Resource Mobilization
For Sustainable Management

Resource Mobilization For Sustainable Management

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on Major Irrigation Schemes in Sri Lanka
held at Kandy, Sri Lanka
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Please direct inquiries and comments to:
Sri Lanka Field Operations
International Irrigation Management Institute
107, Havelock Road
Colombo 5, Sri Lanka

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Foreword

THE GOVERNMENT OF Sri Lanka, and particularly the Ministry of Lands, Irrigation and Mahaweli Development, has been experimenting with a variety of approaches to building a stronger institutional framework for irrigation management for nearly a decade and a half. The major focus has been on developing farmers' organizations so that farmers can participate in irrigation management more effectively, and reorienting the state agencies responsible for irrigation management so they can work with farmers in a joint-management system.

The workshop on Resource Mobilization held in February 1990 was an important milestone in the process of moving toward a clear joint-management policy and identifying the institutional changes required to achieve the objectives of this policy. The Ministry has felt for some time that important institutional questions must be resolved as a precondition to improving the level of resources mobilized from farmers for maintaining and improving irrigation systems. In particular, a key area where reforms are required is within the agencies responsible for managing the major irrigation schemes.

The papers in this volume include very clear analyses of the impediments to high performance system management within the irrigation management agencies, and the direction in which reforms must go to bring improvements. I am pleased that staff from these agencies themselves prepared these papers and proposed such important changes. Other papers identify broader policy issues and recommendations that are very important to the whole change process underway.

But even more important than the papers themselves, the workshop provided a forum at which many of the key irrigation management specialists of the country were able to get together and exchange ideas fruitfully, both with each other and with outside specialists. The workshop recommendations demonstrate the productivity of these discussions; the recommendations form an important basis for making further progress in the reform and strengthening of the government's policies and the institutions for improving the performance of the irrigated agriculture sector.

The Sri Lanka -- IIMI Consultative Committee has done a very good job in providing the overall guidance for the workshop. I congratulate IIMI and the Committee for organizing such a useful workshop and bringing out this important volume of workshop papers.

A.A. Wijetunge,
Secretary
Ministry of Lands, Irrigation and Mahaweli Development

Preface

BUILDING ON THE rich experience of the last decade, the Government of Sri Lanka has decided to reform its irrigation management sector to emphasize joint management of irrigation schemes, with farmers' organizations taking increasing responsibility and authority, and the government providing necessary services as a partner with the farmers.

During the early 1980s, there were several important experiments with participatory management, some officially sponsored and donor-supported and some local efforts by innovative managers, with no outside support. These efforts provide the basis for the expanded programs now being implemented or contemplated. In May 1986, the Government of Sri Lanka and the International Irrigation Management Institute (IIMI) cosponsored an important national workshop on "Participatory Management in Sri Lanka's Irrigation Schemes" whose proceedings were subsequently published by IIMI. The Sri Lanka -- IIMI Consultative Committee built on the recommendations of that workshop to create a broad consensus on the participatory management policy which was subsequently adopted by the government.

In February 1990, at the request of the government, the Sri Lanka--IIMI Consultative Committee sponsored another workshop to build on the concensus reached so far, and to examine the next steps, particularly in relationship to resource mobilization for long-term sustainability. The papers commissioned for this workshop and the recommendations adopted at the workshop are contained in this volume. A major objective of the workshop was to share views on the experiences of the major implementing agencies to date and to consider what steps would be required for the agencies to implement the new participatory management policies.

It is important to note that the views expressed in the individually authored papers are the authors' own views, and not necessarily those of their respective agencies. The recommendations, however, represent the collective views of the participants of the workshop, and were endorsed by the Consultative Committee members.

During 1990, the government has initiated an important initiative to further refine and develop its participatory management strategy, with financial assistance from the United States Agency

for International Development. This Irrigation Management Policy Support Activity has already begun building on the results of the workshop to achieve its objectives.

IIMI was very pleased to accept the role of organizing the workshop, and publishing the proceedings. We would like to express our sincere acknowledgement of the support provided by the Asian Development Bank whose generous grant made this workshop and the publication of these proceedings possible. We would also like to thank the writers of the papers who worked very hard and who revised their papers based on the discussions at the workshop. We would also like to thank the participants at the workshop; the discussions were very lively and very constructive, which enabled the workshop to be a success. Finally, IIMI wishes to thank the members of the Sri Lanka -- IIMI Consultative Committee, particularly the Chairman and the Organizing Committee for the workshop.

We are confident that all the efforts made by everyone to make this workshop a success have contributed greatly to making further progress in improving the performance and sustainability of irrigated agriculture in Sri Lanka.

Douglas J. Merrey
Head, Sri Lanka Field Operations

Masao Kikuchi
Agricultural Economist

Workshop Recommendations

INTRODUCTION

THIS TWO-AND-A-HALF DAY workshop was structured around 11 invited papers presented in plenary sessions during the first one-and-a-half days. Six of the papers analyzed the past experiences and future plans of the three key management agencies, the Irrigation Department, the Irrigation Management Division, and the Mahaweli Economic Agency of the Mahaweli Authority of Sri Lanka. The other five papers focused on broader policy issues and lessons from other countries' experiences. Of the six papers on the three management agencies, three analyzed recent past experience of each agency to identify lessons learned, and three proposed how each agency would implement the new participatory-management policy of the government, with specific reference to changes that might be required in the agencies to make them more effective.

Although the title of the workshop emphasizes "resource mobilization," the major focus of the papers was institutional reform that is seen as a prerequisite to effective mobilization of sufficient resources for sustainable management of irrigation schemes. Therefore, the recommendations of the workshop also focus primarily on institutional reform at the level of the irrigation management agencies.

During the last half of the second day, the workshop participants met in four small working groups, each with a set of specific tasks to accomplish. Three of the discussion groups were organized to discuss the papers on the three management agencies, and were asked to propose recommendations that would improve upon, or refine, or support the recommendations contained in the agency papers. The fourth group, on "Policy Futures," was asked to make recommendations on a broad "vision for the year 2000," based on the papers on policy that had been presented at the workshop.

On the final day of the workshop, the participants met in plenary session. The proposed recommendations of each of the working groups were presented and thoroughly discussed by the participants. During these discussions, some further points came out, and some modifications of the small groups' suggestions were offered.

The present set of recommendations is based primarily on the small groups' reports, the final plenary session discussions, and the papers themselves. The contents of the papers are not repeated here; rather the recommendations specifically discussed by the small groups and at the final plenary session are highlighted. The reader should refer to the papers for additional recommendations. These recommendations have been endorsed by the Sri Lanka--IIMI Consultative Committee, the organizer of the workshop. Workshop participants have been given an opportunity to comment on them in writing before they are finalized.

RECOMMENDATIONS

Recommendations for the Irrigation Department

1. The role of the Irrigation Department has changed from primarily investigation and construction of new systems to management (including modernization) of existing systems jointly with farmers. The Department therefore must develop a capacity for building peoples' organizations and working with them effectively for improved irrigation-system performance. The paper by D.W.R. Weerakoon proposing a new strategy for reorganization of the Irrigation Department is based on a clear recognition of the reorienting and strengthening of the Department that are required. The workshop participants recommend that the Department and its parent Ministry recognize the need for change and take action to strengthen its capacity to work with farmers for joint management of irrigation systems.

2. The workshop endorses the reorganization of the Irrigation Department as proposed in the paper by eng. Weerakoon and recommends that this reorganization be implemented. Specifically, the workshop recommends the creation of three Divisions for Operations and Maintenance (O&M), Engineering, and Services, each to be headed by an Additional Director of Irrigation. In addition, the Department should actively promote and adopt a participatory approach to its own program formulation and management of its program, based on modern management principles.

3. The workshop endorses the necessity for the Irrigation Department to build a variety of new skills and capacities, i.e., to become more multidisciplinary and more management-oriented. There was considerable discussion whether this could be achieved by training the existing staff, who are nearly all civil engineers or whether it is necessary to recruit additional people with the requisite skills.

