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Commission of the European Communities
Ministry of Irrigation, Power and Energy
Irrigation Department



National Irrigation Rehabilitation Project

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Technical Assistance to the Irrigation Research Management Unit

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**SRI LANKA NATIONAL PROGRAM
INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE**

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Executive Summary

THIS IS THE third Annual Report of the Technical Assistance to Irrigation Research Management Unit (IRMU) Project and covers the period from January to December, **1995**.

Establishment and Strengthening of IRMU

Progress in this area was far from satisfactory due primarily to shortage of IRMU staff. The IRMU continues to remain seriously understaffed. During the third year new research personnel were assigned to IRMU while one member of the staff left IRMU on transfer. This left the IRMU with only **4** staff personnel including the Deputy Director who is also assigned on a part-time basis. Determined efforts, as indicated earlier, have borne fruit and the situation is expected to improve significantly in **1996**. The government has approved the creation of positions for nonengineering staff and necessary steps have been taken to fill the vacancies. However, considering the lengthy bureaucratic process it may take another six months to recruit these new staff

The technical assistance project has provided more staff months than planned (extra person-months were provided by IIMI at no additional cost to the project). This was done to offset, to some extent, IRMU staff shortage for implementation of the IRMU work plan.

The research library has, however, made significant progress. Improvement of the physical facilities is nearing completion with the procurement and installation of air conditioners, photocopier, computer systems and book shelves. For the installation of the software, including computerized cataloging and literature search system, an agreement has been signed with the Sri Lankan Library Association (SLLA) which has already initiated work. A list consisting of 250 titles related to all aspects of irrigation and irrigated agriculture has been prepared and the procurement process has already been initiated.

To date the IRMU has not received any equipment or vehicle. IIMI has provided, at no extra cost, one four-wheel-drive vehicle and two computer systems to facilitate IRMU work. This is in addition to the two four-wheel-drive vehicles and three computer systems purchased out of the project funds in **1992-1993**.

Research and Development

Research needs and priorities for **1995** were finalized in consultation with the PD and Co-PD of NIRP and these were subsequently approved by the Research Coordinating Committee (RCC) and Research Advisory Committee (RAC). Twelve studies were undertaken during the year including those carried over from **1994** and two were completed. Studies covered all four major program areas. As for mode of implementation, 5 were implemented by the IRMU, 2 in collaboration with other ID units and the remaining 5 were contracted to universities and other institutes and organizations.

Training and Technology Transfer

The second training course on Rapid Appraisal for Irrigation Systems was conducted with 19 participants from various units of the Irrigation Department. The course on research methodology was canceled due to shortage of IRMU staff.

Forty five more papers related to irrigated agriculture have been summarized bringing the total number to 119. Three out of four workshops planned were held. The fourth one has been rescheduled to be held on 20 February, 1995. The IRMU seminar series continues to remain popular. Thirteen seminars were organized covering various topics related to irrigated agriculture. All three issues of the IRMU Newsletter were published during the year. Interest in fellowships to pursue higher studies in national universities has significantly declined and, as a result, not a single fellowship could be awarded.

Reports and Publications

The 1994 Annual Report and all three quarterly reports were submitted. The proceedings of the workshop on "Farmer Participation in Planning, Design and Rehabilitation of NIRP Schemes" have been published. Proceedings of the other two workshops titled *Farmer Participation* in Rehabilitation of NIRP Schemes: Farmers' Perspective and *Beneficiary-Centered* Management of Irrigation System: Retrospection on Recent Endeavors have been finalized. The first draft of the proceedings of the workshop on Planning and Design Issues in Rehabilitation has also been prepared. Summaries of 11 seminar papers presented during 1994 were published as per schedule. The first draft of summaries of another 13 seminar papers presented in 1995 have been prepared. Fifty "Summaries of Literature" related to irrigated agriculture prepared during 1994 have already been published. Another 45 summaries prepared during the year 1995 have been finalized and will be published on schedule. The Completion Report and Participants' Report for the 1994 RRA course have already been published and similar reports for the 1995 course have been finalized. Final reports on studies titled *Farmer Participation in NIRP Schemes: Phase II* and "Evaluation of Maintenance Performance by Farmer Organization in Handed-Over Distributary Channels" have also been finalized.

Introduction

IT IS WIDELY recognized that the benefits derived from irrigation schemes have not been proportional to the investments made. It is also recognized that the benefits could be increased through minimizing the various constraints impeding the productivity of irrigated agriculture. One of the major constraints to achieving higher productivity has been identified as the lack of research input in improving irrigation management and slow adoption of innovations. It is, therefore, essential to establish a strong research program to improve the performance of irrigated agriculture.

A comprehensive research program requires identification and continuation of research, supporting institutions, reporting and dissemination of research findings and incorporating research findings in the implementation of irrigation activities to achieve improvements in planning, design, and operation and management of irrigation schemes.

Irrigation Research Management Unit (IRMU)

The Irrigation Research Management Unit is being established in the ID as a research-based service unit to address the abovementioned weaknesses. The main objective of the IRMU is to strengthen the institutional capacity of the Irrigation Department (ID) in carrying out research to increase productivity, profitability, sustainability and social equity. The other objectives are to:

1. Identify research needs, carry out or contract for research, evaluate research and adapt them for implementation,
2. initiate and implement a research program which yields results of immediate interest to the irrigated agriculture sector, and
3. Contribute to the quality of planning and implementation of NIRP.

For the establishment and operation of IRMU during the initial stage, necessary assistance is being provided by IIMI, through a four-year Technical Assistance Program.

Objectives of Technical Assistance

The main objective of the Technical Assistance Program is to establish and support the IRMU in its initial stage. This objective is expected to be achieved through a series of well-defined activities.

Activities under Technical Assistance

During the project life of four years the following activities are assigned under Technical Assistance.

- a. Develop the mandate, strategic plan, organizational structure and staffing policy together with ID staff within the first year of assignment.
- b. Assist the IRMU with the preparation of research procedures, policies, annual work plans and related budgets.
- c. Develop methodology and assist training of IRMU staff.
 - i. undertake rapid assessments, particularly to obtain preliminary data for research selection and to train IRMU staff:
 - ii. carry out adaptive research to test technical and institutional innovations;
 - iii. monitor and evaluate a number of schemes being rehabilitated under NIRP, to ascertain how improvements are being implemented and their acceptance, benefits and costs and long-term sustainability;
 - iv. measure the cost-effectiveness of innovations identified in the research programs as required: and
 - v. record and analyze lessons learned in establishing IRMU and its early operations.
- d. Provide support to IRMU to develop their conceptual, administrative and research activities.
- e. Assist IRMU in conducting a series of workshops to disseminate research findings and solicit inputs to the program.
- f. Provide inputs to NIRP from IIMI's in-country and international research findings and IIMI's international programs.

Project Funding

The total CEC support for the project is estimated to be ECU 843,840 and LKR 21,684,000/-. The breakdown of cost (main items) is given below.

Foreign Exchange Cost	Amount (ECU)
a. Fees for services of international staff	734,448
b. Refundable expenses	109,392
	<hr/>
Total	843,840
	=====

Local Cost	Amount (LKR)
a. Fees for the services of national staff	7,444,600
b. Direct expenses	13,260,000
c. Refundable expenses	980,000
	<hr/>
Total	21,664,800
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Inputs Planned and Provided During the Reporting Period

Personnel Provided by the Irrigation Department

THE STAFFING SCHEDULE of the IRMU is presented in Appendix i. Mr. B.M.S. Samarasekera continues to be the Deputy Director, IRMU. This is in addition to his responsibility as the Deputy Director, Contracts and Procurement.

As per staffing schedule, 16 research personnel were to be recruited by the end of 1995. Though the staffing situation considerably improved during 1995 as compared to the previous years, IRMU continued to remain seriously understaffed during the reporting period. Presently, the staff strength is only 25 percent of the planned target.

The most significant development of the year was the government approval for the creation of the cadres for nonengineering research staff for IRMU. Based on that approval which came late in the year, IRMU is now in the process of recruiting 10 nonengineering research staff. It is expected that the recruitment will be completed in early 1996. When completed, the staff strength of the IRMU will rise to 14, i.e., 90 percent of the target.

Personnel Provided by the EEC (Technical Assistance through IIMI)

The staffing schedule of the technical assistance (consultancy services) is provided in Appendix ii. The Technical Advisor has provided 6.7 MM of service during 1995. This brings the total MM of service provided by the Technical Advisor to 29.4 MM from the inception of the project in August, 1992. The Research Associate and the Research Officers have provided 12 MM and 24 MM of services, respectively. Three short-term specialists representing disciplines of agricultural economics, civil engineering and social science have together provided 4 MM of services during the year bringing the total to 21.25 MM. A summary of TA staff mobilization is provided in Appendix iii.

Recognizing the staffing constraints of IRMU, IIMI provided, from its own resources, one additional Research Officer in October, 1994. He continued to work till September, 1995. This became necessary to help implement the 1995 IRMU Work plan as well as to assist with the development of the 1996 Work plan. IIMI has also provided a graduate student from the Wageningen University, Netherlands to assist IRMU in the implementation of the study titled "Strengthening Farmer Organization through Increased Participation of Female Farmers." Her costs are being borne by the Gender Program of IIMI.

Supply of Materials, Operations and Maintenance Costs *Pertaining* to Infrastructure Development

To date no new vehicle has been procured for IRMU. As in 1994, IIMI continued to provide an extra four-wheel drive vehicle from its vehicle pool. This is in addition to the two vehicles procured under the EC grant. IIMI has also made available two extra computer systems.

Financial Contribution

Four more invoices (claims) were submitted, by the Technical Assistance Project, during the year bringing the total to twelve from the inception of the project. Payment of eleven invoices has been received including that for three submitted in 1995.

Presentation and Assessment of Outputs Achieved during the Reporting Period

Analysis of Outputs and Activities Planned and Carried Out

THE LOGICAL FRAMEWORK of the IRMU is given in Appendix iv. The progress is reported in relation to the targets indicated in the annual Work plan of 1995 (Appendix v). The progress of activities during the year is reported under four main output categories namely (a) Establishment and Strengthening of IRMU, (b) Research and Development, (c) Training and Technology Transfer, and (d) Reports and Publications.

Establishment and Strengthening of *IRMU*

Staff Recruitment and Training. Three more research personnel were added to the IRMU during the year. These are Irrigation Department permanent staff one of whom is a senior irrigation engineer of the department. His joining has added considerable strength to the IRMU. The other two were deputed from the newly recruited batch of 1995. The only surviving staff member from 1994, an irrigation engineer was transferred from the IRMU.

The organigram and staffing policy prepared for the IRMU late in 1992, has now been approved by the competent authority and subsequently the government has approved the creation of nonengineering cadres. As has been mentioned earlier IRMU is in the process of recruitment of newly created cadres.

Establishment of the Research Library and Review of Past and Present Research. Physical improvement of the library is almost complete. This includes the procurement and installation of air conditioners, photocopier, computer systems and book shelves. For installing the software, including computerized cataloging and literature search system, an agreement has been signed with the Sri Lankan Library Association (SLLA) which has already initiated the work. A list consisting of 250 titles related to all aspects of irrigation and irrigated agriculture has been prepared and the procurement process has already been initiated.

IMI Technical Assistance staff continued to assist IRMU locate, collect and summarize past and present research conducted within the country in the field of irrigated agriculture. The exercise is expected to lead to better understanding of the problems and help design follow-up research. Over 750 such studies/reports have been identified and 119 have so far been summarized including 45 in 1995.

Research and Development

Research needs and priorities for 1995 were finalized as per plan during the last quarter of 1994. The summary of research programs for 1995 is given in Appendix vi. The 1995 IRMU Work plan and Budget are presented in Appendix vii. The IRMU 1995 Budget is given in Annex viii. The IRMU CEC Grant is given in Appendix ix. The 1966 Work plan of the project is given in Appendix x.

Twelve studies were undertaken during the year including those carried over from 1994. Two studies titled Monitoring farmers' involvement in schemes under *NIRP* and Evaluation of maintenance

performance by farmer organizations in handed-over distributary channels have been completed. A brief progress report of each study is given below.

Monitoring Farmers' Involvement in Schemes under NIRP: Phase II. Phase II of the study on farmer participation in rehabilitation was conducted as a followup of the outcome of the Phase I study which identified the need for further investigation in some aspects to have a more comprehensive understanding of farmer participation in rehabilitation. The study was completed in **1995**.

The overall objective of the study was to review NIRP practices with respect to the development of sustainable farmer organizations (FOs) and recommend suitable alternative options, wherever applicable, for their effective participation in the rehabilitation program and subsequent takeover of the responsibility for O&M of the systems after rehabilitation.

The study was conducted in 20 schemes, **15** minor and **5** major/medium spread across **10** districts. Twenty three Institutional Organizers (IOs), 20 Technical Assistants, 19 Divisional Officers of the Agrarian Services, **49** FO office-bearers and **448** farmers from the sample schemes were interviewed separately using five structured questionnaires.

FOs have been formed in all the schemes, most of them even before the initiation of NIRP implementation. They are functioning at different levels of efficiency, which is to be expected. It was, however, observed that though over 75 percent of them became members of the FOs, active participation in FO activities including attendance in general meetings was as low as **35** percent.

It was observed that a large majority of office-bearers and farmers are full-time farmers though a part of their income is derived from non-farm sources. For farmers, the next most important was the self-employed group followed by groups on salaried employment and traders. In case of the office-bearers salaried employment was the second most important group followed by the self-employed group and traders. An attempt was made to categorize the office-bearers according to their total income as well as according to political affiliations. But they were reluctant to divulge such information. It was, however, apparent that the office-bearers came from the upper echelons of the rural society.

