Project must be extended in order to meet the stated objectives. While initially the Project remained on schedule in terms of putting the Contractor on board and in procuring and obtaining project equipment and other commodities, the other aspects of the Project are seriously behind schedule. Two major reasons for this slow implementation are lack of personnel within the Irrigation Department (for the first two years of implementation) and the racial problems which occurred in the Project area last year.

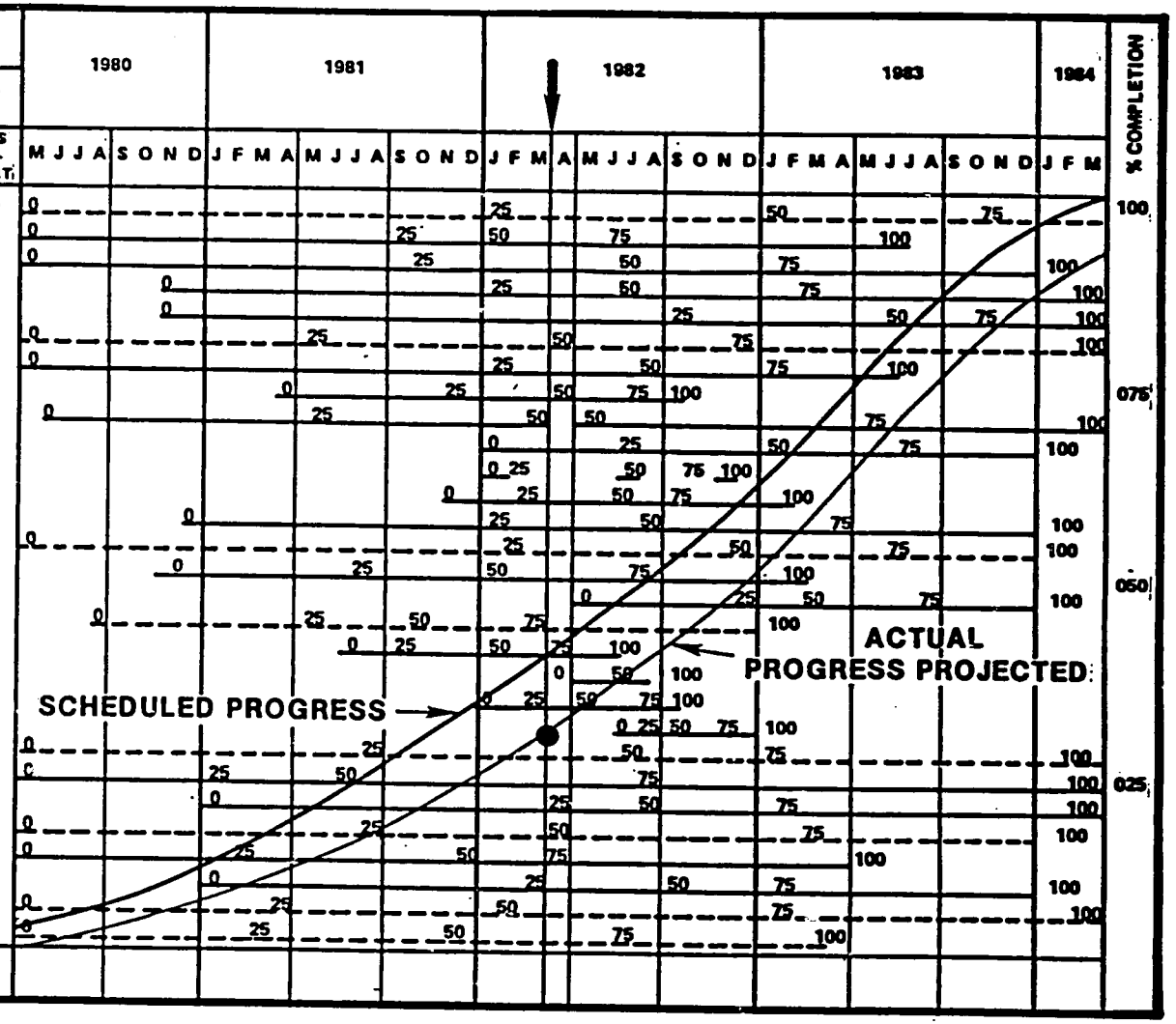
In early August of 1981, racial problems occurred in Gal Oya along with many other areas of the country. During this time the Chief Engineer for Design was injured and nearly all of the project-staff left the area. Many of the staff including the Chief Engineer were not willing to return. Therefore, while serious personnel problems already existed within the Project, these were further exacerbated by these racial disturbances. After these problems, it took the Irrigation Department nearly four months to refill major positions and more than six months to basically establish full staff, which is now working on the Project. Therefore, it took nearly two and a half years after the Project began before a full staff complement was on board and even this may still be deficient in some areas, especially on the equipment operation and maintenance side as well as on the research and planning side. Similar personnel shortages were experienced at Uda Walawe because the responsibility for managing the irrigation system was transferred from the River Valley Development Board to the Mahaweli Authority of Sri Lanka from the River Valley Development Board in 1981. Therefore, it is recommended that the Project be extended by two years, to April 31, 1986 by which time Project work should be completed.