The workshop recommends that where possible, it is desirable to train the existing engineers in new management skills; engineers are task-oriented and therefore in principle can be good managers. It was also agreed that for certain specialized skills such as social science and communications, it may be necessary to recruit additional nonengineering staff.

The workshop recommends that the Department take a flexible approach to solving the problem of broadening its management skills and obtaining necessary expertise. This should include an in-depth evaluation of the skills and potential of existing staff, in order to develop a rational recruitment plan for the future, adoption of new criteria for staff evaluation in relation to the revised objectives of the Department, and a reorientation of the career development options of the Department staff.

4. Although not under the control of the Department, the workshop recommends that the engineering curriculum in universities be modified to fit the changing needs of the Department; more emphasis could be placed on acquiring a basic multidisciplinary orientation and management skills. The Department should also provide facilities and incentives for postgraduate study to acquire management and other skills.

5. The workshop recommends that the Irrigation Department develop and implement a master plan for training of its staff and the appropriate curriculum, providing for continuous in-service training in the skills required such as group dynamics, communication, management skills, and institutional development. Master trainers from among Irrigation Department personnel, supplemented by external specialists as needed, should be identified to reach out to field-level officials and farmers. Along with this, methods for evaluation of training needs, and of the value and impact of training given are required.

6. The workshop recommends that the Department develop a capacity for carrying out some applied research, and for identifying research issues, contracting for and supervising the necessary research, and adapting the findings for future use. Some of the research topics suggested include: improved O&M procedures, system management for crop diversification, rehabilitation methods and philosophy, diagnostic analysis and rapid appraisal, and specialized engineering research.

7. The workshop recommends that the Department develop a capacity to provide assistance to other Departments in its areas of expertise, for example in rehabilitation and modernization of systems, perhaps through a special unit for consulting services.

Recommendations for the Irrigation Management Division

1. The workshop endorses the recommendations contained in the paper on "Future Strategy of the Irrigation Management Division" by Mr. D.M. Ariyaratne. The most important task of the Division is to develop, promote, and strengthen participatory management systems eventually leading to self-management by farmers for increased productivity, profitability, and sustainability of irrigated agriculture.

2. Noting that a government bureaucracy is naturally inclined toward adopting a static and administrative model, the workshop participants agreed that the Irrigation Management Division

must remain conscious of the need to retain a "learning process" mode of operation, so that it can continue to learn from its experiences and retain its innovative character. This is one important rationale for the Irrigation Management Division to retain its status as a "division" of the Ministry, and not become a normal "department:" it can remain more flexible, and not being permanent, it could be easily reformed or disbanded if it did not perform well.

3. The workshop participants discussed the relationships among the concepts of joint management, O&M fee collections, and cost sharing. It was agreed that cost-sharing is basic to the new policy of participatory management. Some participants perceive a contradiction between fee collections and joint management but others see these as complementary. The workshop recommends that the Irrigation Management Division is the most appropriate unit to develop and test methodologies for effective cost-sharing and resource management for the long-term improvement and sustainability of irrigation systems.

4. The workshop participants discussed the three "preconditions" recently established to handing over of distributary and field channels to farmers' organizations. It was agreed that two preconditions, that the organizations be stable and reasonably efficient and that the channels be at a standard that allows water to be regulated and delivered properly, are appropriate. The workshop recommends that specific objective criteria be developed for these two preconditions.

The participants discussed the advantages and disadvantages of the third precondition that the farmers' organizations "should have full confidence in the officers of the Irrigation Department." Some participants felt that such trust cannot be measured, and therefore this precondition could lead to considerable "mischief." Others defended it as necessary for the continued effective operation of the irrigation system: if there is no trust, there would be conflict and disruption rather than "joint" management. In fact, mutual confidence and ability to cooperate are required. The workshop did not come to a clear consensus on this issue, and therefore recommends that further discussion, and objective criteria or methodologies for measuring confidence of farmers in the Department, and of Department officials in the farmers' organizations, are required.

5. The workshop recommends that the linkages between the distributary-channel organization and the project committee, and also downward with the informal field-channel groups, need further articulation and integration. The period of tenure of farmer-organization leaders needs to be specified clearly as well.

6. The workshop recommends establishing clear and cooperative linkages between the Irrigation Management Division field staff and both the Provincial Councils and the Government Agents of the districts.

7. The workshop recommends the establishment of the Sri Lanka Irrigation Management Training Institute to cater to the various irrigation-management agencies, Provincial Councils, and farmers. Since this is part of the terms of reference of the Institutional Strengthening Project funded by the Asian Development Bank the expansion of the facility at Galgamuwa should be pursued through this Project.

8. The workshop recommends research to develop and field-test suitable indicators of efficiency and effectiveness of irrigation systems and farmers' organizations.

Recommendations for the Mahaweli Authority of Sri Lanka

1. While suggesting some refinements of the paper, "Mahaweli's Implementation Strategy of the New Government Policy on Participatory and Joint Management of Irrigation Systems" by Mr. Jayantha Jayewardena, the workshop endorses its recommendations. Many participants felt that one result of the current mode of operation of the Mahaweli Authority has been to create a considerable dependency of settlers on the Authority; therefore, vigorous and sustained efforts will be required both to change the mode of operation of the Authority so it can foster self-reliant farmers' organizations and to change the way farmers presently behave so that they can successfully share the management of the irrigation systems.

2. The workshop endorses the recommendation that a special section be set up within the Mahaweli Economic Agency to plan, implement, and monitor the farmer-organization program. Staff should include people with skills and experience in organizing farmers as well as in water management and agriculture. The workshop recommended setting up similar units (not posting of single individuals) at the project and block levels to insure effective implementation.

3. The workshop also recommends that a separate cadre of "catalysts" or change agents specially trained and charged with the responsibility of promoting farmers' organizations be developed and deployed by the Agency. Existing staff of the Agency with the requisite attitudes and skills could be redeployed for this work; new staff may be recruited as needed; and the assistance of nongovernment organizations with experience and skills in promoting farmers' organizations could be used for this purpose. The role of the Unit Manager in this setup would be to assist in stabilizing the farmers' organizations, and to work closely with them to achieve their objectives in future.

4. The workshop recommends that at the block level and below, Water Management Committees be established that would have a majority of farmer representatives, and would have decision-making authority within their respective areas, and not be simply advisory in nature. There was some discussion of whether a layer of committees between the field channel and block levels might overload the system. This needs to be examined further. Committees below the block level should also be chaired by farmers.

5. The workshop recommends that as is envisioned in other irrigation systems, in the Mahaweli systems too a joint-management system be established for O&M of field and distributary channels involving the Agency and farmers' organizations while the Mahaweli Authority would retain O&M responsibility at the main system level.

6. The workshop endorses the suggestion that sometime in the future farmer representatives should be included on the Water Management Panel that makes policy decisions regarding

allocation of water in the Mahaweli Ganga. An acceptable plan for identifying appropriate representatives is required for this.

7. The workshop recommends establishing a suitable and effective system of monitoring, evaluation, and feedback to insure the process of change towards participatory management is carried out according to the plans. Suitable indicators need to be developed for this purpose, perhaps with assistance from an outside organization with the appropriate expertise, if necessary. The Progress Monitoring Unit of the Authority should play a key role.

8. The workshop recognizes the key role of training programs in implementing the proposed changes and recommends that training needs of each category of staff and of farmers be assessed in the light of the changed objective of participatory management, and that a comprehensive training program be designed and implemented to address the needs identified. Training should include the sharing of experiences in participatory management with other irrigation-management agencies.

9. Strategies to develop officers' and farmers' motivation to accept changes and implement the new program effectively are necessary; the workshop notes the key role of dedicated officers in the division responsible for promoting participatory management.