The study found that without assistance from the government, FOs are not able to generate adequate funds for the proper upkeep of their systems after rehabilitation. Available funds with the FOs varied from as low as Rs 100 in some minor schemes to as high as Rs 80,000 in major/medium schemes. FOs having very little accumulated funds did not have any sources of income other than membership fee. FOs that implemented construction contracts were able to generate up to **Rs 20,000**. Those receiving O&M allocation from the government, however, were able to mobilize funds as high as Rs 80,000.

NIRP encourages FOs to undertake construction contracts in the rehabilitation of their schemes. It was observed that in minor schemes, 80 percent of the FOs obtained and executed construction contracts. The number of contracts taken by them ranged from 4 to 17. Except for one scheme where the FO implemented the entire rehabilitation work through a construction contract, the total value of the contracts ranged from **4** to **54** percent of the total estimated cost of rehabilitation.

Farmer participation in rehabilitation planning and design involved, primarily, meetings with agency officials, participation in walk-throughs, attendance in FO meetings, etc., and finally participation in ratification meetings where the plan for rehabilitation was finalized. It was observed that over 70 percent and 80 percent farmers and office-bearers, respectively, have participated in the planning and design process.

It is mandatory on the part of the FOs to contribute 10 percent of the total cost of rehabilitation. It was found that most of the FOs have managed to accomplish this both through individual assignments and through shramadana. The form of contribution was mainly labor for earthwork or labor for other related work. Over 70 percent of farmers participated in this activity. There were, however, some delays and 57 percent and 21 percent of office-bearers, respectively, from minor and medium schemes, reported that site-specific problems such as inclement weather, defaulting farmers, etc., were the principal reasons for the delay. In some schemes the 10 percent work was separated from the construction contracts taken by the FOs whereas in certain schemes this was built into the contracts taken by the FOs. Where it was built-in, FOs were able to accomplish the tasks with 90 percent of the allocation but could not make any profit which deprived the FOs of an important source of income.

FO involvement in construction supervision with the help of agencies helped improve the quality of work. Farmers expressed their willingness to take over the O&M of the schemes and agency officers confirmed it. There was, however, considerable disagreement between DOs and FOs as to whether the O&M plans were discussed in the meetings held at the planning stage. Farmers and office-bearers indicated that the O&M plans were discussed while the DOs disagreed with this account. About 90 percent of the farmers expressed that they are willing and able to take over the O&M responsibility which was supported by a majority of the office-bearers. More than 80 percent of the DOs indicated that the FOs will be able to manage the minor schemes after turnover but for medium/major schemes only 40 percent was of the same view. They were, however, of the opinion that the FOs will, at least in the short run, need support in training, both technical and financial, as well as funds from the agencies.

Study on the NIRP Turnover Process. The study contracted to ARTI, was initiated in August, 1995. The principal objective of the study was to evaluate the NIRP turnover process and provide information and guidance to NIRP implementing agencies to make this process more effective and sustainable.

The study entails two components, a process documentation during the first season (maha 1995/96) and a large-scale survey during the second season (yala 1996). One of the primary tasks for the research team was to recruit field assistants as process documenters. The task of recruiting 6 process documenters was completed in early August and they were stationed in the field late in August after a weeks training at ARTI.

During the first month in the field, the process documenters conducted a socioeconomic survey of a selected sample. Besides conducting this survey they were involved in understanding the system and identifying problems inherent in the irrigation schemes, particularly in the NIRP schemes. Since the in-house brainstorming session late in September, they have been documenting the process of farmer organization/agency management of the NIRP schemes during the current 1995/1996 maha season.

The study is being implemented in 6 FOs of 4 schemes: 2 minor and 2 medium, located in Hambantota (minor scheme; turned over), Anuradhapura (minor scheme; not turned over), Moneragala (medium scheme; turned over) and Kandy (medium scheme; not turned over) districts.

The preliminary findings of the study based on the observations made during process documentation are described below:

i. Status of Rehabilitation

Physical rehabilitations in most schemes under study are either nearing completion or have already been completed. However, the most common observation is that the physical works are not up *to* FO satisfaction. In some cases as in Mahagalgamuwewa (Anuradhapura) it does not even meet the required standard. Hence, the issue of physical works should be treated seriously, because what matters in the ultimate turning over is the satisfaction of the FOs, the ultimate owners of the systems.

ii. Land Tenure Pattern

Land tenure is increasingly becoming a major threat to system operation and maintenance. In the two medium schemes (Buttala and Gampolawela Raja Ela) most farmers are tenants or in places like Gampolawela head end, most lands are not being cultivated due to landownership patterns. These latter lands are being owned by rich Muslim traders who are not interested in cultivation nor do they want to give tenancy to the same person for fear of losing the ownership of land to the tenant. In minor schemes (Mahagalgamuwewa and Kattadiwewa) most are owner cultivators, but either they have land under neighboring small tanks (e.g., Mahagalgamuwewa) or cultivate chena as their primary source of income (e.g., Kattadiwewa). In both cases, the interest, efforts and responsibility of FOs toward the NIRP rehabilitation appear to be minimal.

iii. Cost of Rice Production and FO Strength

High cost of rice production under most schemes is making farmers think of other alternatives, i.e., vegetables in Gampolawela, chena in Mahagalgamuwewa, etc. Due to this shift, the FOs established primarily for rice farming are gradually becoming ineffective. For example, members of the FO in Kattadiwewa hardly meet for meetings. In Gampolawela, some farmers do not want to cultivate as the lands are overgrown with weeds due to noncultivation during the past three years. Hence, cultivation in the current season would mean high cost for land preparation which increases the overall cost of rice production. As the Gampolawela scheme is located in a more urbanized area, farmers there are generally more inclined toward other types of occupations than toward rice farming. The deviations from rice cultivation again affects the strength of FOs established for rice cultivation.

iv. Commitment of Agency Officials

It appears that there is a distinctive difference between the commitment shown by the central irrigation officials and provincial engineering (irrigation) officials. Though the claim cannot be fully substantiated at this moment due to inadequate information, preliminary process documentation observations indicate a high level of commitment by ID officials as against provincial engineering officials. This can be justified, for the time being, by comparing the inputs given by the ID with respect to Buttala and Gampolawela and by the provincial engineering department with respect to Mahagalgamuwewa and Kattadiwewa. This, however, should not be interpreted as a comprehensive commitment by the ID officials.

The ID commitment will improve further if the FOs are to be sustainable. Some of the constraints identified for further improvement by ID officials are lack of adequate transport facilities to attend all FO meetings, lack of incentives for additional work performed, nonpayment or delayed payment for traveling for field officers (i.e., FOs) when they have to cover additional area, etc.

Evaluation of Maintenance Performance by FOs in Handed-Over DCs. This study was undertaken by the Irrigation Research Management Unit (IRMU) in collaboration with the Sri Lanka National Program (SLNP), IIMI, on the request of the Central Coordinating Committee of the Irrigation Ministry (CCCIM) to ascertain the consequences of maintenance activities undertaken by DC FOs and the sustainability of canals that have been handed over to the FOs for maintenance.

The specific objectives of this study were to: (1) ascertain whether government resources in some manner (funds/staff) still need to be provided to FOs after handover to enable to maintain a high level of performance and sustainability of their systems, (2) assess whether deterioration of systems (neglect) and their operation is lowered to such a degree as to affect productivity (reliability of water supply), (3) determine whether the cost savings by way of lower costs to the government by handover would be negated by having to invest in rehabilitation at intervals shorter than would have occurred under ID control, (4) determine whether or not it is a capability or resource issue rather than the need for a better definition of ID/FO responsibilities and processes, (5) assess whether the institutional arrangements and linkages available at present are adequate, and (6) ascertain whether the technical standards as set by the ID for ID performance in systems are required in reality where systems are handed over, i.e., cost-efficiency trade-off.

Four schemes were selected for the study: Kaudulla, Parakrama Samudraya, Ridi Bendi Ela and Gal Oya Left Bank. Twenty two DCs were purposively selected to represent head, middle and tail of the respective schemes. Among the DCs selected, eleven were handed over while the balance eleven were not handed over.

Both primary and secondary methods were used for data collection. The direct method included the rapid appraisal techniques, interviews with DC representatives using question guidelines followed by direct observations by the research team. In addition to these, interviews were also held with field-level irrigation officials to solicit their views on relevant issues.

Results indicated that the DC FOs, on average, generate from their own resources, almost exclusively through shramadana 38 percent of the resources required to maintain the DCs in good operating conditions. The study also found that the DC FOs were receiving, from the ID, on average, 18 percent of the resources required for the above job.

Clearly, the analysis indicates that the DC FOs are not yet in a position to mobilize adequate resources to carry out the maintenance requirements of their DCs and that they will continue to require financial assistance from the government. They, however, emphasized the need for timely disbursement of funds and also a shift from the present contractual system of payment to a more liberalized mode of payment.

The farmers also identified the following two areas where significant state assistance is required:

- i. **Technical Assistance.** Continued technical support is needed to maintain the canal profile for satisfactory canal operation, in quantification of desilting needs (volume of earth to be excavated), maintenance of hydraulic structures and scheduling of water delivery.

- ii. Training. They indicated that training should be a continuous process because trained Farmer Representatives relinquish their responsibility when a new batch of office-bearers is elected. It is, therefore, essential to train these new FO officials when they assume office. They also indicated that the training programs are conducted mostly in an unstructured manner and, more or less, on an ad hoc basis. They emphasized the importance of more structured and organized training programs with the right type of resource persons.

To assess the rate of deterioration of the turned-over systems, the status of the hydraulic structures and canal proper were ascertained. It was observed that, on average, the level of maintenance of the structures and canals was around 79 percent (assuming 100% as most satisfactory). It was also observed that the condition of structures and canals deteriorates faster during the initial years and then stabilize at around 70-75 percent. It should, however, be noted that the Gal Oya systems were handed over after full rehabilitation whereas the other 3 schemes were handed over after partial rehabilitation.

Based on the above analysis it is evident that, at this point, the systems have not deteriorated to a point to significantly affect productivity (reliability of water supply).

The study found that not a single DC has been completely handed over to the DC FOs as per agreement. In some cases, though maintenance of the channels has been handed over to the DC FOs, there is disagreement about the maintenance responsibilities as spelled out in the agreement.

As the DCs have not yet been fully handed over it was not possible to compute cost savings. In the absence of this it is not possible to predict what reduction in manpower and other logistics will occur as a result of turnover.

During the study it was also observed that the DC FOs were not very clear about their exact responsibilities and were of the opinion that some of the activities assigned to them should really be carried out by the ID. Responses suggest that a redefinition/better interpretation of ID/FO responsibilities is essential.

The institutional arrangements laid down in the agreement for participatory management is either not clearly understood or followed by either party (ID and DC FO). In the case of the ID, the government has control and hence has the responsibility to redefine the role of ID staff, in the absence of which it is quite difficult for them to integrate their changed responsibilities in the day-to-day execution of their tasks.

For the ID, maintenance is governed by the twin objectives of a) improving performance, and b) bringing the system back to design specifications. If maintenance resources are adequate this approach leads to sustainable functioning of the system. However, if maintenance resources are inadequate, the standards force the ID to devote resources to bring items to design specifications rather than to use all resources to improve performance. Therefore, the present ID standards are, given current resource constraints, less effective in sustaining performance than would be a set of standards that places primary importance on system performance. Farmers tend to be concerned only with performance. Therefore, their use of limited maintenance resources may be more effective in sustaining performance than is the ID use of maintenance resources under present standards.

Strengthening **FOs** through Increased Participation of Female Farmers. The research on female involvement in **FOs** was initiated because it was felt that:

- * The percentage of female membership in **FOs** is low compared to male membership, considering female participation in irrigated agriculture
- * The percentage of female office-bearers compared to male office-bearers is low considering female membership in **FOs**
- * Female members are said to be less active in meetings and other **FO** activities

Female participation in **FOs** is being studied in cooperation with NIRP and IIMI. The study aims at documenting and understanding the differential participation of men and women in **FOs**, as well as its impact on participatory management. In addition, it aims at providing some practical recommendations for the improved participation in the Aftercare Project of the NIRP. The reasoning is that active involvement of farmers in **FOs** can only be expected if the **FO** turns out to be an effective means in solving the problems of farmers. As men and women have different responsibilities in irrigated agriculture it is assumed/expected that both needs, and costs and benefits of participation differ for men and women. An assessment of male and female participation will, therefore, be made in view of their responsibilities in irrigated agriculture. Consequently, those findings will be related to the objectives and activities of the **FO**.

The study was initiated by IRMU staff in April, 1995, when it was decided to recruit a gender researcher through IIMI's program on gender issues in irrigation. When the researcher arrived in September, 1995, a small literature survey was undertaken to further develop the research proposal.

The study is divided into two components. The first component consists of short surveys in ten schemes and will concentrate on the extent of the problem. The second component consists of an in-depth study to investigate in detail the processes behind participation in **FOs**. Data collection focuses at inter- and intra-household differences that affect participation in irrigation management.

The research team now consists of one researcher and two counterparts, one from IRMU and the other from NIRP. For data collection of the first component two field research assistants were recruited. As they are fresh graduates a training on gender and irrigation as well as on research methods has been given to them during the first half of October. A reconnaissance survey was conducted in two minor schemes and in one medium scheme to improve guidelines prepared for data collection. A database program has been selected to process data of the first component.