FIGURE 1.

WATER MANAGEMENT PROJECT - SECOND YEAR PROGRAM

LIFE-OF-PROJECT PROGRESS REPORT - AS OF 31 MARCH 1982

WORK COMPONENT/ITEM	PROJECT WEIGHTED PROPORTION/ PERCENT COMPLETE		PERCENT COMPLETE (COMP.) PROJ. BASIS ACT./SCHED.	ANNUAL BASIS LAST RE-PORT	ANNUAL BASIS THIS RE-PORT
1. REHAB. G.O.L.B. SYSTEM	35.0	10.0	28 / 35		20
PREDESIGN ACTIVITIES					22
REHABILITATION DESIGN					22
PRECONSTRUCTION ACTIVITIES					18
CONSTRUCTION ACTIVITIES					18
2. IRRIG. & W. MANAGEMENT TRAINING	20.0	08.0	38 / 47		20
FACILITIES REHAB./CONSTRUCTION					15
RECEIVE AND INSTALL EQUIPMENT					10
GITI TA TRAINING COURSE					15
GITI W. MANAGEMENT TRNG. COURSE					20
WATER MANAGEMENT WORKSHOP					25
PROJ. AREA W. MANAGEMENT TRNG.					22
OVERSEAS W. MANAGEMENT TRNG.					23
3. ON-FARM W. MANAGEMENT RESEARCH	07.5	01.0	11 / 32		18
REHAB./PREPARE PILOT AREAS					17
ON-FARM IRRIGATION RESEARCH					19
4. MASTER PLAN PREPARATION	07.5	01.0	69 / 75		23
FIRST DRAFT – GAL OYA					
FINAL COPY – GAL OYA					
FIRST DRAFT – UDA WALAWE					
FINAL COPY – UDA WALAWE					
5. SOCIO-ECON. RES. & W. USER ASSN.	15.0	05.0	34 / 42		20
ARTI/CORNELL SOCIO-ECON. RES.					23
OTHER ACTIVITIES (IRRIG. DEPT.)					19
6. EQUIP. SELECT., PROC., O.M. & R.	12.5	01.0	19 / 22		21
EQUIPMENT PROCUREMENT, SERVICE					20
EQUIPMENT O.M. & R. ACTIVITIES					23
7. OTHER ASPECTS OF PROJ. IMPL.	02.0	01.0	53 / 55		24
8. PRC/ECI CONSULTANT ACTIVITIES	00.5	01.0	66 / 66		25
TOTAL PROJECT	100.0	29.0	29 / 40		22



APPENDIX A

PHYSICAL ASPECTS OF THE LEFT-BANK CANAL PORTION OF THE GAL OYA IRRIGATION SYSTEM

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The generalities of this project are well documented; however, the physical realities in terms of the real potential for increased crop production through water management improvements (or so called improvements) is still unknown. This results from the fact that much or perhaps almost all of the so-called wasted water is recaptured for use throughout the extensive return flow systems along the natural drainage reaches of the Project.

Estimates have been made concerning the extent of the area which receives water from the Project facilities. These estimates are supposed to include encroachment areas as well as areas irrigated from return flows. However, so far no actual planimetric measurements of aerial photos or other means of reconnaissance in order to estimate irrigated acreage have been completed. Unless this is done for both the Yala and Maha seasons, it is virtually impossible to reach sound conclusions concerning the economics and in fact the overall agricultural productivity gains of proposed Project alterations. ARTI estimates that the added area may be as much as 30,000 acres (60 percent) more than the 45,000 acres served directly by the Left Bank canal.

Aerial Surveys

The latest aerial survey was flown on February 11, 1981. Photos from this survey are available at the Amparai office and are in stereo pairs at a scale of 1:20,000 this is a difficult scale to work with. A preferred scale would be 1:5,000.