10. The workshop participants recognize the need for an institutionalized forum for coordination of the implementation of the participatory-management policy, and for learning from each others' experiences, among the key irrigation-management agencies. The workshop therefore recommends that an interagency coordinating committee be established, with representatives from the Irrigation Department, the Irrigation Management Division, and the Mahaweli Authority. This Committee should meet regularly.

Recommendations for Future Policies

1. The workshop agrees that the domestic agriculture sector is likely to remain very important in the Sri Lankan economy beyond the year 2000, and that the irrigation subsector has the highest growth potential even though present economic performance is below expectations. Therefore, government policy should focus on mechanisms to increase the productivity of the subsector, including adequate resource allocation in the public-investment program.

2. The workshop recommends that the future policy environment should foster commercial farming, facilitate a wide range of crops with export potential, and encourage research that might identify changes in the seasonal production pattern in order to be able to produce crops in response to the market demand. A clear agricultural-sector policy is urgently required to be developed in this regard.

3. As an extension of the present participatory-management policy, the workshop agrees long-term policy may require that the present joint-management structure evolve into a profitable

partnership with farmers and the government to include private enterprises possessing new technologies, and processing and marketing capabilities.

4. At present, a key impediment to moving from subsistence to profitable commercial farming is government land policy. The workshop recommends the government review its land policy and implement a modern policy that would facilitate the transition to commercial agriculture.

5. It is recognized that water will become an increasingly scarce and expensive resource as the country develops, and there will be conflicts over water allocations in future. Therefore, the workshop recommends incorporating into the future policies a realistic code and procedures for water-resource allocation and management, including the management of catchments and watersheds, to insure the long-term sustainability of irrigated agriculture.

6. There was some discussion of the nature of organizational reforms that might be required to facilitate future irrigation management and on whether there ought to be one large agency to replace the present multiplicity of agencies managing irrigation systems. The workshop recommends that no drastic changes be implemented, and that any move toward over-centralization of control over irrigation be resisted. The present agencies should be assisted and encouraged to become more accountable and responsible and to adopt a management mode of operation in place of administrative and bureaucratic modes.

7. The workshop recommends that a comprehensive review of the legal framework be undertaken to remove existing constraints and to facilitate the new policy initiatives.

8. The participants at the workshop recognize that it is essential to develop ways of mobilizing additional resources for the long-term improvement and sustainability of the irrigation systems. The workshop recommends that the irrigation-management agencies experiment with innovative means to generate resources for system O&M, such as through mechanisms that encourage farmers to recognize the true value of water and to use it efficiently, and that they give incentives to project staff to manage water carefully. For example, differential water charges that give an incentive to save water during the wet season for use in the dry season should be vigorously experimented with on those systems with sufficient storage capacity. Another possibility is to compare water use at block or distributary level with previous seasons, and provide incentives to those who use less water.

9. The workshop strongly recommends that a task force on Irrigation Policy Futures be constituted to develop an "action plan" for institutional and human-resource development as well as research and development to facilitate the long-term development of the irrigated agriculture sector. This task force could operate as a part of the Irrigation Management Policy Support Activity being initiated in mid-1990.

Sri Lanka's Experience in Resource Mobilization for System O&M : as Viewed by the Irrigation Department

L.T. Wijesuriya[1]

INTRODUCTION

THIS SUBJECT CAN be viewed and analyzed from three broad perspectives: time framework, nature of resources, and national policy.

First, experiences could be put into a framework of time and space as resources are a variable function of time. The expansion in size and activities experienced by the Irrigation Department has greatly influenced and conditioned the process. The Department has grown and matured with the growth of irrigation activities in Sri Lanka to become an old and large institution with an accumulated wealth of knowledge, practices, and procedures. In this framework the experiences of the country and of the Department in irrigation activities become one and the same.

The second perspective, the nature of resources, is important for this discussion. Human activities, finances, or other inputs have their own production functions combined with technology which react to and change with the external environment and time. Irrigation activity which blends the natural variables of land and water through the physical infrastructure which stores and regulates them, and the social infrastructure or institutional arrangements that activate them in the management process are governed by these factors. Bureaucracies, in isolation, could exert little or limited leverage to regulate and mobilize them under external influences such as market values or marginal productivity values.

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[1] Senior Deputy Director, Irrigation Department.

The alternative uses or opportunity costs of resource inputs or even their outputs perhaps could explain why there is excessive consumption of irrigation water, however much undesirable it may be from an agency point of view. The consumption of irrigation water in excess of theoretical duties, or resort to standing water, could be a low-cost substitute for weedicide, from the users' point of view. They may also explain why effective rainfall cannot be fully utilized or early cultivations cannot always be promoted, or why lift irrigation schemes fail. Risk factors play a dominant role in water management.

How changes in the external environment affect the department and how it can respond to the demand to optimize resource use under such influence should be examined.

The third perspective, policy framework and national priorities, is important in understanding the evolutionary process and the changes. Resource allocation is a dynamic process that shall suit national objectives and the times. And an agency bureaucracy will attempt to fall in line, within its capabilities, capacities, and the practices which have evolved in it.

The Irrigation Department is best understood as a state bureaucracy implementing policies and priorities traceable to the early beginnings through several growth stages.

Historical Perspective

To analyze the Irrigation Department's experiences their evolutionary process needs to be clearly understood. The present outlook, attitudes, and responses are its direct derivative. If one were more concerned with the immediate past, and there too confine discussions only to its later periods, say the last 10 years, then it would be a story of constrained resources. Not looking into how these constraints set in will not do much justice to the subject. The interdependent relationships of all ingredients of this process need to be appreciated before generalizing on any one of them, or on a particular aspect or specific time interval.

Moving back and forth is therefore not considered out of context, when talking of experiences of an elderly organization because the sequences of changes in environment, from social, political, and economic angles, and technological advances and shifts in emphasis are interrelated and evolutionary.

Irrigation activities concerning man-land-water relationship need a whole host of human effort and energies. In Sri Lanka, irrigation has been practiced from very ancient times. The story of ancient irrigation works commencing with smaller systems and ending in major and massive undertakings, which functioned several centuries ago and went into disuse after the 12th century A.D. is too well-known. One is tempted to ask the questions: are the first lessons in management to be learned from the pages of history? How and why did the smaller village irrigation works survive and continue to function upto the 20th century, owned, managed, and used by a poor peasantry while the more ambitious larger systems virtually disappeared, leaving only ruins to be discovered later? Was it because state support and royal patronage were not available to protect and sustain the larger systems?

In the colonial era, the British undertook irrigation activities in the dry zone, primarily to alleviate poverty among the local peasantry. The Irrigation Department was established in 1900 to expedite the execution of irrigation works and for closer supervision of activities in this field. The progressive expansion of these activities has continued the department's practices and

responses to resource mobilization. The practices, skills, and operation techniques that accumulated are paralleled by the increase in the number, size, and acreage of the schemes.

In the earlier period the emphasis was on the restoration of ancient works aimed at alleviating rural poverty and increasing food production. Between the two World Wars peasant colonization and resettlement from densely populated areas to the sparsely populated dry zone, coupled with food production were the primary objectives (Farmer 1956). Towards independence, the achieving of self-sufficiency and import substitution for rice, the staple diet, gathered greater recognition and momentum culminating in the Green Revolution at which stage irrigation had a substantial role to play. The construction activities and operation of the Department followed suit to accommodate these trends. Then we come to the present stage where the major concern is to increase the efficiency of unit resource allocations, and achieve greater productivity of existing irrigation systems, with less capital investment. Crop diversification is one such objective.

The construction orientation of the Irrigation Department, therefore, clearly stands out from the early beginnings though other aspects were not altogether overlooked. Extracts from the reports of W.L. Strange (Irrigation Adviser to the government, who prepared comprehensive plans and reports on irrigation policy and organizational needs of the Department) and from the early administration reports hint that the government policy was to *develop and mature* schemes that were already constructed or were at hand and to secure their substantial success before proceeding to carry out other large schemes (Irrigation Department 1975).