Ten sites, four medium and six minor schemes, have been selected for the study. All of them are undergoing rehabilitation under the NIRP. Selection criteria were:

- size of command area—minimum of 20 ha for minor schemes and a maximum of 300 hectares for medium schemes
- * commencement of the NIRP project before February, 1995
- * good performance of the **FO** (according to the Implementing agency)

In addition to these criteria, both tank and anicut schemes under the different implementing agencies were included.

Data collection of the first component has been completed in three minor schemes. In January, 1996, the in-depth research will commence. Data collection is expected to be completed by May, 1996.

Participatory Action Research for Improved System Management and Increased Production in *Minor Irrigation* Schemes Rehabilitated under *NIRP*. A study for identifying and implementing a strategy for the aftercare program is essential as it was not clear how to implement this program in the handed-over NIRP minor irrigation schemes to achieve the full benefits of the rehabilitation project. The Participatory Action Research methodology used in the study has been found to be an efficient mechanism for developing coordination among various agencies and the farming community for research-based problem-solving; also it results in cost-effective and sustainable internalization of research innovations. The study is being carried out in close collaboration with the Department of Agrarian Services, the Irrigation Department, the Department of Agriculture, and farmers. Field data collection is scheduled to commence in January, 1995.

The overall objective of this study is to develop an implementation strategy for the aftercare program to achieve the maximum benefits from the rehabilitated projects. It is expected that a better farmer manageable system for improved M&E and increased production will be developed through this study. The specific objectives of the study are to strengthen FOs to manage irrigation schemes in a sustainable manner, and to develop a seasonal plan, a better O&M plan and a better cropping system based on the available resources (land and water) which will increase agricultural production and farmers' income. The expected output of the study is: a better O&M plan for sustainability of the scheme, an agriculture plan to maximize agricultural production with optimal use of land and water, a better seasonal planning procedure to reduce cultivation risk and for smoother operation, and increased farmer participation in system management.

The study will be conducted in two phases. Activities in the first phase included selecting the sites and identifying the farmers' O&M and agricultural production practices. The O&M plans, seasonal plans and cropping plans will be developed in consultation with farmers and implemented in the second phase. For the study of the two schemes, the Dunupotha Wewa Scheme in the Kurunegala District and the Maha Kiri Ibban Wewa in the Anuradhapura District in which the rehabilitation work was completed and is ready for handing over were selected. Collecting of basic data on scheme features, farmer O&M and cultivation practices, socioeconomic and institutional aspects was completed as per the work plan.

Estimation of Tank Yields and Review of Spill Formulae for Minor Tanks. This study was initiated with the objectives of estimating specific water yield from small catchments, and determining adequacy of spill capacity parameters for spillway design and inflow hydrographs.

Monitoring of the tank water levels and other related variables for the selected tanks under the above study, commenced on 1 April, 1995. At the time of installation of staff gauges and rain gauges, rehabilitation work had not been completed in some of the tanks. Even though the installation of all equipment required for monitoring was done in April, most of the tanks did not receive any appreciable amount of water during the southwest monsoon and, therefore, remained dry until October. In Senasuma Wewa at Wellawaya and Paragahalanda Wewa at Bibile, the little water that remained from the northeast monsoon had to be drained out to commence rehabilitation works after the commencement

of the monitoring program. As a result and due to climatic factors and the commencement of the rehabilitation work, the monitoring program was interrupted.

During the monitoring of tank data several problems cropped up in almost every tank ; they are summarized below under five districts:

Hambantota District. Kattadiya Wewa, Kirinda. The rehabilitation work was completed before monitoring of water levels commenced with the exception of the fixing of the sluice gate and raising of the spill crest. During November, **1995** filling of the tank was commenced and at the end of December the water level in the tank was **6.24 ft.** above the sluice sill level. No water was issued from the tank at the time of writing of this report.

Even though the rehabilitation work was completed, due to dry weather conditions in the area, the tank was dry up to November, **1995**. Hence, no useful data have been collected for analysis during that time. Effective monitoring of the tank water level was done only from November, **1995**.

The depth-area-capacity curve for the tank was available only above the FSL. Arrangements were made to carry out the tank bed survey by the Hambantota IE and this curve was received at the end of October, **1995**

Kurunegala District. Lihinigiriya Tank, Wedakada. During the time of gauge installation, the sluice gate and downstream structures were not completed. The rehabilitation was completed in September, **1995**. At the end of the year, the water level in the tank was **0.37 ft.** above the sill level of the sluice and it was going down due to the prevailing dry weather condition in the area.

There is a leak through the spill-cum-sluice. The sluice obstruction had been forced open at the beginning of August, **1995** before the installation of the gate. Monitoring of the tank water levels was interrupted during the period.

Tittawela Tank, Tittawela. The rehabilitation work was completed before the installation of the gauges. The water level in the tank was **4.4 ft.** above the sill level of the sluice in mid- January, **1996** and it is going down due to the prevailing dry weather conditions in the area. The full extent of **104** acres of rice is being cultivated during maha and water for these lands is being issued on a rotational basis. Effective monitoring began in April, **1995**.

Matale District. Bulana Wewa, Galewala. The rehabilitation work was completed before the installation of the gauges. The water level in the tank was **3.5 ft.** above the sluice sill level at the end of December, **1995**. Water is being issued on a rotational basis. There is a leak through the spill and the sluice and cracks are appearing along the tank bund. Since there is no well-defined spill channel, the leak through the spillway cannot be measured. Due to the dry weather conditions in the area the tank was dry at the end of September, **1995** and the tank water levels could not be monitored smoothly.

Henwalayagama Wewa, Sigiriya. The rehabilitation work was completed before the installation of the gauges. The water level in the tank was **2.2 ft.** above the sill level of the sluice in mid-January, **1996**. Due to the dry weather conditions in the area, the tank was dry during September, **1995** and October, **1995**. Hence, the duration of useful monitoring was from May, **1995** to September, **1995** and from November, **1995** onwards. There is a leak through the sluice gate and cracks have appeared along the tank bund. There is a high-level sluice which is located to the right of the original sluice. This seems to

be an illegal tapping. The leak through the sluice and water issues through the high level sluice were measured.

Moneragala District. Senasuma Wewa, Wellawaya. The installation of tank gauges was completed in March, 1995. The rehabilitation work of the tank commenced in June, 1995, which included structural improvements to the tank bund and the spill. To carry out these improvements steps were taken to empty the tank. Hence, the observation of the tank water levels was discontinued until the rehabilitation work was over. There was no water in the tank from August, 1995 to mid-November, 1995. The rehabilitation work was completed during November, 1995 and monitoring of the tank water levels commenced. The water level in the tank was 10.87 fl. above sill level of the sluice at the end of December, 1995. The duration of useful monitoring has been from November, 1995 to date.

Paragahalanda Wewa, Bibile. Tank gauges were installed in April, 1995. The rehabilitation work of the tank commenced in June, 1995 and was completed in December, 1995. Hence, the observation of tank water levels was discontinued, but rainfall observations were continued. Even though the rehabilitation work was completed in December, 1995, gauge posts had already been refixed in November, 1995.

Nuwara **Eliya** District. Kande Ela Reservoir. Monitoring of the tank water level started before the rehabilitation work was initiated. Action was taken to paint the tank gauge which was installed on the Morning Glory Spillway Barrel, thereby increasing the accuracy of data. Since there are no water issues from the inception of the study, discharge measurements could not be made. The water level in the tank was 22.5 fl. above the sill in mid-December, 1995.

Another objective of the study is to model these catchments by correlating the hydrological variables such as rainfall, stream flow and evapotranspiration to physical characteristics of the catchments. Therefore, arrangements have been made with the Land Use Division of the Irrigation Department to obtain their services to identify the soil characteristics and soil properties in each catchment.

Evaluation and Use of Computer Models in Improved **O&M of Irrigation** Schemes. The study is being implemented in four schemes with the main objective of applying computerized decision support tools for improved O&M of irrigation systems. A brief progress report of each scheme is provided below:

The Buttala Anicut Scheme. The above study has been carried out in the Buttala Anicut Scheme since 1994 yala season. During 1994 yala, 1994/95 maha, 1995 yala and 1995/96 maha. the daily gauge readings in selected monitoring points were observed and recorded in standard formats and the IMIS database. The research work in the Buttala Scheme mainly deals with the operation and distribution aspects of irrigation water as agreed at the inception of the study. Due to the water abundant environment of the system no efforts have been made to reduce or issue water on a targeted schedule. However, many aspects related to main canal operation have been studied with the present system of water distribution.

Application of SIC hydraulic simulation model to the Buttala main canal has been completed. Two field calibrations have been carried out in 1994/95 maha and 1995 yala. On both occasions data were analyzed and studied for determining the hydraulic behavior of the canal. The important parameters of the different reaches of the canal and the structures have been established. The calibrated hydraulic

model will be tested for different operational scenarios to establish rules of operation. This could be used as a training tool to understand the hydraulic behavior of the canal in relation to operation and (distribution aspect of water management by system managers.

During this season (1995/96 maha) the number of monitoring points required for daily operation are being observed by patrol laborers with the actual time of adjustments. This will enable to prepare norms for operation of gates by patrol laborers in addition to their normal routine work on maintenance.

The Rajangana Scheme. Progress of the study in the Rajangana Scheme has been slower as compared to the other schemes. Installation of the gauges have nearly been completed but calibration has not yet been completed. Data collection is progressing and collected data are being transferred to the IE's office regularly. After transferring all data, processing will begin. Data are being updated and entered using Lotus spreadsheet. The outputs are daily discharges, volumes issued and the cumulative volumes. No decision has yet been made on the type of computer model to be used.

The **Badagiriya** Tank Scheme. The measurement network has been fully established. Data collection for the year 1995 has been completed and entered into the computerized IMIS. These data are now being processed. The duty for each outlet canal is being computed and calibrations are being rechecked. A programmable calculator is being used with a simple program to compute the delivery discharge with the collected gauge readings and sluice opening.

The Kekanadura Scheme. In the Kekanadura Scheme, 8 water measuring devices were constructed at control points in the canal network and the water delivery system, and cultivation data (extent) were calculated. During the study, existing methods of water issues were not disturbed and the water issues were done according to the farmers' demand.

A computer program is being developed for water scheduling and seasonal planning. The scheduling program has already been developed (scheduling program developed for KOISP has been modified to suit the Kekanadura Scheme): the program for seasonal planning is nearing completion. Analysis of the preliminary data indicates that water delivery closely matches demand and, as such, a computer software may not be needed for this scheme. This, however, needs to be confirmed in the final analysis of data.

Semiautomatic Now Control System for **Improved O&M of Irrigation** Schemes. This is a follow-up study on **performance** monitoring of automatic wafer levels of the downstream control structures conducted by the Deputy Director, ITI in the Rajangana Major Irrigation Scheme. The objectives of the study are to develop a semiautomatic flow control system consisting of baffle distributors and long-crested weirs and to test its adaptability in a medium irrigation scheme at system level. The Panugala Scheme in the Gampaha District has been selected for the study and is being implemented on the right bank canal of the scheme in collaboration with the Deputy Director, Colombo and **IE**, Gampaha.

The advantage of baffle distributors for flow regulation over conventional flow regulators is that these free surface offtake equipments are designed to supply controllable constant flows whereas in the conventional flow regulators flow can be controlled easily but it is not easy for farmers to measure it. The flow is controlled at the downstream by opening or closing the requisite combination of different-sized shutters. Once the distributor is locked at a given setting the flow remains constant. Integration

of the design of offtakes with long-crested weirs also results in head control at offtakes which results in a more stable flow.

The study is being implemented in the following phases: Design of the semiautomatic flow control system, manufacture of baffle distributors, construction and installation of the semiautomatic flow control system and testing its adaptability by the farmers.

The design phase which included the determination of the location and dimensions of duckbill weirs, the selection of a combination of baffle distributors and the determination of sill height of these baffle distributors has been completed. Other related activities were:

- * Cross-sectional data (station, side slope L, side slope R, bed level, bed width, etc.) of the right bank main canal were entered for 78 sections and a backwater profile was computed.
- * Existing turnout structures were grouped according to the location of the proposed turnout structures and the maximum head required (including losses) at each turnout was calculated in relation to the highest rice-field level with the standing water level of 0.15 m.
- * Location and dimensions of the duckbill weirs were determined for the minimum flow of 140 l/s. After computing the maximum head required at each proposed turnout location, with the provision of an end regulator, the backwater profile was simulated using the basic program 'Profile' for the flow of 140 l/s. Using the program, the backwater profile was simulated at every 30 m of the canal. At the turnout location where the water surface elevation is not sufficient to meet the head required, another duckbill weir was introduced. Thus, in addition to the end regulator two more regulators (duckbill weirs) are required to maintain the necessary head.
- * For a flux (h) of 0.1 m for 140 l/s, using the equation $Q = cLh^{3/2}$ ($c = 1.60$), length of the duckbill weir was determined (2.8m). Allowing for a flux of 0.1 m, based on the water depth required, the height of the duckbill weir was also determined for each location.
- * For the length of 2.8 m, flux at the duckbill weir is 0.14 m for the maximum flow of 240 l/s.
- * With the new water depth (height of duckbill weir at each location + 0.14 m) at the regulator position, the backwater profile was determined for 240 l/s.
- * Depending on the water-level variation at the proposed turnout location (for 140 l/s and 240 l/s) sill of the baffle distributors was determined.
- * Based on the demand at each turnout, the combinations of baffle distributors and shutter widths were also determined.