Unfortunately ground-truth information was not gathered or at least it does not seem to be available to go along with these survey pictures. Therefore, the actual cropped areas during the 1981 Maha season may be difficult to be estimated from them. What is needed is an extensive flyover with ground-truth backup for both the Maha and Yala seasons; and this flyover should be made as near as possible to mid-season. of course cloudcover presents a problem for such flyovers but the importance of the aircraft staying on station long enough to obtain suitable photographs should pay high dividends. (Perhaps Lansat would be available and could be used.)

What is needed is to make an effort to tie in both the directly irrigated areas and the areas irrigated from their return flows in order to get a better picture of the actual area irrigation from each distributary. Even if these areas must be approximated, based on the

aerial photographic reconnaissance, the results should be much more accurate and useful than estimates based on less sophisticated approximations. Obviously as one progresses down the drainage ways it will be difficult to determine the areas which are irrigated from any one distributary where several distributaries could potentially be feeding water into the zone.

The reasons for taking these details into account is because plans are obviously under way to alter deliveries to existing distributaries. This is done and there is what might be termed "water-savings" in the directly irrigated upstream reaches of the system, return flows will be diminished. Thus, whatever water is saved will either have to be released for picking up areas that have obtained water rights to return flow (which might be called earned rights). Therefore, much of the effort to save water would have been to no avail.

Field Observations of Return-Flows

During the Review Team's visits in early June 1982, there was little evidence of wasted water from the Left Bank of the Project areas. The Team followed a number of drain ways only to find the water being rediverted and applied at another downstream location. Because the topography is relatively steep there are numerous opportunities for utilizing any drainage waters before it reaches the sea. In fact we progressed down the Andella Oya drainage system which directs drainage water from the Left Bank canal systems to the lagoon and only found a small amount of water being discharged. (Our estimates on June 2 were that about 5 cu feet per second were being discharged into the lagoon). By the looks of the two lowest anicut structures on Andella Oya it appeared that even this relatively small amount of drainflow was about to be cut off and diverted to rice paddies in the near vicinity.

Because of this extensive reuse of water the Review Team feels that there is serious questions in terms of trying to save water on the directly irrigated land. This is because the water saved must still be released to the lands now receiving return flow waters in order to maintain the same irrigated acreage; or the so called saved waters could be diverted to tail end locations along the sub-mains and new lands be brought under irrigation at the expense of discontinuing irrigation on some lands now receiving return flow waters. It is entirely possible that this redistribution of water may result in reduced overall project production as the lands in the drainage reaches appear to be better rice soils (being of heavier textures) than the soils along the tail reaches of the project submains and distributaries.

The PRC/ECI master plan for the Gal Oya Irrigation Project recognizes the return flow concepts discussed above but makes insufficient allowances for dealing with this potentiality.

Project Rehabilitation

Project rehabilitation can be thought of as a combination of differed maintenance and modernization. In the case of the Gal Oya Left Bank Canal system the major argument at this time can only be made for deferred maintenance. Even this can be staged in terms of critical areas where the canal system is unable to carry needed flows or it is in danger of breaching. A second order of activity would be to put the canal into reasonable operable shape so that routine maintenance is sufficient to keep the system in a stable condition. A third level of improvement would be to add the minimum number of control structures so that the major portions of the main and branch canal systems could be kept in continuous operation and water rotations be taken care of by opening and closing the headworks into ditributaries and the minor branch canals.

The major value of this third level of improvement, which actually is only to get the system back to somewhere near its original operable condition, would be: to sharpen up the distributary deliveries; and to keep the main branch canals under continuous operation so that they would not be suggested to rapid drawdown every few days. This should improve bank stability and reduce maintenance.

Controlling flows at the heads of distributaries and rotating at this point would make the periodic rotations sharper or crisper. Instead of taking days for the on-cycle flows to stabilize throughout all of the distributaries along a major branch canal, the on-cycle would stabilize in a matter of hours if distributaries were controlled independently. This would enable the practical use of shorter rotation cycles. Rather than using a cycle of five days on five days off and cycles of three and a half days on and three and a half off would be very practical. Perhaps shorter cycles would result in improved yields and thus production gains could be made with the addition of very little or no additional water. As far as improving overall project production, when return flow irrigated land are also included, it is impossible to know at this time whether this additional control would be economically justifiable; but it will certainly provide a better sense of controlled water management on the part of the ID.

Suggestions could be made for further rehabilitation efforts. These may include: repairing drop and division structures throughout the distributaries network; and assisting with general cleaning repair and maintenance along distributaries. It is difficult to see how a great deal of detailed effort in terms of controlled outlets and rigid rotation schedules would prove worthwhile.