Three different phases can be broadly identified in a time frame, which conditioned the Department responses to resource mobilization during the period of its expansion. The first phase, then can be identified as a *construction phase* where there was a preponderance of such activities and where number, sizes, and acreage grew and the Department matured in this background. This phase roughly coincides with the period up to the mid- century. Then emerged the *expansion phase* during the next quarter century when emphasis was placed on productivity increase with rapid expansion of acreage, river basin development for optimum use of land and water resources, and development of several other skills. The major part of the activities and resources of the Department was devoted to the investigation and design of multipurpose projects and the development of major river basins (de S. Gunasekera 1962, 1963). It is also the period when construction activities reached a saturation point, with the largest investments made on a single multipurpose project, the Mahaweli Programme. Thereafter, a few other selected new projects were undertaken guided by rigid national investment criteria. The approach of the Department on resource mobilization was consolidated during this phase. With expansion and saturation, the momentum of construction and skills got diffused and diverted to other avenues. First glimpses of constraints are experienced towards the end of this phase.

The third and current phase, could be called the *management phase*. It is placed approximately in the last quarter of the century and is the period more relevant to this discussion. The orientation during the earlier phases with a bias towards construction has largely modeled the present-day resource mobilization and allocation priorities.

This phase can also be viewed as the era of resource constraints when the demand for higher returns per unit allocation is ever-increasing under pressure of productivity and efficiency considerations. Management reorientation strategies have emerged in this background. Resource mobilization practices are an outcome of the many changes in the external environment, as well as of the technological advances, and shifts in policies and priorities.

Management Reorientation

From a construction-oriented technical department which is part of a state bureaucracy, and an old one at that, the transformation to the current trends in participatory management would be a long story. To cut this short it would be sufficient if one understands that irrigation management which started as a 'top-down' process with social welfare as an original objective does now need partnerships in an era moving towards an open economy.

In the village irrigation works cohesive small peasant groups managed their own affairs with little or no outside support, making use of traditions and customs which had not totally disappeared even in the 20th century. In contrast, irrigation-management activities in major schemes could be labeled as a top-down process because of the high degree of involvement of officials and also because of the dependence and expectations of larger heterogeneous groups upon officials. The top-down approach has to be transformed into a participatory approach according to the new thinking and policy that evolved during the last decade. The Irrigation Department has to reckon with this concern in the future and is caught up in this transition. As an original and active partner of the top-down process due to its own historical reasons and beginnings, and having developed as a well-established bureaucracy, the department is neither fully prepared nor reoriented to accept and accommodate sudden changes. It is the natural reaction of any technically oriented government body.

The island-wide irrigation network which is the physical structure and the Departmental organic structure which operates and maintains them have certain links and bondages. Old linkages need relaxing and new linkages have to build in a different management structure and setting. Strains and stresses are therefore to be expected in the physical structure as paralleled in human relations too.

Operations and Maintenance Practice

Recently, emphasis has been placed on increasing productivity through irrigated agriculture in existing systems by increasing efficiencies in water use and on the sustainability of the same systems within limited financial and human resources that could be apportioned for their proper upkeep, with ever- increasing O&M costs. This has focused extra attention on the role, functions, and practices of agencies like the Irrigation Department (ID) which play a vital part in the whole process.

For sustainable irrigation management high expectations are placed on the ID to provide the key production input -water- in an efficient manner, meeting all the durability, equity, and reliability considerations, and in a coordinated manner with the other input supplies. This needs collection, storage, releases, delivering and, distribution of the limited natural resource through the storage and distributary network for application at the farm in correct quantities at the correct times to supplement the effective rainfall where necessary, and to drain the excess. These activities entail operation and management of the system as a whole for which the department has overall responsibilities through the control of funds voted by the government as well as through other institutional arrangements. It needs the mobilization of a whole host of human and financial

resources. Maintenance of the whole system, protection and safety criteria included, falls within this purview.

In the long association of the department with these activities wide experiences have been gained, skills have been developed, and sound practices have emerged. Standards and norms have been established from time to time in keeping with the advances in technology and demands of each system. Water management has been recognized as a scientific endeavor of interaction which needs both agency and user participation for maximizing efficiency in use.

In an earlier era, most irrigation systems were designed for one season maha cultivation only for rice production. In this era, operation and maintenance was an easy task and mobilization of resources was convenient in a less resource-constrained environment, particularly finances. The users or beneficiaries were expected to maintain parts of the system at the tertiary level of the field channels but here too the Department could intervene and perform this function when deficiencies occurred.

When construction increased and areas under maintenance and operation grew, the Department, after realizing the importance of these activities, consolidated the practices and issued several circulars and guidelines. The importance attributed to O&M during the expansion can be highlighted by reference to the introduction to the O&M manual issued as far back as 1956 when, A.E.C. de S Gunasekera, the then Director of Irrigation in the foreword states: "Due to the rapid increase in our constructional activities, the accent has nowadays been more on the construction of new work and bringing in new lands under cultivation. The subject of maintenance of these works has unfortunately been relegated to a back seat. Every year several miles of embankment and channels and hundreds of structures are being restored and constructed by the department, which without an organized scheme of systematic maintenance will revert to disrepair requiring restoration[2] all over again and millions of rupees that the government is spending for the regeneration of this country would be wasted or at least not fully utilized" (Arumugam 1956).

In the same manual, S. Arumugam, the senior Deputy Director who compiled it summarizes the mission of the document in one sentence "Systematic organization is the key note to successful maintenance."

The wisdom and vision in these statements stand out distinctly even today when one is inclined to think whether we are not repeating the same thing over again, may be using different sets of words even after 35 years!

The quality of O&M depends on the amount of financial and other resources made available and applied as well as on the institutional arrangements, and a blend of the technology, through which they are mobilized. When the demands from the system are less and resources unconstrained, it is natural that sound practices would emerge easily without a crisis. In newly constructed irrigation works, maintenance levels required are more easy to assess before gradual deterioration sets in, as they would be nearer to original conditions. With time, particularly in earthen channels, this is different.

Maintenance programs and cyclic items of work, both routine and preventive in nature, have been assessed and embodied in several departmental guidelines, circulars, and procedures, issued from time to time. Items needing particular attention before the onset of monsoon for system

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[2] The word 'rehabilitation' had not entered irrigation vocabulary as yet.

safety are also included. The department is expected to operate and maintain all the headworks and distributary system down to the tertiary level, the field channels. Only structures and major items of earthwork in field channels are expected to be maintained by the government with voted funds. The users or beneficiaries whose lots are served are responsible for the maintenance of the field channels, seasonally, by doing clearing, desilting, and earthwork for distribution of water to each lot. The functions and responsibilities of the users have been embodied in the statutes in this regard. The manual earlier referred to stipulates that "in major colonization schemes, however, all components of the scheme including field and drainage channels shall be constructed and also maintained by the department until such time *as the scheme is sufficiently advanced* when the field and drainage channels of less than 3/8 mile in lengths or serving less than 100 ac (sic) shall be *handed over* to the colonists for maintenance" (Arumugam 1956).

Here again vision for the future is clearly indicated when a stage of advancement of schemes and new management practices are foreseen. This is a subject closer to our current discussion. Maintenance of field channels by the users has been done under varying degrees of involvement and success over time so that it is not easy to generalize and make sweeping statements. As a general rule clearing the channels for taking water to each lot was done beyond the point from where the government responsibility ended. Availability of water, degree of reliance, returns from cultivation etc., and several other factors have affected the user involvement. This subject has led to much thinking.

To appreciate the crisis situations that have developed in later stages it is necessary to understand how things happened in a less resource-constrained environment. Practices that evolved when finance for O&M was adequate, and was even supplemented from the contingencies available from construction estimates of newly constructed schemes, have a bearing on the later situations. It is interesting to note that a Director of Irrigation in the 1960s expressed disappointment, and lamented over the inability to do more maintenance due to the limited close seasons as water issues had to be repeatedly extended. At that stage the greater constraint had been the 'time' factor.