The State Engineering Corporation which was contacted for the manufacture of baffle distributors is in the process of preparing quotations for such manufacture. As this system is to be operated by the farmers they were consulted at the feasibility stage to determine flow rates and location of turnouts. More consultations with farmers have been planned to train them on the operation of the system.

Irrigation Water Management for **Crop** Diversification under **Minor Irrigation** Schemes Rehabilitated by the **NIRP**. Contracted to the Crop Science Department of the University of Peradeniya, the study was initiated from July, **1995**. The principal objective of the study is to develop an appropriate package of diversified cropping systems to maximize the utilization of land and water and optimize farmers' income.

Two research sites, the Elapathawewa Scheme in the Anuradhapura District and the Ambalegoda Scheme in the at Kurunegala District were selected for the study. A comprehensive literature survey on the above subject was carried out during the preparatory phase. A questionnaire was developed based on the literature survey as well as the information obtained from the kanna meetings. Field layouts were made and water measuring gauges (i.e., gauge posts, flumes) were installed at the **respective** research sites during the preparatory phase. Three research assistants were employed for implementing the study.

Information on daily rainfall and water issues was collected from the beginning of **1995/96** maha. The questionnaire survey is currently being carried out and is nearing completion. The **farm** activities will be monitored continuously during the first year of the study (diagnostic phase). A computerized bibliographic survey (including abstracts, where available), on irrigation water management for crop diversification, is currently being prepared.

Study on the Assessment of Tank-Bed Siltation. This study is being implemented by the Environmental Studies Center of the University of Peradeniya. The study was begun in April, **1995** with the objective of monitoring siltation in small irrigation tanks and characterizing **the** spatial and temporal variability of the process. The study **will** also develop a model to quantify sediment yields from small catchments as well as formulate ways to minimize negative environmental impacts due to siltation that could be applied in future rehabilitation programs.

For this study, **6** sites have been selected in the dry zone of the country. A pilot sediment trap has been constructed at the Wewala Wewa Tank. But due to delay in the initiation of the study, detailed measurements could not be made before the end of the rains in April, **1995**. It was, however, observed that the trap did collect sediment during the only rainfall event to occur after the construction was completed.

Apart from the trap constructed during the pilot study, five sediment traps have also been constructed in Wewala, Bulana, Heenwalayagama, **Ittikattiya** and **Bulankulame** schemes. These traps are equipped with overflow weirs with which discharge can be measured and they are provided with bypass channels to facilitate the removal of sediment from the traps **after storm** events.

Rain gauges have been installed, two at Wewala and one each at the other sites. Data collectors have been employed at all five sites. Their duties include care and maintenance of the traps, measuring the sediments collected in the trap after each **storm** event, collection of sediment samples for size analysis and measurement of rainfall.

Three traps at Wewala, Heenwalayagama and **Bulana** were ready at the time of the inter- monsoonal rains late in October and early in November. Two severe storms were experienced at these sites. The traps at Wewala and Bulana were damaged by these storms. Data, however, were collected at Bulana and Heenwalayagama. The sediment traps and rain gauges functioned as **expected**. After the abovementioned **inter-monsoonal** rains there has been no significant rainfall in the study areas.

Therefore, no further data could be obtained. Maps of the sites on the scale of 1:50,000 have been obtained and the details of the catchments are being collected.

Study on Micro-Catchment Degradation. Catchment degradation is the loss of the productive value of land due to human activity. This involves depletion of soil fertility, increase of storm runoff and sediment load, and drying up of streams. Catchment responses to the clearing of natural forests may take the form of soil erosion and the associated loss of productivity and alteration of hydrological processes within the catchments. Reduced infiltration capacity and acceleration of the rate of surface runoff can cause soil erosion, flooding and siltation of reservoirs, channels and low-lying croplands,

The main objective of the study is to diagnose the causes and consequences of catchment degradation and preparation of a management plan. The secondary objectives are to quantify and model the effects of land use practices on surface runoff from micro-catchments and the creation of a GIS database for selected micro-catchments.

A proposal to implement the study has been submitted by the Environmental Studies Center of the University of Peradeniya. After incorporating the comments from the reviewers the proposal has been sent to the Project Director, NIRP for approval.

Archaeological Study on Ancient Irrigation Systems. Both historical and archaeological evidence indicates the central significance of irrigation to the florescence of ancient Sri Lankan civilization. In 1975, the Irrigation Department estimated over 15,000 major and minor working schemes. Most of these schemes, like most of the 1,000 plus schemes scheduled for rehabilitation under NIRP, have pre-modern origins and form an important part of Sri Lanka's cultural and scientific heritage. The Archaeological Study on Ancient Irrigation Systems, undertaken by the Ancient Science and Technology Program of the Institute of Fundamental Studies, is designed to advance knowledge and stimulate research concerning the origins and development of ancient Sri Lankan irrigation-related technologies. The study also contains an environmental impact assessment component for recording the archaeological remains related to each NIRP project. This information is used to appraise NIRP contractors of the presence of archaeological materials to prevent the inadvertent loss of items related to the national cultural heritage through the obliteration of archaeological remains during NIRP construction activities.

Just over fifty days of field work were completed during 1995, following the release of NIRP funds in early July. The field team completed 22 NIRP projects (9 medium/major schemes and 13 small schemes) and visited 12 non-NIRP irrigation localities in 8 districts encompassing all three rainfall zones. During this work the team recorded traces of 40 ancient irrigation-related structures, including 9 *bisokotuwas* or sluice valve cisterns (4 on NIRP schemes). In addition to the irrigation structures themselves, investigations in the near vicinity of the 34 projects have revealed 32 ancient settlements, 38 stone-pillared buildings, 14 stupas, 5 cave monasteries, 15 localities with ancient rock-cut steps, 2 stone bridges, 12 inscriptions, and 4 relief sculptures. Five of these sites have already been seriously damaged by recent irrigation construction activities, while another 9 are very likely to be impacted by currently planned irrigation construction activities. Although all NIRP irrigation projects have been renovated at least once in the past, over 50 percent of the NIRP projects visited still retains some traces of their ancient irrigation structures. The majority of these, however, have been disarticulated by earlier Irrigation Department construction activities. Much of what still remains will be further destroyed with

each succeeding rehabilitation, especially now that blasting and mechanized earthmoving equipment are increasingly employed in the work.

Although no new lands are being officially brought under cultivation during NIRP activities, in some projects small remnants of higher land within the current fields are being lowered to maximize the areas of productive fields. Such remnants sometimes contain archaeological remains from the higher area, and these are being disarticulated at best, or totally removed at worst, by the field improvement process.

As might be expected, of the 12 NIRP projects that still retain traces of their ancient irrigation structures, the structures are more evident at the medium/large schemes (found at 77% of the larger schemes but at only 38% of the small schemes) where the ancient constructions were more substantial and the irrigated areas and populations were larger. Although irrigation-related structures are more commonly found on the larger projects, significant remains—even including an ancient *bisokotuwa*--have been discovered on small projects. Furthermore, fairly intensive surveys in the vicinity of small schemes have revealed significant frequencies of other categories of important archaeological remains such as stupas, inscriptions, stone-pillared buildings (generally religious structures), and settlement sites, although these are not as frequent as in the larger schemes. Despite the samples being fairly small, clearly, these results indicate that small schemes possess evidence that should not be ignored or discounted in the study of ancient irrigation. Even more importantly, since the remains at small schemes appear as liable to being impacted by construction activities as are those at the larger schemes, archaeological impact assessment surveys are as necessary around small schemes as around large ones.

Output 1. Establishment and strengthening of IRMU.

Activity		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
i. Staff Recruitment*	Planned	xxx xxx x											
	Carried out			xx			x						
ii. Establishment of Research Library and Review of Past and Present Literature	Planned	x	x	x	x	x	x	x	x	x	x	x	x
	Carried out	x	x	x	x	x	x	x	x	x	x	x	x

* Out of planned 9 only 3 staff were recruited.

Output 2. Research and development.

Activity		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
i. Finalization of Research Needs and Priorities for 1995	Planned	x	x										
	Carried out	x	x										
ii. Implementation of Research Programs	Planned	x	x	x	x	x	x	x	x	x	x	x	x
	Carried out	x	x	x	x	x	x	x	x	x	x	x	x
iii. Record and Analyze Lessons Learned in IRMU Establishment	Planned	x	x	x	x	x	x	x	x	x	x	x	x
	Carried out	x	x	x	x	x	x	x	x	x	x	x	x
iv. Preparation of Research Needs and Priorities for 1996	Planned										x	x	x
	Carried out										x	x	x

Output 3. Training and technology transfer.

Activity		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
i. Training on Rapid appraisal	Planned				x								
	Carried out				x								
ii. Training on Research Methodology	Planned										x		
	Carried out												
iii. Holding of Workshops	Planned		x			x				x			x
	Carried out		x			x							x
iv. Holding of Seminars	Planned	x	x	x	x	x	x	x	x	x	x	x	x
	Carried out	x	x	x	x	x	x	x	x	x	x	x	x
v. Award of Research Fellowships	Planned			x	x	x				x	x	x	
	Carried out												
vi. Newsletter	Planned	x				x				x			
	Carried out		x				x			x			

The much lower proportion of nonirrigation remains at the non-NIRP localities that were visited results from a less-intensive survey methodology as these localities were not subjected to the archaeological impact assessment aspect of the field investigations. The identifiable remains of the 9 bisokotuwās as well as parts of 5 other sluice structures and the disarticulated blocks of possibly 6 more sluices clearly show that substantial amounts of archaeological material are still potentially available for research on ancient irrigation. These structures require further investigation during Phase II of the study for detailed information on construction techniques, chronological changes, and other developments in irrigation technology.

Training and Technology Transfer

TRAINING ON RAPID Appraisal of Irrigation System. The second Rapid Rural Appraisal (RRA) course for determining rehabilitation needs for irrigation schemes and identification of research needs was conducted at the Irrigation Training Institute at Galgamuwa.

The 2-week training course was organized by the IRMU with the help of the Sri Lanka Field Operations ~~of~~ ^{office} of IIMI and was held from 18 to 28 April, 1995. The general objective of the course was to sensitize irrigation officials interested in diagnostic and research activities on the advantage of using the RRA technique in collecting the required information. Other objectives were:

- To provide course participants with a thorough understanding of the purposes, principles and methods of RRA
- * Help course participants plan RRA techniques in live irrigation schemes
- * Guide course participants in implementing and reporting RRA results

Nineteen participants from the ID, the NIRP and the IRMU attended the course. Ten resource persons, 3 from the ID and 7 from IIMI were involved in the training program.

The course was a blend of classroom lectures, group discussions and extensive field exercises. During the first week, classroom lectures including case studies and group discussions were conducted on the following topics:

- * Introduction to RRA
- * RRA needs for NIRP schemes
 - RRA: A tool for identifying research needs
- Appraisal methods for irrigation supplies and drainage
- * Social and institutional aspects
- * Farm management
- * RRA analysis and presentation techniques
- * Farmer group interview techniques
- * RRA case studies

During the second week, field work was conducted at the Pahala Kokwewa Minor Irrigation Scheme located in the Galgamuwa Irrigation District. For the purpose of rapid appraisal, the participants were organized into 3 groups to appraise engineering, agricultural and socioeconomic aspects. Field data were collected with the active participation of 17 farmers. The first draft of the appraisal report was presented to the farmers to verify data and solicit their comments for improvements. The final report was presented on the last day of the training program.

The training course was very well received by the participants. The course was evaluated with **22.2** percent rated as excellent. 53.6 percent as good, 18.6 percent as alright, and 5.6 percent as mediocre. None of the participants rated the course as "not good." The participants, however, made some recommendations for further improvement of the course. The completion report and the participants' report have already been finalized.

Holding of Seminars. As part of its technology transfer program, the IRMU initiated a monthly seminar series from December, **1992**. Thirteen seminars were held during **1995**. Speakers included professionals from national and international agencies, nongovernmental organizations, universities, etc. The seminar series continues to remain popular and is widely attended by participants from national and international organizations. Presentations in the seminar series came from the following institutes: IIMI - **4**, NIRP - **3**, NGO - **2**, ID - **1**, IRMU - **1**, University - **1** and one from the Department of Environmental Protection, Alberta, Canada. A wide range of topics was covered in these seminars, which included irrigation engineering and management - **4**; participatory management - **2**, women in irrigation - **2**, crop diversification - **1**, GIS - **1** and other miscellaneous disciplines - **3**. In addition to serving as a strong component of the technology transfer program, these seminars also provide essential inputs to the IRMU's research program. Summaries of these seminar presentations are being published separately.

Publication of Newsletter. The information dissemination program was strengthened by Initiating the publication of the IRMU Newsletter early in **1994**. Three issues of the Newsletter have been published in **1995** bringing the total to 5 since its initiation. The Newsletter is distributed to over 300 professionals, researchers, administrators and planners within the country.

Award of Fellowships. A strong component of the staff development program is the award of fellowships to the IRMU/ID officials to pursue higher studies leading to postgraduate degrees/diplomas in national universities. There is provision for awarding 8 such fellowships up to the end of **1994**, and **4** had already been awarded. This year, in spite of intensive effort no fellowship could be awarded due to lack of interest among the staff. The principal reasons for lack of interest are; (i) staff prefer foreign scholarships to local ones, (ii) nonavailability of an adequate number of appropriate courses, (iii) Staff availing of these lose priority for eligibility for foreign fellowships, and (iv) most of the advanced degrees offered by the national universities are not recognized abroad. To offer more flexibility it was decided that in addition to technical fields these fellowships will also be offered to staff interested in pursuing higher studies in management.