It is doubtful that a rigid rotation schedule along farm channels would be warranted or even desirable. However, assistance might be given in helping the farmers place their outlets appropriately and providing division boxes, measuring devices and control gates at the heads of farm channels where these were requested by the farmer groups.

It should be kept in mind in making improvements along the distributaries which would change the flow regime and return flow realities that such changes may be counter-productive to the system as a whole. Again the Team would like to stress that there is considerable evidence that most of the so-called lost water is being utilized as return flow and is irrigating lower lands.

System Modeling

In addition to the reservoir operational model which has been developed by the PRC/ECI Consultants, the Review Team recommends that a complete operational model for the entire system be developed and run. As mentioned earlier to develop this model will require a complete inventory of the lands now being irrigated and receiving either direct or return flow water form the system as well as spacial rainfall input data from throughout the system. We propose that this model be operated assuming perfect management throughout the entire Maha and Yala seasons to estimate how much water if any might actually be saved through better water control.

Since in many past years irrigation releases are only made from the main dams after the major part of the rainy season has passed, one might find that very little water can actually be saved through the proposed better control even with optimum management. In other words most of the reported excessive run-off may result from conditions during November, December and early January when the excesses are uncontrollable and cannot be stored. Reports indicate that the water in the irrigation channels at this time is basically that water which has been intercepted by the system and is not controllable.

If this is the case, then these losses are unavoidable and the only issue may be that if the control gates are closed at the head of the distributaries then the excess waters can be delivered to the tail reaches of the system. Whether this will result in increased crop production may be debatable. However, if there are systematic water release or excess water is available in the tail reaches, possibly farmers in this area will begin to utilize these waters for irrigation. Such waters may also be valuable in terms of recharging the ground-water system and improve the reliability of domestic wells in the tail regions.

If the model proves that considerable amounts of water can be saved by careful operation of the system, then the question becomes the balance between the cost of maintaining this operational control versus the value of the water saved and utilized later. Depending on the outcome, the ID will then be in a better position to determine what modernization may be appropriate to provide the necessary management and control system for expert operations of the canal network.

One might envision expert operation requiring a system of rain gauges throughout the project. Radio communication could be used to report rainfall throughout the project back to the control center at Ampara where this information could be keyed into a desk top computer. A relatively simple operational program could be used to indicate what system modes were necessary to optimize water deliveries within the physical constraint of the system.

While having a computer may seem like a complicated operation, the computer if properly programmed will simplify management decisions on the part of the irrigation officers. Feedback from the computer could then be reported by radio communication to the various control points of the system and the gates operated manually according to the specific information received. We would call this a quasi-automatic system, being automatic in sense of the decision making processors but manually operated in terms of the mechanical processors.

Concluding Comments

In conclusion, the following points should be kept in mind:

1. System control points should be minimized.

2. The current system operation should be studied carefully before major changes are made.

3. Any proposal alterations in deliveries should be carefully considered before being implemented, because such alterations may effect return flow users in ways which result in counter productive situations.

4. Since much of the system has become accustomed to a large scale rotational cycle these portions of the system should be maintained under that operating mode. Discharges should be approximately the same in the distributaries and channels after rehabilitation as they were before. Changes in the broad water delivery patterns should be made very slowly - perhaps over a period of 5 to 10 years.

35

5. A major reason for downstream control in the system is to keep water in the major branches continually, which should reduce maintenance and probably improve deliveries for domestic purposes to the tail-end distributaries.

6. Another potential benefit of controlling deliveries at the distributary inlets in that this should make the water flows to farms come in a crisper or sharper manner. In other words, instead of taking days to reach reasonable equilibrium, the shorter flow path from the head of distributaries to the ends (as opposed to the flow distance throughout an entire submain system) will result in what might be called crisper operation. The delivery cycle could be decreased and perhaps better production could be obtained with very little additional water inputs.

7. In our mind, better performance in terms of the Irrigation Department means providing more predictable and reliable discharges to or throughout the system. The farmers could then plan better for their water needs and feel comfortable in developing whatever water rotational activities they would like to do among themselves knowing that the systems would perform in a protectable manner. Furthermore, better water management from the standpoint of the ID would mean providing controls throughout the system which would allow farmers to better control their irrigation operations. In addition, the ID personnel should be cognizant of why they are delivering water and the effective of water shortages on production at various times throughout the growing season.