Resources - Financial and Human

Operation and maintenance costs are always a concern in resource mobilization. In an earlier era it was easier to asses the costs when the demands from a new system were lesser and orderly and damages minimal. Good practices could be sustained and the estimation and allocation of government funds were consistent. The officers in charge of schemes prepared estimates in advance under standard practices that had evolved according to the actual needs. Funds were released by the head office after due scrutinity and control. They were sufficient for allocation including reserves kept for special items of contingencies. The allocation system was rational in that actual field conditions including periodic leveling necessary on each canal or bund, and status of the structures determined the criteria for assessment.

Two decades ago, allocations were not prorated on an acreage basis. The level of total government funding remained at about Rs 20 per acre for O&M, which was sufficient when departmental overheads were lesser and there was still the reserve fund. Budgetary restrictions did not affect O&M funding unlike today. This practice has almost disappeared and unfortunately

given way to a system of prorating precisely when there is an overall deficiency of funds. Maintenance work is highly prioritized to suit fund availability. How the constraints set in will be dealt with later. As a result, cyclic and preventive maintenance suffered almost irrevocably and the later remedy of rehabilitation had become necessary for deferred maintenance, or as a substitute for poor maintenance. Financing for the operation component has not been a major concern as this had to continue in any event to keep the system going and cultivation uninterrupted.

Operation and maintenance need a complexity of human activities including labor, supervision, and coordination in addition to the physical needs such as material, fuel, implements, vehicles, etc. All these activities contribute to costs.

A gradual increase of overall human activities can be distinctly observed over the years if one compares the acreage under O&M. The expansion of acreage is not in proportion to the increase in man-days per unit area. This applies for all categories including labor and field-officer level to middle- and higher-management levels. Contribution of this input to overall system performance or production efficiencies cannot be ascertained as there is no system of indicators and therefore qualitative analysis will be clouded. Likewise, the absence of data on unit allocation of funds and other inputs with impact on productivity has prevented monitoring and evaluation of resource use in general. Any information available in this regard is specific to certain projects only.

Crises and Constraints

The past decade or two is a period when several things have been happening at the same time and which has a direct bearing on the subject of resources, and is more relevant to the ensuing discussions.

Greater productivity from existing irrigation systems was expected because of saturation of construction and therefore lesser investment on new projects. Optimum water use, efficiency of performance increase in cropping intensities and diversification, and greater output per unit of land and water were demanded. The older systems, designed primarily for a single season cultivation, had now to perform under conditions of overloading over and above the original designs. This was aggravated by unscheduled water demands and expansion of command or service areas. The expansion was due to encroachments by the second and third generation of settlers, when major schemes grew in age. Another reason for unscheduled demand was the fact of fragmentation and tenurial changes. Marginal lands set apart as reservations began to be cultivated.

Under the socioeconomic changes taking place, the expectations of the users were high which also contributed to such unscheduled demand. Indeed, maintenance should have become better and more resources added under such a demand condition. But was it how things happened?

With the cessation of new construction works, accumulated, large overheads both tangible and intangible, which were partly met earlier from the construction votes, had now to be met from O&M funds. The construction momentum unleashed earlier needed new avenues of absorption and O&M funds became the next available choice. Other construction and development agencies came up and absorbed part of the capacity.

With the setting up of the Territorial Civil Engineering Organization, there was policy emphasis on labor intensive techniques. Irrigation attracted additional labor including skilled, unskilled, and supervisory grades. It is no secret that these temporary cadres ultimately achieve 'de facto' permanent status. There are over 1,200 permanent laborers on roll and more are to be made permanent under new rules and regulations. Employment considerations take precedence over utility at times. Administration overheads apportionable to O&M have been increasing. The number of offices, vehicles etc., to be maintained has grown out of proportion and O&M support needed to sustain them have been difficult. The estimation process itself has been a concern.

At the same time the budgetary provisions made for O&M had been gradually reduced in real terms. It is a worldwide trend that O&M funds are the first to be slashed for austerity, and the Irrigation Department had been at the receiving end. With increased overheads this has amounted to burning the candle at both ends from the viewpoint of funds used for actual maintenance.

It is difficult to convince the authorities of the claims for added recurrent expenditure. One is told to manage with the previous level of funds said to be sufficient. When it comes to irrigation systems, this arrangement has lasting repercussions, as returns cannot be easily quantified. The result had been a financially constrained maintenance practice over the last few years.

One had to wait till a major disaster occurred (e.g., at Kantalai) to prove the point that, leave alone returns, other considerations such as safety warrant extraattention at least for headworks. The disaster made it possible to generate extrafunds as a safety precaution.

The changes during the Territorial Civil Engineering Organization period had an impact on the procedures for budgeting and allocation of manpower when certain new practices had come into existence. One such change is in the cardres of maintenance overseers which had been replaced by work supervisors, a construction-oriented category.

All these factors led to the O&M expenditure diminishing to very low levels. They contributed to the gradual deterioration of major systems. The deficiencies had led both to the accumulation of maintenance needs and to periodic physical rehabilitation. On an already handicapped system under extended demands the net results have been further deterioration and increasing O&M costs creating a vicious circle. The deficits are partly met by other funding sources such as those for improvements to major works and flood damage. The lasting effect of the changes that have occurred is the reversal of the process of O&M estimation. Due to financial constraints the preparation of estimates and programs of work is done more to suit the expected budgetary allocation and not to reflect on the field conditions or actual cyclic-system needs. This is a process that needs re-reversing again. This has also led to rethinking on the optimum levels of O&M costs needed to sustain a system. Standardized data are used to frame estimates without much distinction.

It is ironic that such a reversal of process has occurred when emphasis on sustainability as well as on the very financial constraints has become an open subject of discussion and concern.

The Present Funding Structure

The concern over O&M funding requirements led to a study by the Irrigation Department in 1982 to asses overall national requirements for budgetary purposes. After analyzing a sample of 16

schemes an average value of Rs 200 per acre was reached. This study was based on data available and collected from samples and generalizing on typical requirements. The summary data used was limited and differences in requirements between different types of system, their size, age or degree of deterioration, recent rehabilitation, water availability, operational success etc., were not weighted separately. This exercise is considered adequate for overall purposes. Different systems where data vary widely, including channel densities, type of regulation etc., need individual analysis for refined assessment. Attempts have been made to draw a distinction between operation and maintenance costs and maintenance requirement costs for dams, roads, and channel categories. This again is an overall assessment and is not based on actual scheme-wise needs.

On this basis a decision was taken by the government in 1984 to allocate half the requirements from the national budget and recover the balance from the users and to extend the recoveries gradually to the full requirement over a period of five years. The recovery programs, which had some initial success, have suffered drawbacks later.

Some current projections estimate present requirements of O&M funds at today's prices at over Rs 400 per acre. The allocation area-wise or scheme-wise follows the same pattern of prorating and the actual field conditions are not adequately considered. Weightage to field conditions is generally not assigned due to overall shortage of funds. There is no distinction between 'efficient system' for water availability. Prorating is used as the second best alternative under these circumstances.

Under this set up, the present maintenance practices have been transformed into a financially constrained and highly prioritized one rather than a scientific, cyclic, and a preventive program. This is inadequate in the long run. It has often been argued that the low level of funding as well as insufficient institutional mechanisms for their proper use have both contributed to the deterioration that set in. How much each factor has contributed will be a matter of opinion. But the fact that the arising need for periodic rehabilitation and large sums expended reflect both causes and effects of delayed maintenance, cannot be denied.