Holding of Workshops. The following four were tentatively identified as workshop topics for 1995:

- * Farmer Participation in Planning, Design and Rehabilitation of NIRP Schemes: Farmers' Perspective
- * Managing Irrigation Systems after Turnover: Lessons from Integrated Management of Major Irrigation Settlement Schemes (INMAS) and Mahaweli and Their Implication to NIRP
- * Sustainability of Farmer Organizations: Myth or Reality: Dialogue with Farmers and Officials
- Crop Diversification Strategies for Minor Irrigation Schemes

While finalizing the topics the second title was changed to Beneficiary-Centered Management of Irrigation Systems: Retrospection of Recent Endeavors and the third was altered to *Planning* and Design Issues in Rehabilitation. This was done to keep a proper balance between technical and socioeconomic issues. Of the planned four, three workshops were held during the year. The fourth one, *Crop Diversification Strategies for Minor Irrigation Schemes* has been rescheduled for 20 February, 1996.

Workshop on Farmer Participation in Planning, Design and Rehabilitation of NIRP Schemes: **Farmers'** Perspective. This workshop was held at the Sri Lanka Irrigation Training Institute (SLITI), Galgamuwa on 25 February 1995. Twenty farmer representatives were invited to represent 8 Deputy Director (DD) Ranges covering 12 Irrigation Engineer (IE) Divisions and 19 of them participated in the workshop. The objective of the workshop was to document their experiences and solicit recommendations to further strengthen farmer participation in the rehabilitation of NIRP schemes.

Participants were divided into 4 groups. Each group presented its experiences with the guidance of a facilitator. They expressed their views and experiences under the following components of farmer participation:

- * FO formation and preparation
- * Farmer participation in the planning and design of rehabilitation
- * Contribution by farmers of 10 percent of the resources needed for the rehabilitation
- Construction contracting by FOs
- * Construction supervision by FOs

Farmer representatives expressed their satisfaction over the functioning of their respective FOs in spite of some unavoidable shortcomings. Rehabilitation was identified as an incentive for farmers to join FOs and the presence of Institutional Organizers (IOs) was considered an added benefit in continuing FO activities.

FO members were concerned about the lack of legal authority to deal with defaulters, especially in relation to the 10 percent contribution toward rehabilitation. However, FOs used different strategies in achieving the 10 percent contribution from the members. Most of the construction contracts have been carried out by individuals through subcontracts rather than by FOs. The overall quality of this work was good due to the close supervision by the FOs during the entire process. The proceedings of the workshop has already been finalized and will be published very soon.

Workshop on Beneficiary-Centered Management of irrigation Systems: Retrospection of Recent Endeavors. The second workshop planned for the year, Beneficiary-Centered Management of Irrigation Systems: Retrospection of Recent Endeavors was held on 25 May, 1995 at the Irrigation Department, Colombo. "One of the major drawbacks to successful implementation of beneficiary-centered management of irrigation systems in the true sense has been the lack of a multidisciplinary approach. While there is no doubt that, with training, qualified technical staff do prove to be successful institutional staff, this is essentially tied to personal qualities and in instances where conflicts of Interest arise, as they often do, with respect to irrigation and, especially, construction work, it is likely that true participation will result" said Mr. Jaliya Medagama, Secretary to the Ministry of Irrigation. Power and Energy, while delivering his address as the chief guest. This workshop was organized by the IRMU and the ID in collaboration with the Sri Lanka Field Operation office of the International Irrigation Management Institute.

The objectives of the workshop were:

- * To discuss the salient features of the programs implemented in the recent past that can be applied to NIRP
- To document the findings and experience in the relevant subjects for dissemination among interested persons
- * To provide a forum to policymakers, technocrats and researchers to deal with a subject in close interaction so that the recommendations could be widely acceptable as well as applicable

Four papers were presented at the workshop during two session, for which over 25 participants were invited from implementing agencies, the Irrigation Management Division (IMD), the Mahaweli Economic Agency (MEA), research institutes, the Irrigation Department and IIMI. The workshop recommendations and proceedings will be made available soon.

Workshop on Planning and Design issues of Rehabilitation

A workshop on Planning and Design Issues of Rehabilitation was held on 5 and 6 December 1995, at the Irrigation Training Institute (ITI), in Galgamuwa. It was jointly sponsored by the IRMU and the ITI. Forty five engineers from the ID, the DAS and the MECA (Mahaweli Economic and Construction Agency) participated in the workshop deliberations.

All the members of the Senior Directorate and most of the Range Deputy Directors were among the participants from the ID.

The objectives of the workshop were:

- * Identifying planning and design issues of rehabilitation and resolving them or proposing action to resolve them
- * Identifying further research required to address the issues

The workshop created a forum to share the experiences of participants in the planning and design process of irrigation rehabilitation and, therefore, it created a training environment as well. There was much enthusiasm among the participants, both in small group discussions and in plenary sessions. Fifteen issues identified in the issue paper were critically evaluated during the deliberations and a positive consensus was reached in proposing solutions to most of the issues. The workshop proceedings are being finalized.

Output 4. Training and technology transfer.

Activity		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A. Reports i. Quarterly Report	Planned				x			x			x		
	Carried out				x			x			x		
ii. Annual Report	Planned	x	x	x									
	Carried out	x	x	x									
B. Publications iii. Workshop on Participation in Planning, Design and Rehabilitation of NRP Schemes: Farmers' Perspective	Planned								x				
	Carried out									x			
iv. Beneficiary-Centered Management of Irrigation Systems: Retrospection on Recent Endeavors	Planned										x		
	Carried out									x			
v. Workshop on Planning and Designs in Rehabilitation	Planned												x
	Carried out												x
vi. Report on Rapid Appraisal Training	Planned							x	x	x			
	Carried out							x	x	x			
vii. Abstracts of monthly seminars	Planned	x	x	x									
	Carried out	x	x	x									
viii. IRMU Research Reports	Planned	x	x	x									
	Carried out	x	x	x									
ix. Summaries of Literature Review	Planned	x	x	x									
	Carried out	x	x	x									

Reports and Publications

Annual Report. The second annual report for 1994 was submitted as per schedule in March, 1995.

Quarterly Reports. Three quarterly reports (January to March, April to June and July to October) were submitted as per schedule in April, July and October.

Workshop Proceedings. The proceedings of the workshop on farmer participation in planning, design and rehabilitation of NIRP schemes has been published. Proceedings of the other two workshops titled Farmer participation in rehabilitation of NIRP schemes: Farmers' perspective and *Beneficiary-centered* management of irrigation systems: Retrospection on recent endeavors have been finalized and are being prepared before being sent to the press. The first draft of the proceedings of the workshop on *Planning* and design issues in rehabilitation has also been prepared.

Abstracts of Monthly Seminars. Summaries of 11 seminar papers presented during 1994 were published as per schedule. The first drafts of summaries of another 13 seminar papers presented in 1994 have been prepared and sent to be reviewed.

Report on Rapid Appraisal Training. The final report of the 1994 training course has been published. The completion report and participants' report on the above training course held in 1995 have been finalized. They are being prepared before being sent to the press.

Summaries of Literature Reviews. Summaries of 50 papers prepared during 1994 have already been published. Summaries of 45 papers prepared during 1995 have been finalized and will be published on schedule.

IRMU Research Reports. Final reports on studies titled Farmer *participation in NIRP schemes: Phase II* and Evaluation of maintenance performance by farmer organization in handed over distributary channels are nearing completion and will be submitted in March, 1996 as per schedule.

Preparation of the 1995 Work Plan and Budget

THE 1995 WORK plan and budget were prepared in November in consultation with the IRMU staff and with the Project Director and Co-Project Director, NIRP. This was subsequently approved by the RCC and the RAC. The Work plan--Life of Project is given in Appendix xi and a list of the IRMU Monthly Seminars for 1995 presented in given in Appendix xii.

Project Constraints

Lack of Adequate Staff

One of the most important activities of the TA Program is to help adequate staffing of IRMU and train them to carry out the responsibilities assigned. This is also the area where minimum progress has been made during the last 3 1/2 years.

At the very inception stage of the project a multidisciplinary organizational structure, including a staffing policy and a coordination mechanism was developed. The structure proposes IRMU to be organized into 4 disciplines (Irrigation and Drainage; Irrigation Agronomy; Socioeconomics and Environment). When fully staffed, the IRMU is expected to have 17 research staff including the Deputy Director (Head of IRMU). The recruitment and training of the staff were to be done in phases bringing it to full strength at the end of the 4-year TA Program late in 1996.

The organizational and staffing plan has now been approved by the Treasury including the creation of new cadres for the nonengineering research staff. The next step is to obtain approval of the scheme of recruitment from the Director General of Establishments before actual recruitment can be made. As the whole process is quite lengthy it now appears extremely doubtful whether the positions can be filled before the TA Program expires at the end of July, 1996.

To date, 9 research personnel, including the Deputy Director (part-time) were recruited/seconded to IRMU, 4 of them on contract appointments and the other 5 seconded from the ID. Unfortunately, all 4 recruited on contract left IRMU, 2 for more secure jobs and the other 2 for higher studies abroad. All four were trained by the TA team and they were slowly getting into the rhythm of research. Their departure has been a big loss. A fresh start shall have to be made again to recruit and train new staff.

If adequate personnel are not recruited immediately, the IRMU will not be sustainable after the Technical Assistance program terminates on 31 July, 1996.

Lack of Interest in Fellowships

Provisions have been made in the Technical Assistance Program to provide 8 fellowships for ID/IRMU staff to pursue higher studies in national universities. Four fellowships have so far been awarded. In 1995, out of the 4 planned fellowships not a single could be awarded. The demand for utilization of fellowships has become very low for the following reasons:

- These fellowships are in direct competition with fellowships offered for higher degrees in foreign universities

- * Many of the advanced degrees offered by local universities are not recognized abroad
- * Staff availing of these lose their priority for eligibility for foreign fellowships
- * Nonavailability of adequate number of appropriate courses

To improve the situation some steps have been taken. These include the use of the fellowships for attending postgraduate courses in management and diluting its impact on eligibility for foreign scholarships. These, however, may not be enough and the fellowship program needs to be reorganized to enable participants to pursue higher studies in foreign universities.

Inadequate Financial Performance by IRMU

IRMU has been allocated LKR **50,070,400** for implementing its program. From the inception of the project to the end of **1995** only about **12** percent of the allocation has so far been expended. It is evident that the IRMU expenditure has seriously lagged behind. Several reasons have been identified, which include:

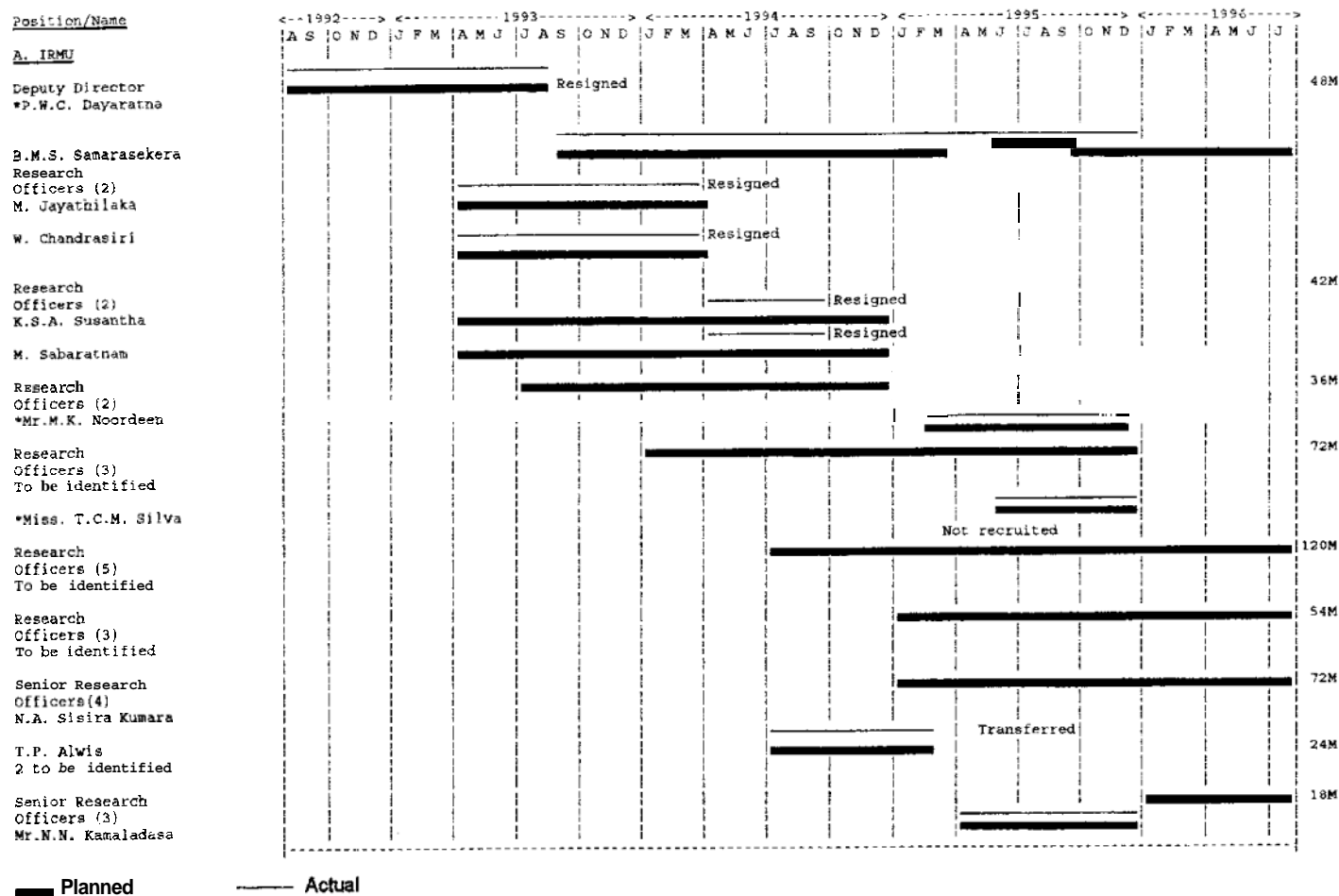
- The decision of the ID not to hire local consultants for IRMU
- * The very small number of professionals hired on contract; the permanent ID officers seconded to IRMU continue to receive their salary from government funds
- * Practically no expenditure on support staff, traveling and supply and services as no support staff were recruited; no vehicles have yet been procured and very little expenditure has been incurred in supply and services

The above needs have nearly entirely been covered from the TA budget

- There have been delays in awarding contracts for research. After nearly one year of processing only one contract has been signed and another two are in advanced stages of processing.
- * Provision for paying honoraria to RAC and RCC members has been approved by the government. **But** honoraria for ID staff from other divisions implementing IRMU research and technology transfer program have not been approved.
- * There is no mechanism for IRMU to spend funds directly and to reflect them in the relevant votes. Presently all vouchers go through the Project Director, NIRP and no head office branch is authorized to disburse funds. This situation has created long delays and inconvenience in settling IRMU bills.