8. All of the operations discussed earlier should not preclude considering the possibilities of improving the timing of releases from the main reservoir in order to not only improve irrigation but also to accommodate power generation in the best way possible. With the numerous reservoirs spread through the system, it should be possible to accommodate power releases without jeopardizing irrigation priorities.

9. Little if anything has been done to consider variations in the soils throughout the systems or spacial variations in rainfall from the upper to lower ends of the system. Some thoughts and considerations are wanted in this area.

36

APPENDIX B

COMMENTS ON PROJECT ORGANIZATION AND COORDINATION

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It is becoming increasingly clear that the field level organization is a vital component for which the importance attached is extremely inadequate. The reason for this is perhaps due to the preoccupation with the project level activities which ran into numerous problems in staffing, etc., and the continuation of the same attention as before. Apart from this factor it is evident that organizationally the three principal agencies, namely, ID, ARTI, PRC/ECI and other district level line organizations have not been able to merge into a uniform program. In the case of the ARTI, the resultant conflicts manifest themselves pronouncedly in the field level operations. As far as the ID is concerned, the field level work is merely the place where decisions at the Project level are carried out with no attention given to the feed-back from the field. The principal inconsistency in this approach, is that, while other organizations phase out over a given period of time, ID will be the only organization left behind as the principal service agency for the farmers. Continued disregard for some of these key issues is likely to nullify the broad objectives of the project and therefore a positive effort should be made to disabuse the minds of the farmer with the objective of building up a new image for the ID.

Besides the above matters, a still more important factor is the need to closely identify the institutional constraints operating at the field level. The coordination of these activities at the grassroot level is left to informal arrangements between officials who work on their own initiative and good-will. Research on institutional planning per se cannot be of any use unless they recognize the need to exist in an amicable institutional environment. The need to look for these matters is presumed to be outside the scope of work assigned to each agency, who prefer to stay within their respective grooves.

At the Project level there is a greater need to formalize and institutionalize some of the decision making processes to enable greater participation of the different agencies concerned. Outside the District Project Coodinating Meeting, a group of officers from the ID, ARTI and PRC/ECI Consultants meet in an informal body but the decisions taken at this meeting, although implemented, are not known to others. The coordinating activities can be made more effective by setting up sub-committees for each important work area like institutional planning and constructions, propaganda and publicity, designs, etc., so that the management approach will not be required to depend on individuals for decision making. The recommendation of these specialized groups can be taken up for discussion at the Coordinating

and Steering Committee Meetings. In the absence of such arrangements project implementation often manifest themselves as criticisms leveled against one agency by another.

The pivotal role of this Project for the implementation of future irrigation programs largely in respect of intensifying improved irrigation facilities does not seem to have received the recognition in all levels. This is perhaps one reason which contributes to the lack of total commitment to the Project Objectives. It is, therefore, necessary to bring about a strong management approach which can link all these agencies into a common strategy.

Program of GSL-AID Contractors

Some of these aspects have been already dealt with. There is no gain in saying that they have failed to achieve a common strategy and approach in implementing the Project. Thus the work of one agency is at cross-purposes with another. As a commerical organization, the PRC/ECI Consultants should have displayed a high degree of cordial interaction and response. The impact of the Contractor is felt only in a few fields and some of the specialized consultants provided through the Contractor appear to be irrelevant although the original project document would have contained them.

As far as GSL-AID activities are concerned, there is a need to invite a higher degree of collective decision making because unilateral decisions by any side often prove to be self-defeating. It is necessary for the AID to demonstrate a greater understanding and sympathy for agencies striving to implement the Project since it unfolds new dimensions in the irrigation sector.

APPENDIX C

FIELD VISIT WITH THE CULTIVATORS

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FIELD VISIT WITH THE CULTIVATORS

The Evaluation Team and an interpreter departed from the Irrigation Department Regional Headquarters at Amparai about 4:30 in the afternoon on June 3, 1982. We had taken great pains to obtain an interpreter who had no identification with the Project. We were fortunate in securing the services of a professor at a nearby training school who had no real understanding of what the Project was about and no prior information on either its successes or failures. We felt confident that we had taken an appropriate step in eliminating interpreter bias.

As the short tropical dusk approached, we parked our vehicle and walked along the access road of the distributary. It was not long before a crowd had gathered and we were able to begin talking about the project. The first farmer who we encountered was a member of a turn-out group. He was proud to be a member and he assured us that his turn-out group had been very conscientious in saving water. They did this for the benefit of the tail-enders. When asked who the tail-enders were he replied that many of them were friends and relatives. It did not seem surprising to us that a farmer would save water for the benefit of his relatives.