Financial allocation for paying the salaries of turnout attendants, and work supervisors involved in O&M, are provided under the Irrigation Department budget together with funds for flood-damage repair and additional improvements to head works for system safety. Allocations for O&M of major schemes, improvements to major schemes, and improvements to water management are provided under the Irrigation Management Division budget; these allocations are then made available to the Irrigation Department. Under whatever label or source, these serve similar O&M purposes of 'normal maintenance.' In addition, contributions from farmers, when available, were used, in consultation with them to attend to priority maintenance in field channels and sometimes other selected D-channels. In general, work has been done on those sections which serve the farmers who contributed to the fund.

The concern over the ever-increasing gap between available finances for O&M and the requirements has led to many deliberations. The government funding over the last two years has generally been of the order of half the requirements or even less. The balance or the gap is to be bridged with user support. This is the current thinking and will be a concern for the Department in future.

Engineers' Perception of O&M

One area of concern when talking of O&M is the low pride of place assigned to any setup. This is a universal syndrome and in the Irrigation Department it may perhaps be traced to the construction-oriented early beginnings. Among technical personnel there is a tendency to devalue and consider it as an overseer's job in relation to the more glamorous activities in design and construction. This point is relevant in the allocation of resources, which becomes a matter of choice between two competing demands. Is it because achievements in construction and rewards, if any, are easily visible while the reverse is true of O&M? Yet, it is the other way when these are failures? Whatever the case may be, such differential treatment is detrimental to resource allocation priorities for O&M and merits more attention from all levels.

Solutions

After the Territorial Civil Engineering Organization reamalgamation (1978), the newly constituted Irrigation Department found itself in the dilemma of operating and maintaining already handicapped irrigation systems. Deterioration had set in due to restricted maintenance, whilst demands from the very same system were increasing due to higher productivity emphasis and users' expectations. The deterioration due to poor maintenance had brought in a whole host of problems for water issues arising from:

Inadequacy of controls
Loss of conveyance efficiencies
Excessive consumption of water
Tail-end problems
Damages and breakages of structures and bunds
Siltation, scours, and capacity changes
Inadequacy of attention to headworks
Conflicts among users
Straining of user-agency relationships
Breakdown of procedures and supervision

Earlier in the mid seventies, when the department was playing the role of consultant as a Specialized Agency, trials had been conducted by the newly formed Water Management Branch of the Department on ways and means of overcoming water-issue problems in selected schemes. New techniques such as scheduling and rotation of irrigation were adopted (Maheswaran 1976). These trials which had shown positive results also indicated the high degree of user support and involvement necessary to achieve success. From these first glimpses the Department realized the need for greater participatory approach in management. To a great extent this led and modeled later thinking and policies in resource management. A few such early experiments are referred to in the following.

Minipe and Kimbulwana Oya

Saddled with the problem of meeting the demands in a handicapped system, some officers of the department on their own intervened, and tried to solve the problems in such schemes (de Silva 1985; Gunadasa 1988).

In Minipe, it had been demonstrated how a difficult system for water distribution could still be managed effectively with more effort by officials and users and how mutual confidence and cordial relations could pay dividends. Water had been supplied to areas almost given up as impossible under other conditions. How farmers could help each other to resolve their own problems in water issues actively encouraged by the Agency was well-demonstrated. Similarly the potential that lies in a yet inadequately tapped resource, namely, farmer participation in water management, was better-exposed and avenues available to harness it were brought to light.

Similarly observed in both Minipe and Kimbulwana oya were the positive results obtainable from interdisciplinary coordination and understanding of the issues involved in water management. These ranged from physical limitations of the system to agency-user relationships and problems arising from conflicts among the two parties and within the parties themselves.

In Kimbulwana Oya, it was proved how good operation plans could not only be formulated but adhered to, including commencement of early cultivation and water-saving devices in a difficult system. The trust placed on the officers by the users and the impartial and silent dedication of officers paid dividends to bring a difficult system back to functional status. Similarly, the need for constant involvement in such efforts has also been demonstrated. The trials, experiments, and success of these efforts made in the late seventies and early eighties had been appreciated and became an eyeopener. The process of confidence-building, goodwill and trust, and their role in good management had been exposed. A change-agent's role in management strategies was thus demonstrated. These trials, which can be termed a breakthrough in participatory management, had influenced and modeled later thinking and the formulation of new policies to a great extent. It is interesting to note that the Irrigation Department as an institution could not or did not respond adequately to these innovations immediately at that time when they were being tried out, except perhaps the personal interest shown by individual officials. The reaction, as to be expected from a government agency, was slow. Yet the positive results, however, caught the eye of other agencies much faster, including policymaking levels, research workers, and even international communities involved in irrigation. Financing agencies were interested in them as alternative resources for good management strategies.

One feature of these success stories is that wider publicity for them really came after the success and not during the process which, perhaps, may give a clue to their success.

Sustainability or replication of this type of intervention is one thing, but they could be treated as 'pilot schemes' which have shown new directions for better management of resources in constrained environments. They have also shown that formal mechanisms are not the only ways available for user support. The role of NGOs as shown in Nagadeepa too is worth looking at in this regard.

Projects and Prescriptions

For the improvement of O&M in major irrigation schemes including better use of resources several ideas and strategies have been developed and applied. Some of them have been incorporated in special projects.

Recommendations which sometimes could be called 'prescriptions' for purposes of discussion, had been developed and applied to varying degrees of success. No attempt is being made to make any judgement on them here. Recommendations range from generalizations such as motivation in management strategies, persuasion, setting examples, demonstration by good will and understanding, confidence- and trust-building to more specific stands such as legal reforms, catalytic processes and institution-building, training, handing over, water charges, cost recoveries, and taxes etc.

Cost-effectiveness of alternative combinations of resource allocation and prioritization of objectives play a vital part when more parameters are brought into the equation of resource input and management strategies.

Special projects, some implemented with the collaboration and support of international funding agencies, have tried alternative approaches and strategies with a combination of packages relevant to this discussion. They range from the hardware-oriented Tank Improvement and Modernization Project (TIMP) to the software-oriented Irrigation System Management Project (ISMP) and other programs like the Integrated Management of Major Irrigation Settlement Schemes (INMAS) and the latest, the self-reliant Management of Irrigation Systems (MANIS). Experience on some of these projects and lessons learned have already been documented. Some have been used as a vehicle to obtain the desired results of cost-effective participation and user support in O&M during and after rehabilitation for sustainability as well as for developing future procedures. Different combinations of improvement in physical system and management have been tried. User participation in the rehabilitation and O&M activity has been built into the aims and objectives in the formulation and implementation of these projects as a package deal. Possibilities of compensating budgetary deficits through better management techniques in comparison to higher levels of O&M expenditure, even led to a reexamination of desirable levels of O&M.

Tank Improvement and Modernization Project (TIMP). The Tank Improvement and Modernization Project, one of the earliest to be implemented, has tried modernization techniques for better water management which provided improved technical facilities for regulation and control. Ineffectiveness of the heavy technical bias has led to a later rethinking and remodeling of new projects. Capabilities of resorting to strict delivery schedules, and rotational issues embodied in the project could not be fully realized subsequently. It has been said that user involvement at the inception, including design stage in decision making or finding more precisely how users would react and what they want, was lacking in this project, and this was one of the reasons for failure, if it can be called failure. Inadequate attention given to sustainability of the technical improvements in the 'after project' situation and the need for having a user involvement program along with it, comprised one lesson learnt. Similarly, the modernization approach could be called far too much water-management-oriented in comparison to maintenance orientation. However, the main system regulation had been successful (IIMI 1986).

The TIMP has shown that to get full use of technical improvements, not only users' acceptance of them but their prolonged and continued involvement in operation and management at desired levels is necessary. This appears a simple explanation now, yet learnt at a price.