It is, therefore, essential that disbursement procedures of IRMU funds should be made **easier**

Staffing Schedule - ID/IRMU

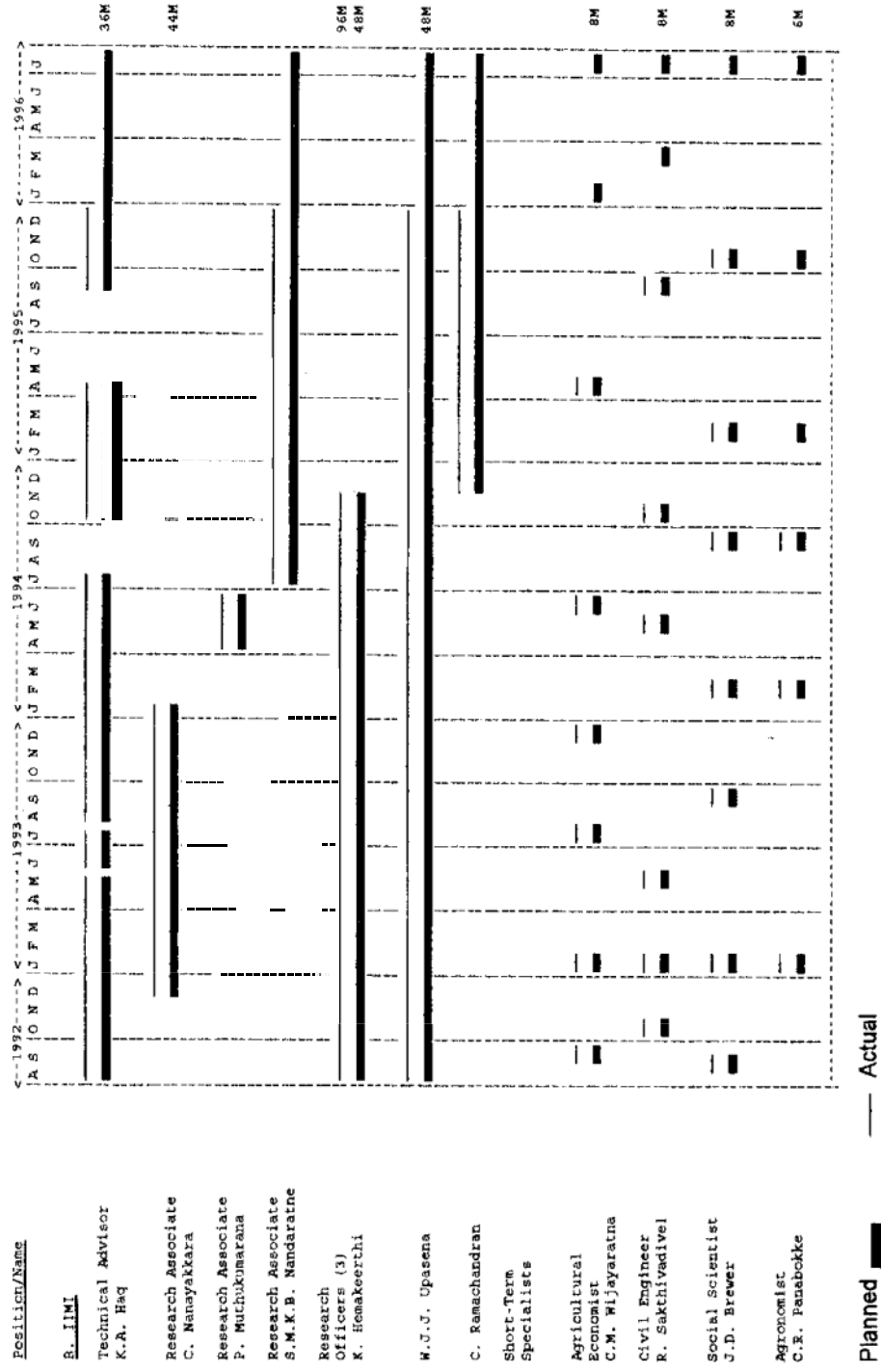


Mr. B.M.S. Samarasekera assumed duties on 01 September, 1993

Mr. M.K Noordeen joined IRMU on 28 February, 1995

Miss T.C.M. Silva joined IRMU on 20 June, 1995

Staffing Schedule - Consulting Services



Summary of Staff Mobilization and Inputs (August 1992 - December 1995)

POST	NOMINATION	APPROVAL	DATE		MAN - MONTH			BALANCE
			START	LEAVE	ALLOCATION	UTILIZED UP TO 31.12.94	UTILIZED DURING 1995	
Technical Advisor	K. Azharul Haq		17/08/92		36	22.7	6.7	6.6
Research Associates	C. Nanayakkara		01/12/92	28/02/94	48	15	0	-
			01/04/94	30/06/94	-	3	0	-
			11/07/94	-	-	5.7	12	12.3
Research Officers	K. Hemakeerthi		01/08/92	15/11/94	48	27.5	0	0
	J. Upasena		01/08/92		48	29	12	7.0
	C. Ramachandran		01/10/94		20.5	1.5	12	7.0
Agricultural Economist	C.M. Wijayaratna		01/08/92		8.0	4.75	1.0	2.25
Irrigation Specialist	R. Sakthivadivel		01/08/92		8.0	4.75	1.0	2.25
Agronomist	C.R. Panabokke		01/08/92		6.0	3.0	0	3.0
Sociologist	J. Brewer		01/08/92		8.0	4.75	2.0	1.25
Research Supervisors	Prof. O.C.H. Senerath Dr. S. Buvendralingam Dr. N. Ratnayake				96	30	18	48

Logical Framework -
IRRIGATION RESEARCH MANAGEMENT UNIT

PROJECT STRUCTURE	INDICATORS OF ACHIEVEMENT	ASSESSMENT OF INDICATORS	RISKS/ASSUMPTIONS
General objectives Sustainable increase in agricultural production and income from irrigation investment by research into technical and institutional aspects	increased agricultural production increased farm income	Benchmark and post-project evaluation Mid-term evaluation	There are no significant risks except that it will be very difficult to assess the individual contribution to increased production and income as other factors are also involved
Immediate objectives . Produce adaptive research results which will be of immediate interest and applicability to NIRP	Adoption of innovations	. Progress report of NIRP . External evaluation report	1. There are no significant risks
Outputs . Establish a research unit . A strategic research plan . IRMU direct research projects . Contracted research project	Sustainable IRMU Approved document No. of successful projects No. of successful projects	. Progress report of NIRP . External evaluation report . Review by RAC, NIRP, EEC WB . Review of research reports by RAC, NIRP, EEC and WB . Review of research reports by IRMU, NIRP, RAC, EEC, and WB	1. There are no significant risks 2. There is no risk of failure, but may be delayed due to time-lag in obtaining comments from different organizations, officers, etc. 3. There is no specific risk except for time overrun and availability of trained personnel with IRMU 4. Availability of a competent organization to undertake the work

Logical Framework (continued)

PROJECT STRUCTURE	INDICATORS OF ACHIEVEMENT	ASSESSMENT OF INDICATORS	RISKS/ASSUMPTIONS
5. Disseminated findings	<ul style="list-style-type: none"> -No. of workshops -No. of seminar -No. of newsletters -No. of technical papers -Spread of knowledge 	<ul style="list-style-type: none"> . Progress reports - do- - do - 	<ul style="list-style-type: none"> . No specific risks
6. Training	6. No. of trainin courses conduced and personnel trained	6. Review of the completion report of the courses	6. Unclear as to how long it might take staff to use acquired knowledge in actual field studies
7. Fellowships	7. No. of fellowships awarded	7. Progress report	7. There is no specific risk. There is an outside chance that some awardees may not successfully complete these studies
8. Improved methods of operation and maintenance of schemes	8. No. of cases of successful adoption	8. Annual report - review by NIRP, RAC, EEC, and WB	8. May not automatically ensure adoption because other factors may influence decision
9. Improved methode of water resources planni and utilization	9. No. of cases c successful adoption	9. Continuous monitoring	9. Conflict of interests and high cost
0. Improved cropping pattern	0. No. of Cases c successful adoption	0. Progress report continuous monitoring and evaluation by EEC, WB	0. Marketing problems may influence adoption
1. Research data for implementation	1. A research data bank of analyzed and evaluated data	1. Progress reports	1. Easy accessibility of data can occasionally be a problem
2. Improved library facilities	2. Increased no. books, journal modules. etc. - Adequate space with matching physical facilities	2. Progress reports	2. No specific risk is involved
3. Improved awareness about environment	3. Building environment concerns in projects/stud	3. Evaluation by RAC, NIRP, EEC	3. Low response from clients due to cost and other factors

- RAC = Research Advisory Committee
 NIRP = National Irrigation Rehabilitation Project
 CEC = Commission of European Communities
 WB = World Bank

1995 Work Plan

	<-----1995----->												<1996>		
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
A. Establishment and Strengthening of IRMU															
staff Recruitment and Training															
Establish Research Library															
B. Research and Development															
Implementation Of Research Program															
Research Needs and Priorities for 1996															
C. Training and Technology Transfer															
Training on Rapid Appraisal															
Training on Research Methodology															
Holding Workshops															
Holding Seminars															
Award of Research Fellowships															
Newsletter															
D. Reports															
Quarterly Report															
Annual Report															
E. Publications															
Workshop Proceedings															
Report on Rapid Appraisal Training															
Report on Research Methodology Training															
Abstracts of Monthly Seminars															
IRMU Research Progress															
Summaries of Literature Review															

Summary of Research Program for 1995

Program: Local Management of *Irrigation* Systems and Turnover

1. Monitoring farmers' involvement in schemes under NIRP

Research mode	: By IRMU
Objective(s)	: To assess, a) farmers' involvement in rehabilitation planning and design, b) the efficacy of farmer participation in rehabilitation including 10 percent contribution to cost of rehabilitation, and the success with regard to implementation of FO contract;.
Time of commencement	: January, 1993
Time of completion	: June, 1995
Duration	: 2.5 years
Field sites	: Wennoru Wewa and Kobeigane schemes in the Kurunegala District and Gampolawela, Udagoda Bandara Ela and Udawela Maha Ela schemes in the Kandy District. Another 15 sites have been added during the second phase of the study initiated In early 1994.
Estimated cost	: Rs 150,000

2. Study on the turnover process of the NIRP schemes

Research mode	: Contract
Objective	: To assess effectiveness of FOs in the O&M of the schemes handed over after rehabilitation including resource mobilization for O&M.
Time of commencement	: June, 1995
Time of completion	: May, 1997
Duration	: 2 years
Field sites	: Two completed schemes under NIRP
Estimated cost	: Rs 700,000

3. Evaluation of maintenance performance by **FOs** in handed-over **DCs**.

Research mode	: By IRMU
Objective	: To evaluate the structures and other aspects of DCs which have been handed over to FOs for maintenance.
Time of commencement	: November 1994
Time of completion	: April 1995
Duration	: 6 months
Field sites	: Parakrama Samudraya, Kaudulla, Gal Oya Left Bank, and Ridi Bendi Eia irrigation systems.
Estimated cost	: Rs 60.000

4. Strengthening **FOs** through increased participation of female farmers

Research mode	: By IRMU
Objectives	: To assess, a) the degree and nature of women's involvement in FOs , b) identify the main constraints for women to assume active roles in FOs , and c) formulate an action plan for the promotion of increased participation of women in FOs .
Time of commencement	: March 1995
Time of completion	: December 1996
Duration	: 1 year and 10 months
Field sites	: Selected from NIRP schemes
Estimated cost	: Rs 500.000

Program: Improving management of irrigation schemes

5. Action research to enable farmer organizations in selected, completed **NIRP** schemes, to improve O&M as **well** as increase production

Research mode	: IRMU
Objective	: To develop an implementation strategy for the aftercare of the rehabilitated scheme
Time of commencement	: February 1995

Time of completion : January 1997

Duration : 2 years

Field sites : Dunupotha Wewa in the Kurunegala District and Maha Kiri Ibbewa in the Anuradhapura District

Estimated cost : Rs 400,000

6. Estimation of tank yields and review of spill design formulae for minor tanks

Research mode : Collaborative, with Hydrology Division, ID

Objective : To improve yield estimation for small catchments by recalibrating model parameters for flood estimation formulae.