Another farmer reported that water control and water use had been more efficient in the past but that since the departure of the Gal Oya Development Board, the distribution system had been eroding. This farmer felt that the I.O. program and turn-out groups were re-establishing patterns which had existed in the past. The same farmer reported that occasions when they had appeared to be wasting water in the past, they were in fact helping the system. He suggested that at times the level of the water in the distributary canal threatened to breach canal banks. When this happened, he reported that farmers everywhere in the area opened all of their turnouts and attempted to push the water through before damage could occur. We noted that it is highly likely, given the rainfall distribution pattern within the area and the pattern of releases into the main branch canals, that such overflowing is occasionally unavoidable and that the appropriate action of the cultivator is to "waste water."

On the afternoon prior to the field trip the Team members had spent considerable time reviewing design drawings in the Irrigation Department which included the installation of "pucca nucca's." We were curious to know whether or not the cultivators perceived any need for improved field turnout structures. We observed how easily coconut shells were used to stop the flow of water in small turnout pipes which was quite consistent with the PRC/ECI report on the use of coconut shells to control the water in field turnouts. It seemed

very likely from our conversations with the farmers that farmers had already heard of the pucca nucca program even though no pucca nuccas have as yet been installed in the area. This suggested to us the possibility that membership in the turn-out groups may be viewed as a mechanism for shortening the time period for receiving benefits from the rehabilitation program.

It has been pointed out to the Review Team in earlier discussions with Program Officials that cultivators within the region were well aware that a rehabilitation program had begun and had been asking considerable questions regarding the type of benefits, and when they would be arriving. In a situation in which individual and group pressure is frequently used in an attempt at increasing water allotment, it would not be surprising to find that similar types of activity would be perceived to be necessary to obtain the benefits of rehabilitation. As we walked on down this distributary we observed that considerable construction has been going on in the area. The distributary had been deepend, the access road had been improved, construction work was going on to change the capacity of the drop structures on the channel. We speculated that the reason for this was to increase the amount of water which could be supplied to the tail-enders, for this was an area in which encroachment had increased the demand for water at the tail-end of the canal. Given the reuse situation which we had been observing during our field trip across the entire system, we wondered where this extra water was going to come from.

We returned to our vehicle speculating on what we had learned. As we walked along the distributary an old man came out of his home, hurried down the path, and with obvious difficulty trotted across a rickety log bridge which spanned the distributary. He was clearly unhappy about the improvements to the distributary. The channel had been widened and deepened and apparently a new element of danger injected into his life. He was insistent that we use our good offices to have an appropriate access bridge constructed for the benefit of all who would pass that way. Here was additional evidence that appeals to authority, is seen as a legitimate and appropriate way for receiving social benefits.

We concluded from our brief field trip that a least all of the cultivators with whom we had talked had very positive feelings about the I.O. program. We recalled particularly the cultivator who had noted with pride, how because of these activities, that the water allocation to the Left Bank for this season had been increased from 8,000 to 12,000 acres which would be irrigated. It seemed clear that farmers valued the opportunity to interact with the Irrigation Department and that this reduced tension within them. It was also clear that the I.O.'s had been doing a commendable job in informing the farmers about the nature of the rehabilitation program.

12

APPENDIX D

STATUS OF PROJECT

APPENDIX D

STATUS OF PROJECT

In this capsule progress report the evaluation and recommended adjustments follow the same format as that used in quarterly progress reports. That is, the Project and the Scope of Work as set forth in the Contract, both define the work by a series of eight distinct components:

1. Rehabilitation of the Gal Oya Left Bank System
2. Irrigation and Water Management Training
3. On-Farm Water Management Research
4. Master Plan Preparation
5. Socio-Economic Research and Water Users Association
6. Equipment Selection, Procurement, and O.M. & R
7. Other aspects of Project Implementation
8. PRC/ECI Consultant Activities

Rehabilitation of the Gal Oya Left Bank System

In terms of activity, cost and exposure to public scrutiny, this is the largest single component of the eight - it was assigned a weighted percentage of 35%. However, in spite of its scope, this work component is not the most important but it is the basic first step in the attainment of the ultimate goal of improved water management. Therefore, this component is weighted heavily, and progress, or lack of it, will significantly affect the overall project progress rate. As of 31 March 1982, this component was reported by the consultant as 28% complete when it should have been 35% complete, based on a project completion date of 31 March 1984. Even this progress rate is somewhat misleading because a part of the work reported as complete in 1981 has been redone this season, and a significant part of that may have to be repeated in 1983.