The Gal Oya Water Management Project. The Gal Oya Water Management Project, which started with an openminded approach (in comparison to TIMP) had 'pragmatic' rehabilitation as an objective. Technical improvements were limited, in that *probable use* rather than *possible use* was a criterion, (Ponrajah 1981), and in its implementation, dialogue with the users had a greater part to play. It is generally considered that the experimentation was successful with positive results achieved in user involvement, in decision making, and in participation at various stages. Similarly, agency-user relationship was improved and the understanding of each other's problems, including practical limitations, was made better. A process of forming user associations was promoted by a system of Institutional Organizer involvement, with the assistance of the Agrarian Training and Research Institute to facilitate this (Uphoff 1986).

Several problems inherent up to that stage in the Gal Oya scheme, such as tail-end problems, conflicts and complaints, economy in water use, and cultivating a greater acreage, had been solved. Cost-effectiveness of investment made was demonstrated to a degree of satisfaction. Rotation and better water management were practiced. Models were developed. The users' assistance in flow of information for design and field work was well-appreciated. Yet, certain assumptions made regarding expected farmers' contribution to do voluntary work in field channels (FCs), desilting etc. were nevertheless not fully realized, proving that such assumptions need revision all the time during implementation. Only partial success in this regard has been recorded.

Other Projects and Programs

Interventions for more effective mobilization of resources have been attempted in other projects as well, such as the Major Irrigation Rehabilitation Project, the INMAS program and the ISMP. Going into greater detail on experiences are avoided here as they are still ongoing and it is premature to comment, and, secondly because the Irrigation Management Division as the implementing agency would deliberate further on them.

In the Major Irrigation Rehabilitation Project (MIRP), varying degrees of user support for maintenance of FCs by farmers have been observed in the rehabilitated sections. It is interesting to note that in a scheme like Rajangana, being a system rich in water availability and where farmers are already organized, better maintenance of FCs is still wanting. In Kantalai where there are relative water shortages, the responses are somewhat different. This is only a generalization as no quantifications have been done.

Initial assumptions made during project formulation for the farmers to do earthwork in FCs without project funds and voluntary support for the same in distributary channels as well, under the ISMP, had to be modified and compromised at the implementation stage. The objective is now being achieved by arranging contractual obligations in a slightly amended form.

Handing Over

In keeping with the new policy of handing over of distributary channels, at the secondary level of operation, to the users for O&M, a few selected channels in some schemes have been so handed over. As this is a very recent exercise, with only 1 or 2 seasons gone by, the full implications and experiences are yet to be documented.

Some user associations have responded well to this call and expressed the desire to take over this responsibility. Experiences in this regard have so far shown that there is still confused or little understanding of the meaning of "handing over." Procedures for formalizing this exercise need more thought. As there is no legal framework for a complete turn over, existing contracting procedures between the government and private parties have been made use of, to try this out. Informal methods have also been adopted.

Nagadeepa. Operation and maintenance or other responsibilities of the user and the state during and after handing over need a clearer definition. In certain schemes such as Nagadeepa encouraging results have been already reported. The users have done more work on channels than the departments could do with limited funds under similar circumstances. Main system operations have been facilitated and uncomfortable water demands have been reduced. A feeling of responsibility, participation in decision making, and a certain uniformity of resource allocation such as attention to areas in difficulty, have been achieved. Damages have been reduced. In this scheme the NGO in the role of a 'change agent' (Atapattu 1989) has helped management.

A clearer understanding of their respective roles among those directly involved in the transition stage is necessary until this exercise is fully formalized. There is also the need for a step-wise approach in a phased-out program to give effect to this policy objective.

MANIS Program. The MANIS program was tried out only very recently and therefore much cannot be said at this stage. However, initial setbacks were observed. Over 175,000 acres in nearly 175 schemes are involved in MANIS. Although aims were similar to the larger INMAS program the approach was different.

The MANIS program was expected to 'take off' without outside support, extra resources, or incentives. In an integrated management exercise the Irrigation Engineer and the Technical Assistant were expected to do a little more than their normal duties, and function as project officers for the MANIS program. Rewards, if any, were to come later.

A certain measure of success has been recorded in a few schemes in the northwestern and Sabaragamuwa provinces. But this again is attributable to the personal interests of a few individual officers.

It is sometimes believed that results obtained in one specific case can be replicated elsewhere in general and on a larger scale. Such assumptions need not always be correct. Similarly, attempts to fall in line with policies would not suffice without policy commitments at all levels. Also without official backing there cannot be self-propelled motivation in management.

to fall in line with policies would not suffice without policy commitments at all levels. Also without official backing there cannot be self-propelled motivation in management.

General

In the long association of the Department with O&M, numerous other experiences have been gained. One such related to water availability or natural advantages affecting conditions in resource use is found in the Rajangana and in the Kaudulla schemes where it was seen that sufficient water availability by itself was a major factor which governed user or agency reactions. In the Kaudulla scheme, for example, the differences in duties for *yala* and *maha* were not as large as was expected, indicating that effective rainfall was utilized to a lesser degree (Abernathy 1985).

In the allocation of resources too, for example O&M, no distinction had been made between water-short systems and water-rich systems. No procedure has been developed as yet for such reinforcements in order to compensate disadvantaged schemes.

Legal Framework

The legal framework is another area of relevance. The limitations of present ordinances and statutes have been often felt, when attempts were made to improve management strategies including participation. The present ordinances are far too short of meeting objectives of changed policies, particularly those dealing with offenses and participatory management. Revisions have not kept abreast with changes in environment. Even the Irrigation Ordinances up to 1956 provided for mechanisms such as proprietors' meetings, maintenance of parts of system, and collection of rates, though some of these were not strictly implemented. Far-reaching changes thereafter were only meant to give effect to the Paddy Lands Act.

In the process of earlier reforms, when the *rajakariya* system was abolished, some ancient traditions and customs associated with irrigation were lost. In our quest for user support, a closer reexamination of what had gone by and a revival of what should be applicable today, if it is possible, may perhaps be added to the list of prescriptions aforesaid.

Conclusions

1. The Irrigation Department as an agency, with an inherent construction-oriented bureaucratic tendency, is slow to change in the journey towards *participatory management*. The Department finds itself at *cross roads* here. Individual officers can react faster as was shown at times of crises and such officers should be encouraged. Likewise, the potential of the Department, possessing a large reservoir of knowledge and manpower can be geared to reach the same goal.

2. Further, *awareness* programs are necessary for bringing about changes. There need to be a free flow of information and better communication for the improvement of resource mobilization. The limitation of both agencies and users must be understood and appreciated. The nature of resource constraints, the rationale behind participatory approach, and the concepts like handing over, should be explicitly articulated. Likewise, policies and their objectives as well as the effect of the external environment when understood better will assist the process of change.

3. *Policies* intentions and declarations, have to go hand in hand with policy commitments. They need translation into action at all levels. The flow has to be top to bottom, vice versa and across. A long-term and sustainable policy can pay better dividends.

4. *Financial constraints* have largely contributed to the deterioration of maintenance but not so much of operations. The strategy of *participatory management*, and user's involvement should be appreciated for its own merits as well as a means for overcoming state financial deficiencies. It should be treated as an end by itself, and not as the second-best choice.

5. Exercises such as *"handing over"* which have far-reaching implications and major changes for the future have to be implemented step-wise, after consolidating lessons from experience at each stage. Roles of agency and users need review all the time.

6. *Attitudes* associated with the lesser attraction of O&M or those which seek to confine Irrigation Engineering only to the civil part of hydraulics, have to undergo revision and change.

7. *Replication* of experiences at one time or place, even if found useful in general, need not be suitable in all cases. Assumptions need modification in time and space. Innovations or perceptions, which are not "lab tested," as it were, when applied in real situations need to be done with caution.

8. The experiences of the Irrigation Department, with the long association in O&M of major and minor irrigation works are numerous. They range from legal and statutory aspects, financial constraints, environmental issues and water availability, and appropriate technology to human relations that affect resource mobilization. These experiences are invaluable for forming new strategies and policies.