Time of commencement : January 1, 1995

Time of completion : June 30, 1997

Duration : 2.5 years

Field sites : Meddeketiya and Wewala Wewa schemes in Kurunegala and Kandy districts

Estimated cost : Rs 430,000

7. Evaluation and use of computer models for improving irrigation management

Research mode : In collaboration with Range Deputy Directors, ID

Objective(s) : Pilot-test locally developed/modified computer-assisted models for improved management of irrigation systems.

Time of commencement : July 1, 1993

Time of completion : June 30, 1996

Duration : 3.0 years

Field sites : Buttala Anicut Scheme (NIRP), Moneragala District, Kekandura Scheme (NIRP), Matara District, Rajangana Scheme, Anuradhapura District and Badagiriya Scheme, Hambantota District

Estimated cost : Rs 1,222,000

8. Adoption of flow dividers by **FOs** in **O&M** of irrigation systems after turnover

Research mode	: By IRMU
Objective(s)	: a. To test the adoption of the semiautomatic flow control system in flow regulations by FO's in the irrigation system b. To study and compare the performance of conventional. flow regulators and semiautomatic flow control systems in efficiency and economy of water use.
Time of commencement	: March, 1995
Time of completion	: June, 1997
Duration	: 2.0 years
Field site(s)	: A minor/medium irrigation system to be selected in the dry zone, preferably from the Kurunegala District.
Estimated cost	: Rs 675,000

Program: Irrigation Management for Crop Diversification

9. Irrigation management for crop **diversification** in minor schemes

Research mode	: Contract
Objective(s)	: To identify appropriate water management practices for diversified cropping in NLRP schemes to increase productivity and farmers' income.
Time of commencement	: April, 1995
Time of completion	: March, 1997
Duration	: 2 years
Field sites	: To be finalized with the collaborating/contracting agency
Estimated cost	: Rs 600,000

Program: Environmental Studies

10. Assessment of tank-bed siltation

Research mode	: Contract
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Objective(s)	: To quantify sediment input to the reservoir and its temporal and spatial distribution over two sediment years.
Time of commencement	: March, 1995
Time of completion	: February, 1997
Duration	: 2.0 years
Field sites	: Three sites to be identified from schemes to be rehabilitated under NIRP
Estimated cost	: Rs 1,000,000

11. Study on catchment degradation of minor tanks catchments

Research mode	: Contract
Objective(s)	: Systematic identification of process and quantification of catchment degradation and preparing a total catchment management plan.
Time of commencement	: June, 1995
Time of completion	: May, 1997
Duration	: 2.0 years
Field sites	: Murapola Scheme in the District and two other NIRP schemes (to be identified)
Estimated cost	: Rs 1,000,000

12. Archaeological study on ancient irrigation systems

Research mode	: Contract
Objective(s)	: To document ancient irrigation technologies and to prevent loss of national cultural heritage through the obliteration of archaeological material during the NIRP construction activities.
Time of commencement	: April, 1995
Time of completion	: March, 1997
Duration	: 2.0years
Field site(s)	: To be selected
Estimated cost	: Rs 3,750,000

Irrigation Research Management Unit

Work Plan and Budget for 1996

PAST PERFORMANCE AND PROGRESS: 1995

THIS SECTION DESCRIBES the progress achieved by IRMU up to October, 1995 and some of the remaining work that has to be carried out during November and December, 1995.

ESTABLISHMENT AND STRENGTHENING OF IRMU

Staff Recruitment and Movement

During 1995, 3 new research personnel joined the IRMU - one Chief Irrigation Engineer and 2 Irrigation Engineers. One Senior Irrigation Engineer seconded to IRMU in 1994 was transferred. The total IRMU staff strength stands at 4. Meantime, the government has approved the creation of cadres for nonengineering research staff and has authorized recruitment of 10 such personnel. Necessary steps are being taken for the recruitment of the above staff.

Establishment of the Research Library

Improvement work of the physical facilities of the library is in full swing. Rooms housing the library have been renovated and are being completely refurbished. The procurement and installation of air conditioners, photocopier and computer systems have been completed. The special task force created by the ID to oversee the upgrading of the library has also prepared the agreement to be signed by the Sri Lanka Library Association and the ID. The Project Director/NIRP has approved the agreement.

A list of books and journals related to irrigated agriculture has been prepared. This list which includes more than 250 titles has been forwarded to the Project Director/NIRP for approval.

RESEARCH AND DEVELOPMENT

Implementation of Research Program

Out of the 13 studies under implementation in 1995, 3 have been completed. But the final report of the study on performance monitoring of the automatic water level downstream control structure has not yet been received from the researcher.

Program: Local Management of Irrigation Systems and Turnover

Monitoring farmers' involvement in schemes under NIRP. The second phase of the study carried out in 20 schemes (15 minor and 5 major/medium) has been completed and the 1st draft of the final report has been circulated for comments.

Study on the turnover process of the NIRP schemes. The study has been contracted to ARTI with the signing of the contract in July 1995. Field data collection has already begun in selected sites.

Evaluation of maintenance performance by FOs in handed-over DCs. The study has already been completed. An interim report was submitted to the CCCIM in mid-October and it was followed by a presentation at the CCCIM meeting on 14 November, 1995. The final report is under preparation.

Strengthening FOs through increased participation of female farmers. The study was initiated in September 1995 with a Dutch researcher seconded by IIMI. Field assistants have been trained and data collection will begin very shortly.

Program: Improving Management of Irrigation Schemes

Performance monitoring of the automatic water level downstream control structures. The study has already been completed. But the final report has not yet been submitted by the concerned researcher.

Action research to enable FOs in selected, completed NIRP schemes, to improve O&M as well as increase agricultural production. A reconnaissance survey has been completed in two selected schemes. Field work will commence from December, 1995 and continued throughout 1996.

Estimation of tank yields and review of spill design formulae for minor tanks. The study is progressing satisfactorily. Field data collection has begun in all 8 selected tanks. The inception report and the first progress report have been submitted by the project leader.

Evaluation and use of computer models for improving irrigation management. The study is progressing satisfactorily. Calibration work in all the schemes has been completed except in the Rajangana schemes. Data collection and the transmission mechanism are also in place and working satisfactorily.

Adaptive research on semiautomatic flow control systems in improving O&M of irrigation systems. The scheme for the study has been selected and the design of the long-crested weirs (duckbill weir) has been completed and locations for their positioning have been identified.

Program: Irrigation Management for Crop Diversification

Irrigation management for crop diversification in minor irrigation schemes. An agreement with the University of Peradeniya has been signed for the implementation of the study. Other collaborators are the Department of Agriculture and Provincial Councils (the North Central Province and the North Western Province). Sites have been selected and field work has begun. The first progress report was submitted by the Project Leader in October, 1995.

Program: Environmental Studies

Assessment of tank-bed siltation. The study has been contracted to the Environmental Studies Centre of the University of Peradeniya. Six sites have been selected for the study. Instrumentation for data collection has been completed in 3 sites. In the other 3, it will be completed in late November. Data collection, once begun, will continue throughout 1996.

Study on catchment degradation. The proposal could not be finalized as reviewers of the proposal recommended major changes in the proposal. The proposal is expected to be finalized by mid-December, 1995.

Archaeological study on ancient irrigation systems. The study has been contracted to the Institute of Fundamental Studies (IFS). Field data collection has already begun.

TRAINING AND TECHNOLOGY TRANSFER

Training

Training on Rapid Appraisal. The second 2-week course on *Rapid Appraisal of Irrigation Schemes for Modernization and Rehabilitation* was conducted from 18 to 28, April, 1995 at the Irrigation Training Institute. Nineteen participants attended the course. Resource persons were drawn from both the ID and IIMI.

Training on research methodology. The research methodology workshop was canceled due to the lack of enough IRMU staff.

Review of Past and Present Research

The IIMI Technical Assistance team is assisting the IRMU to locate, collect and summarize present and past research conducted within the country in the field of irrigated agriculture. So far, 750 studies/reports have been identified and 110 have been summarized (24 in 1993, 50 in 1994 and 36 in 1995).

Holding of Workshops

Four workshops were scheduled to be held in 1995. Two have already been held and the third and fourth are slated for early and late December.

Workshop on farmer participation in rehabilitation on NIRP schemes: Farmers' perspective. The workshop was held on 25 February, 1995 at the ITI and was participated by 19 farmer representatives from 8 Irrigation Ranges covering 12 Irrigation Divisions. The principal objective was to document their experiences and recommendations to further strengthen farmer participation in NIRP schemes.

The farmer representatives were concerned about the absence of legal authority in dealing with defaulters where the 10 percent contribution for rehabilitation was concerned. They were unhappy with

the situation where most of the construction contracts awarded to the FOs were being carried out by individuals. They were also concerned with the lack of transparency on the part of the FO leaders in obtaining and implementing contracts on behalf of FOs.

Workshop on beneficiary-centered management and irrigation systems: Retrospection on recent endeavors. This workshop was held on 26 May 1995, at the Irrigation Department. The Secretary, Ministry of Irrigation, Power and Energy and the Director, Research, International Irrigation Management Institute were, respectively, Chief Guest and Special Guest. The major objective of the workshop was to collate successful experiences from programs of the recent past and ways to adapt them in improving NIRP implementation. Altogether, 25 participants from different agencies attended the workshop.

Workshop on planning and design in rehabilitation. The workshop is planned to be held in early December, 1995. It will address both micro- and macro-level issues in planning and design of rehabilitation. The discussion will center on an issue paper developed jointly by the IRMU and the ITI with input from other the ID staff. The workshop is expected to identify critical issues pertaining to planning and designing in rehabilitation as well as help identify research needs to address these issues.

Workshop on strategies for crop diversification in minor irrigation schemes. Planned to be held in late December, 1995 the primary objective of the workshop is to provide a forum to the researchers, planners and administrators to share their experiences and help develop a strategy for crop diversification in minor irrigation schemes.

Holding of Seminars

As a strong component of its information dissemination program the IRMU started a monthly seminar series from December, 1992. Ten seminars were held this year bringing the total to 34 at the end of October, 1995. Two more are planned for November and December.

Publication of the Newsletter

The information dissemination program was bolstered by the publication of the IRMU Newsletter from early 1994. During 1995, 3 issues of the Newsletter have been released.

Award of Fellowships

Out of eight planned fellowships only four were awarded up to the end of 1994. In 1995, no further fellowships could be awarded due to (i) lack of interest in pursuing higher studies within the country, and (2) the nonavailability of suitable postgraduate programs.

REPORTS AND PUBLICATIONS

Reports

Annual Report. The second Annual Report covering the calendar year 1994 was submitted in March 1995.

Quarterly Reports. Three quarterly reports (January-March, April-June, July-September) were submitted as per schedule.

RRA Training Completion Report. The completion report of the RRA training has been submitted as per schedule in September, 1995.

RRA Training Module. This activity was carried over from 1994. As per revised plan the preparation of the module was completed in January 1995.

Publications

Workshop Proceedings. The proceedings of the workshop titled *Seasonal planning procedures to improve irrigation management performance*, carried over from 1994 has now been published. Proceedings of the two workshops (*Farmer participation in rehabilitation on NIRP schemes: Farmers' perspective* and *Beneficiary-centered management and irrigation systems: Retrospection on recent endeavors*) have also been finalized and sent to the press.

Summaries of Monthly Seminars. The second such volume containing summaries of 11 seminars has been published.

IRMU Research Report. The *Report on macro-catchment management study*, carried over from 1994, has been finalized and sent to the press. The *Report on the farmer participation in NIRP schemes* has also been finalized. The first drafts of the *Reports on Phase II of the farmer participation study* and *distributary channel turnover study* have been completed. The *Report of the downstream control study* could not be finalized as it was not submitted by the researcher.

Summaries of Literature Review. The second such volume containing summaries of 50 papers (literature) related to irrigated agriculture in Sri Lanka has been published.

Proposed Work Plan for 1996

The 1996 work plan will be different from previous years as the Technical Assistance Program will end at the end of July, 1996 and the IRMU will implement the rest of the plan independently. The overall work plan for the year is presented in Appendix x.

Establishment and Strengthening of IRMU

Staff Recruitment. As has been mentioned earlier, government approval for the recruitment of nonengineering research staff has been obtained. All efforts will be made to complete recruitment by the end of 1995. Any leftovers will be completed in early 1996. These new recruits will also be trained by assigning them to ongoing IRMU research projects.

Establishment of the Research Library. Upgrading of the ID library to a research library which is in progress will be completed in 1996.

Research and Development

Research Implementation. The year 1996 will be one of consolidation for the IRMU research program. The Mid-Term Review Mission has also recommended that no new studies be taken up in 1996. Efforts will be directed to successfully complete all the ongoing studies as per schedule. One new activity, however, will be included in the 1996 work plan. This activity, preparation of a comprehensive database for all the irrigation systems in the country, is being initiated at the request of the Ministry of Irrigation, Power and Energy. With the completion of three studies in 1995, the following 10 studies will be carried over to 1996.

Program: Local Management of Irrigation Systems and Turnover

Study on the turnover process of the NIRP schemes. The study contracted to the ARTI in mid-1995 is expected to be completed by October 1996. Field data will be collected till mid-1996 and the final report will be prepared before the completion date.