There are a number of specific reasons why this component is behind schedule such as: shortage of personnel, delays in survey data, inacceptable survey procedures which resulted in the rejection of 8 km of survey, and delay in housing and equipment facilities; however, the main reason is that the original program was too ambitious. The first Life of Project Work Plan, based on the rehabilitation of the delivery facilities for 22,000 ha; envisioned that 2,000 ha would be rehabilitated in 1981, 12,000 ha in 1982, and 8,000 ha in 1983. Based on Project experience the total area was revised to 24,000 ha with 1,000 ha in 1981, 6,000 ha in 1982, and 17,000 ha in 1983/1984.

44

This is probably still much too ambitious. At the present rate of progress, it is now estimated that at the end of 1982, the total progress was no more than 1,000 ha in 1981 and will be about 4,000 ha in 1982; which will leave 19,000 ha still to be rehabilitated. It is plain to be seen that an additional three years will be required to complete the remaining 19,000 ha. With this in mind, the chart presented as Figure 1 in Section V of this report needs revision.The annual progress as now proposed is 1,000 ha for 1981, 4,000 ha for 1982, 7,000 ha for 1983, 7,000 ha for 1984, and 5,000 ha for 1985. The Consultant feels that this is a realistic and attainable schedule for this work component.

Raising the crest height of the Navakiri Aru Tank is another item which should be considered under this work component, even though it was not contemplated under the original Scope of Work. This is a recommended action under the master plan; however, because of the present heavy schedule for the available construction equipment it is recommended that 1983 be spent in site investigations and the preparation of plans and designs. The actual work could be undertaken in 1984/1985, and could be completed within this two year period if additional earth moving equipment is available. Equipment presently on hand will be fully occupied in system rehabilitation work, and even if it were to become available, would still have to be augmented by additional earthmovers and compactors.

The cost estimates for the extended rehabilitation time frame and the Navakiri embankment raising scheme are necessarily very general at this time, but the estimates that have been made are as follows:

• Two year extension for rehabilitation	Rs. 80,000,000
• Raise Navakiri Sru Tank Embankment	Rs. 100,000,000
Total additional cost, Component 1	Rs. 180,000,000

Since some additional equipment might need to be purchased, it is estimated that the total foreign exchange portion would be about Rs. 100,000,000 or U.S. $5,000,000.

Irrigation and Water Management Training

This work component was delayed about one year for lack of adequate housing for the expatriate advisor and failure to provide the necessary facilities at GITI. It is one of the fundamental components and must be continued beyond the present termination date of the expatriate advisor. The Training Program should be extended through 1984 in order to provide sufficient trained TA's to handle the increased water management duties. It should also be noted that the

15

overseas training programs are not recommended for extension other than to mid 1983, and this is primarily to take care of the long-term students at CSU. The weighted proportion of 20% which has been assigned to this work component is a good indication of the importance attached to this activity. As of 31 March 1982, the work was 38% complete, when it should have been 47% complete based on a Project termination date of 31 March 1984.

On-Farm Water Management Research

This is another of the basic components which will require an extended termination date. Like all the other components, it too has suffered from a lack of personnel and necessary flow measuring and control equipment. Equipment specifications, quotations, and delivery conditions have been supplied by the Consultant and have been in the hands of the Client for several months with no purchase decision made as of this date. Most of the flow measuring equipment has a delivery date of three to four months following receipt of a firm order, so that even if the decision to purchase was to be made this month, the equipment would not be available in the field until late in 1982. For this reason, among others, the Consultant has recommended that the program, including the expatriate specialist, be extended to the end of 1984.

This work component is complicated by the fact that the Contract specifies that such activities shall take place in two locations; in Gal Oya and in Uda Walawe. The responsibility for the Uda Walawe Project was originally in the hands of the River Valley Development Board (RVDB), but it has now been handed over to the Mahaweli Authority. The Mahaweli Authority would like to increase the scope of work on, as well as accelerate the pace of the program.

The research program was assigned a weighted proportion of 7.5% of the Project, and as of 31 March 1982, the progress was 11%, when it should have been 31%.