Strengthening farmer organizations through increased participation of female farmers. The study being conducted in 10 NIRP schemes is expected to be completed in July, 1996.

Program: Improving Management of Irrigation Schemes

Action research to enable FOs, in selected completed NIRP schemes, to improve O&M as well as increase agricultural production. Data collection will be completed in 2 selected schemes during the year. The study is scheduled for completion in early 1997.

Estimation of tank yields and review of spill design formulae for minor tanks. Data collection will continue in 1996. The study is scheduled for completion in mid-1997.

Evaluation and use of computer models for improving irrigation management. Data collection will continue up to the end of June, 1996. The study was scheduled for completion in June, 1996. But because of certain problems in calibration in Rajangana schemes the study is scheduled for completion in December, 1996.

Adaptive research on semiautomatic flow control systems in improving O&M of irrigation systems: Necessary structures will be designed, constructed and installed in the first half of 1996. Data collection will begin from the second half of the year. The study is scheduled for completion in mid-1997.

Program: Irrigation Management for Crop Diversification

Irrigation management for crop diversification in minor schemes. This study has been contracted to the University of Peradeniya. The study is scheduled to end in March, 1997. The entire year (1996) will be spent on field data collection.

Program: Environmental Studies

Assessment of tank-bed siltation. The study was initiated in March 1995 with the signing of a contract between the University of Peradeniya and the ID. Data collection which began in December 1995 will continue through 1996. The study is scheduled for completion in the second quarter of 1997.

Study on catchment degradation. This study was to be contracted in June 1995. But it was delayed as reviewers of the proposal wanted significant modification. The proposal will be revised and finalized before the end of the year. Field data will be collected during 1996.

Archaeological study on ancient irrigation systems. The first phase of the study will be completed in March 1996. Based on the findings of the Phase I study a second phase will be initiated. Therefore, part of 1996 will be used in evaluating the work on Phase I and the other part in the initiation of the Phase II study. The rest of the year will be spent in data collection.

Preparation of a database for Sri Lanka's irrigation systems. In the absence of a reasonably accurate database it is becoming increasingly difficult to implement rehabilitation and modernization programs. IRMU, therefore, proposes to initiate this process in 1996, initially, to prepare a comprehensive database of irrigated agriculture in 3 to 4 Divisional Secretariats on a pilot basis. A proposal has already been prepared which will be submitted to the RCC and RAC for approval. Later this activity will be expanded, in phases, to include the entire island. Once completed, this will be updated every five years.

TRAINING AND TECHNOLOGY TRANSFER

Training

Training course for trainers in Rapid Appraisal. The third course on Rapid Appraisal of Irrigation System for Modernization will also be held. Participants from IRMU and other ID staff including those participating in IRMU research programs will be invited to attend this program. It is also planned to invite relevant participants from DAS and provincial councils, the two organizations involved in the implementation of NIRP along with the ID.

Review of Past Literature

Another 50 studies related to the irrigated agriculture of the country will be reviewed and summarized bringing the total number of studies to 175.

Holding of Workshops

The following three topics have been tentatively identified for 1996:

- * Structural changes necessary in the ID, the IMD and the Ministry to take Sri Lankan agriculture to the next century
- * Emerging power relations in FOs and their impact on the effectiveness and sustainability
- * Gender issues in irrigated agriculture

Holding of Seminars

IRMU Seminar Series will continue. Between 10 to 12 seminars will be organized during the year.

Award of Research Fellowships

Four fellowships that could not be awarded last year will be awarded this year. Newly recruited IRMU staff will be encouraged to participate in the fellowship program.

Publication of Newsletter

Three issues will be published during the year (January, May, and September).

REPORTS AND PUBLICATIONS

Reports

Annual Report. Annual Report for 1995 will be submitted in February, 1996.

Quarterly Reports. Three quarterly reports will be submitted as per schedule (April, July, August).

TA Project Completion Report. The 4-year Technical Assistance Project is scheduled for completion by 31 July, 1996. The project completion report will be submitted in July, 1996.

RRA Training Completion Report. The completion report of the RRA training will be submitted in June, 1996.

Publications

The following reports/papers/documents will be published.

Workshop Proceedings. Proceedings of the workshops, two conducted in 1995 and two planned for 1996, will be published.

IRMU Seminar. The third volume of the summaries of IRMU monthly seminars will be published in February, 1996.

Literature Review. The third volume containing 50 review summaries will be published.

Technical Papers. The following technical papers will be prepared for publication:

- * Farmer Participation in Rehabilitation of Irrigation Schemes, Processes and Impacts
- * Evaluation of Maintenance Performance by FOs in Handed-Over DCs.

1995 BUDGET

Irrigation Research Management Unit-ID

NO.	ITEMS	TOTAL Rs
1.	Local consultant	-
2.	ID professional staff	1,000,000.00
3.	Support staff, traveling, office supply and services	100,000.00
4.	Library	2,500,000.00
5.	Research	
5.1	Monitoring farmers' involvement in NIRP schemes	25,000.00
5.2	Study on the turnover process of the NIRP schemes	650,000.00
5.3	Evaluation of maintenance performance by farmer organizations in handed-over distributary channels	25,000.00
5.4	Strengthening farmer organizations through increased participation of female farmers	300,000.00
5.5	Performance monitoring of automatic water level downstream control structures	10,000.00
5.6	Action research to enable farmer organizations, in selected completed NIRP schemes to improve O&M as well as increase agricultural production	150,000.00
5.7	Estimation of tank yields and review of spill design formulae for minor tanks	300,000.00
5.8	Evaluation and use of computer models for improving irrigation management	400,000.00
5.9	Adaptive research on semiautomatic flow control systems in improving O&M of irrigation system infrastructures to enable farmer organizations to effectively operate and maintain systems after turnover	300,000.00
5.10	Irrigation management for crop diversification in minor schemes	1,000,000.00
5.11	Assessment of tank-bed siltation	1,000,000.00
5.12	Study on catchment degradation	300,000.00
5.13	Archaeological study on ancient irrigation	1,200,000.00
5.14	Database for irrigation projects	1,000,000.00
5.15	Research arising out of immediate NIRP needs	500,000.00
6.	Workshop	75,000.00
7.	Honorarium	100,000.00
8.	Seminar	24,000.00
9.	Training course--rapid appraisal	150,000.00
10.	Vehicle operation and maintenance	150,000.00
11.	Vehicle procurement	4,400,000.00
Total		15,659,000.00

Irrigation Research Management Unit - IIMI
(Up to JULY 31, 1996)

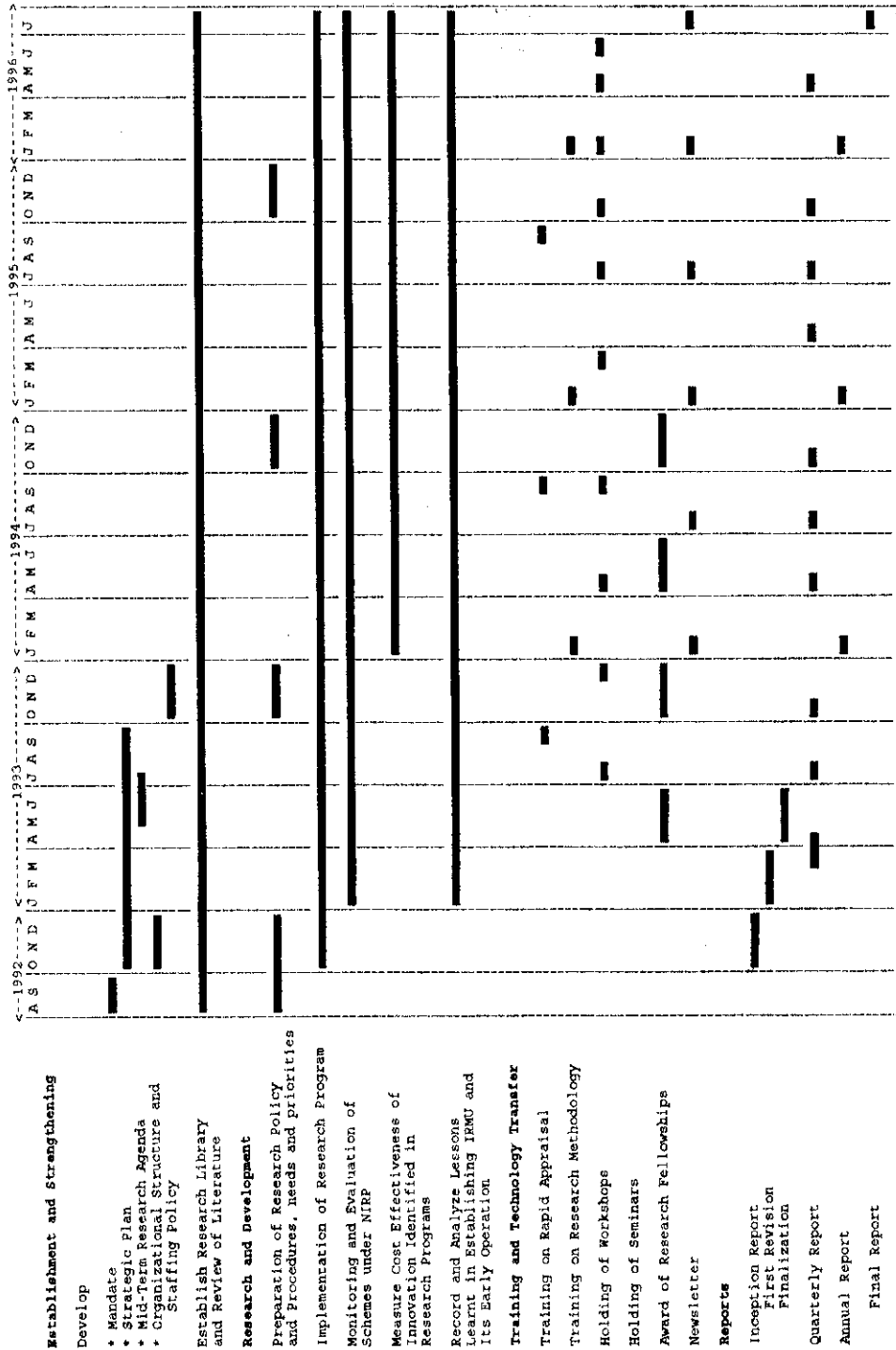
CEC GRANT

REF.	ITEMS	QUANTITY	UNIT RATE	AMOUNT	
				ECU	LKR
1.	FEES				
	Fees for services of international staff	10	11,128.00	111,280.00	
	Fees for services of national staff	14	40,185.00		562,590.00
	- do -	7	46,530.00		325,710.00
	- do -	21	14,100.00		296,100.00
2.	DIRECT EXPENSES				
	Daily allowances	70	1,200.00		84,000.00
	Accommodation	7	60,000.00		420,000.00
	Local travel				
	Motor cycle operation	14	7,500.00		105,000.00
	Vehicle operation	14	23,000.00		322,000.00
	Office furniture and administrative equipment	7	20,000.00		140,000.00
	Running office	7	55,000.00		385,000.00
	Publication expenses	7	62,000.00		434,000.00
	Workshops	7	10,000.00		70,000.00
3.	REFUNDABLE EXPENSES				
	Long-distance travel-round trip	1	1,675.00	1,675.00	
	Fellowships	4	122,500.00		490,000.00
	Total			112,955.00	3,634,400.00

1996 WORK PLAN

[illegible]

Work Plan—Life of Project



Notes: JFM = January-February-March
 AMJ = April-May-June
 JAS = July-August-September
 OND = October-November-December

IRMU Monthly Seminars: 1995

DATE	TITLE	RESOURCE PERSON
03.02.95	Assessment of socio-economic and institutional factors affecting performance of small tank irrigation systems	Dr. M. Samad, Research Associate, IIMI
28.02.95	Performance monitoring of the automatic flow and water level downstream control structures	Engr. H.M. Jayatilleke, Deputy Director, Irrigation Training Institute, Galgamuwa
23.03.95	Irrigation management for crop diversification: evaluation of rice chili inter-cropping	Dr. K. Azharul Haq, Technical Advisor, IRMU
02.05.95	Participatory management of natural resources: lessons from SCOR project	Dr. C.M. Wijayarathna, Head, IIMI/SLFO
24.06.95	Planning and design for rehabilitation: Experiences from NIRP	M/s N. Nadarajah and N.D.S. Ginige, Consultants, NIRP
26.06.95	Recent changes in irrigation law and its impact on irrigation management	Mr. I.K. Weerawardena, Consultant, NIRP
17.07.95	Involvement of women in irrigation maintenance	Mr. Kapila P. Wimaladharma, Managing Director, AGRIDEV Consultant Co.
31.07.95	Water management infrastructure rehabilitation: experience from Canada	Dr. Upali Hippola, Manager, Major Irrigation Infrastructure Rehabilitation Project, Alberta, Canada
01.09.95	Participatory rural appraisal in monitoring and evaluation of irrigation systems	Mr. K. Jinapala, Research Associate, IIMI/SLFO
29.09.95	Objectives-oriented project planning	Prof. D.C.H. Senarath, Civil Engineering Dept. University of Moratuwa
30.10.95	Gender issues in irrigation management	Ms. K. Athukorale, Freelance Consultant
27.11.95	Geographical Information System (GIS) - Its application in improving irrigation water management	Mr. K.S.R. de Silva, Project Director, NIRP
18.12.95	Irrigation design standards in Indonesia and their applicability in Sri Lanka	Dr. R. Renault, Irrigation Specialist, IIMI