Master Plan Preparation

This work component was also assigned a weighted proportion of 7.5%. On 31 March 1982, progress was 69% when it should have been 75%. This component also covers two different Project sites; Gal Oya and Uda Walawe. Barring any requests to expand the scope of work and/or accelerate the progress pace in Uda Walawe, it is expected that this work component can be completed within the time and personnel constraints of the present contract. The draft of the Gal Oya Master Plan has been completed, and it is estimated that the final copy will be available by the third quarter of 1982. The outline of the Uda Walawe study and much of the basic material has been completed. It is

expected that the first draft will be ready by the third quarter of 1982, and the final copy by mid 1983. The Review Team has reviewed the draft of the Gal Oya Master Plan prepared by the PRC/ECI Consultants and as mentioned earlier (see Section III) we feel this is a reconnaissance level plan. While it fits the requirements specified in the Scope of Work it is not adequate for the rehabilitation and training activities envisioned for the Project. These are important studies, but it is felt that for the Gal Oya Project it is a case of the cart before the horse. A comprehensive master plan should have been completed to guide the rehabilitation work. It is hoped that this will be the case in Uda Walawe.

Socio-Economic Research and Water Users Associations

The Consultant feels that the tasks to be completed in this area cannot possibly be achieved before 1988. The importance attached to this work component is emphasized by the weighted proportion assigned to it - 15%. As of 31 March 1982, the progress rate was 34% compared to a scheduled accomplishment of 42%. It is felt that this is a good progress rate, but most or all the effort will be lost if provisions are not made to continue the program past the present termination date of 31 March 1984. On the revised Life-of-Project, this work component should be extended to the end of 1985. However, it is strongly recommended that international assistance for this program be extended into 1987/1988.

This work component is one of the fundamental facets of the water management program. Neither the rehabilitation of the water storage and delivery system or the proposed new rational and comparatively stringent O&M measures can ever achieve their purpose unless accompanied by institutional improvements. Assistance is needed to guide and enforce the recommended management measures and to gain the enthusiastic participation of the ultimate users of the project the farmers. In this respect, the Consultant has intimated in the master plan that if the ID is unwilling to accept the responsibility for integrated water management, then perhaps efforts should be made to either find another agency that will accept this responsibility, or create a new agency.

Equipment Selection, Procurement, OM&R

This work component was assigned a weighted value fo 12.5%. As of the end of March 1982, progress rate was 19% compared to a scheduled rate of 22%. This very high progress rate was possible because practically all heavy equipment, and a large part of the maintenance tools and equipment had arrived and was in use on the Project. Since the major part of the use of the heavy equipment was already measured under the rehabilitation work component, the delays encountered in

construction are not reflected in this work component. However, the Consultant feels that the system adopted by the ID for the management of the equipment is not conductive to efficient performance and will ultimately result in high operational costs, low productivity, low equipment utilization rate, and a shortened equipment life. Furthermore, much of the equipment which was procured for the Project is not appropriate for the rehabilitation program now envisioned.

Other Aspects of Project Implementation

This work component was assigned a weighted percentage of 2%, and as of 31 March 1982, the completion rate was 50% compared to a scheduled rate of 55%. This high rate of achievement is due simply to the fact that the activities included in this work component cannot be easily measured except by the passage of time. Most of the activities are of the administrative or public relations type and have little direct bearing on progress achieved on production activities. However, because the activities of this work component are inseparably connected with the conduct of the program as a whole the revised Life-of-Project Program should show these activities extended to the end of 1985.

PRC/ECI Consultant Activities

This work component has the lowest weighted percentage 0.5%. As of the end of March 1982, progress achieved was the same as progress scheduled; 66%. This component is composed mostly of consultant "housekeeping" and administrative activities, it is measured only by elapsed time, and has little or no "built-in" elements to delay progress.

Summary of General Observations

A summary of some general observations concerning the status of the Project include:

1. There is no doubt the the life of the project must be extended until the end of 1985 if the present scope of work is to be accomplished, particularly with reference to the rehabilitation of the Gal Oya Left Bank system.

2. Preconstruction activities for the raising of the Navakiri Dam embankment height should be included as a part of the present scope of work, with completion by the end of 1983. Construction of his work could then be undertaken in 1984 and completed by the end of 1985.

3. The institutional building component of the Project should have foreign assistance until at least the end of 1987, when it is estimated (perhaps optimistically) that the farmers in the Gal Oya Left Bank area can all be organized at least to the first-phase level.

4. The on-farm water management research should be a on-going task that does not end with the current Project termination date. This applies equally as well to the water management training program, especially the domestic portion of the program.

5. The question of ultimate responsibility for the Uda Walawe Project must be resolved by the involved agencies of the GSL. Until this is done, the final scope of work for the Uda Walawe portion of the Project cannot be determined, nor can final contract requirements be defined.