What is recorded and interpreted here has left some questions not totally answered. The presentation is the author's own viewpoint of how the Irrigation Department in general experienced, felt about, and reacted to matters which have a relevance to the subject of discussion. It is not a narrative of all such experiences either. Neither is it an aggregation of several viewpoints of collective thinking nor an official standpoint. It is only a review of recorded or heard versions of what had taken place, when, where, and how, in a long and wide array of events.

ANNEX I

Table 1. Expansion of area under irrigation - major schemes (acres).

Year	Gravity		Drainage, Flood Protection and Salt Water Exclusion		Total
	No. of schemes	Area (Acres)	No. of schemes	Area (Acres)	
1954		271,433		2,497	273,930
1960		329,490		3,040	332,530
1966		390,155		5,700	395,855
1970		475,600		63,000	538,600
1982	346	624,697	26	63,563	688,233
1985	360	631,726	29	75,455	707,181
1988	395	652,995		108,496	761,491

Table 2. Approximate levels of total O&M fund availability (Rs million).

Year	Total Availability
1950	2.70
1955	3.10
1960	10.30
1982	83.50
1983	80.70
1984	88.10
1985	105.60
1986	105.40
1987	108.50
1988	88.60
1989	110.00

Table 3. Breakdown of average cost of O&M per acre, 1982 (in rupees approximately).

i.	Labor	92.5
ii.	Supervision	5.0
iii.	Drivers and operators	5.5
iv.	Traveling and combined allowance	2.5
v.	Fuel and vehicle repair	11.0
vi.	Tools and material	33.0
vii.	Administration overhead	18.5
viii.	Depreciation of vehicles and equipment	24.5
xi.	Physical contingencies	7.5
		200.0

Table 4. Expenditure of the Irrigation Department in the past - O&M and total expenditure - a comparison (Rs million).

Selected year	Operation & maintenance	Total expenditure
1950	2.1	43.0
1954	2.5	41.3
1960	10.3	44.4
1969	5.7	90.2
1985	105.6	730.8

Source: Administration Reports of the Director of Irrigation.

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Experience of the Irrigation Management Division in Resource Mobilization for System O&M

Ananda Gunesekera and S.S. Ranatunga[3]

INTRODUCTION

SINCE INDEPENDENCE, IRRIGATION development in Sri Lanka has received special attention in the formulation of policies and strategies for the rural sector. The horizontal expansion of agriculture by bringing additional land under cultivation was considered the best strategy because it provided an answer to the high population density in southwest Sri Lanka while increasing agricultural production. Large extents of land in the dry zone could not be cultivated due to lack of water and the abundance of neglected large-scale irrigation systems showed the enormous potential in this part of the country. Therefore, the most appropriate policy decision taken was to rehabilitate the abandoned major irrigation systems in the dry zone.

Since independence large sums of money have been invested in the reconstruction of these major irrigation schemes and in the settling of people in them. The policy of expansion of irrigated agricultural settlements has become an integral part of rural development and it was further expanded by developing major river valleys in the dry zone as irrigated settlements. Gal oya was the first river valley development scheme under which nearly 50,000 hectares (ha) of new land were brought under cultivation.

Nearly five decades of government intervention in irrigation development resulted in bringing 82,000 ha of irrigated land in the Mahaweli areas and approximately 260,000 ha outside the Mahaweli region under major irrigation schemes.

Even as early as the late fifties it was felt that the potential of these major irrigation schemes was yet to be exploited. There was mounting criticism that the heavy investment in irrigation was not bringing commensurate returns and was a misapplication of limited capital resources. The

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[3] Deputy Directors, Irrigation Management Division.

IRRF mission which visited the island in 1951 pointed out for the first time that the productivity of these schemes should be greatly increased. "Since then there has been persistent criticism that these major settlement schemes are not providing benefits comparable to the costs, that they have not proved to be centers of growth" (Silva, 1986).

During the 1960s the "Green Revolution" technology was applied as a solution to the low productivity in the irrigation schemes and the special projects program was initiated in 1965 through large-scale intervention of the bureaucracy. The application of "Green Revolution technology" has definitely increased the productivity levels in many areas. However, it has been pointed out that "it favored the well-irrigated areas, generated serious socioeconomic disparities, and led to over-adaptation of high-yielding varieties without the supporting systems of credit, fertilizer, and management practices" (Alwis, 1986). After a few years of success the initial momentum of increasing productivity through the "Green Revolution technology" began to stagnate and towards the mid-1970s the country entered the post-Green Revolution era.

Since the mid-1970s, mainly due to the escalation of cost of new construction and rehabilitation and diminishing land resources, the emphasis was clearly moving from the creation of new irrigation systems to the enhancement of productivity in existing systems through efficient irrigation management and cost-effective rehabilitation. It was envisaged that qualitative improvements of current systems would bring about a "water revolution" that would be analogous to the Green Revolution.

INTEGRATED MANAGEMENT OF MAJOR IRRIGATION SETTLEMENT SCHEMES (INMAS)

In pursuing this objective, a "Programme for the Integrated Management of Major Agricultural Settlements" (INMAS) was initiated by the government in 1984. The aim of INMAS is to enhance the productivity and production in major irrigation schemes through improvement of irrigation management and the efficient management of agricultural production.

The implementation of this program was entrusted with the newly established Irrigation Management Division of the Ministry of Lands and Lands Development. It is a multidisciplinary organization with the sole mandate of enhancing the productivity of the major irrigation settlements.

INMAS and the Sustainability of Irrigation Schemes

Within the broader perspectives of the INMAS Programme, an irrigation system is viewed as a whole system having several interrelated and interdependent subsystems or components. The main components are physical, cropping, economic, and social-organizational subsystems. The sustainability of an irrigation system is the sustainability of all these components.

Therefore, the INMAS concept aims at achieving total system sustainability through enhancing agricultural productivity. A high level of productivity guarantees high income levels for

farmers which in turn generate the internal capacity to sustain the whole system continuously. This INMAS concept of sustainability has also been identified as an "agro-economic productivity sustaining system aiming to enhance the economic productivity of farmers by uplifting agriculture productivity in major irrigated areas through efficient and sufficient supply of water and to attain continuity of the systems via such economic productivity" (TEAMS 1989).

In moving towards this long-term objective of achieving total sustainability through enhancing productivity, under the INMAS Programme it has been identified that sustainability of the physical system is a prerequisite to achieve INMAS objectives.

Enhancement of Productivity and the Physical System

Although total sustainability of an Irrigation System depends on the interaction and organization of all components, the physical subsystem always provides the base for this complex hydraulic, farming, and social organization system.

A system of irrigated agriculture has been defined as a "a landscape to which is added physical structures that impound, divert, channel or otherwise move water from a source to some desired location" (Coward Jr. 1980).

The proper functioning of these structures is essential to insure the adequacy, reliability, and predictability of supply of water for the purpose of producing food or fiber. Therefore, in the implementation of the INMAS Programme, a very high emphasis has been given to the operation and maintenance of the physical system. This is one of the primary goals of the program.

Background to the Problem of Sustainability of the Physical System

In analyzing the problem of operation and maintenance it was seen that this is a manifestation of the larger problem of lack of resources and a problem of social organization and management.

The problem of sustainability of the physical system is a result of a combination of various factors. The heavy investment in the development of major irrigation works during the postindependence era as shown in Table 1 has made it necessary for the government to takeover the responsibility of management of the systems.

Table 1. Investment in major irrigation 1950 - 1982 (Rs '000).

Year	Major works	River basin development	Total
1950 - 1954	171.9	84.7	256.6
1955 - 1959	133.8	35.3	169.1
1960 - 1964	153.6	15.3	168.9
1965 - 1969	245.3	20.4	265.7
1970 - 1974	175.0	280.7	445.7
1975 - 1979	362.0	1,654.2	2,016.2
1980 - 1982	1,200.3	7,100.0	8,300.3
Total	2,441.9	9,190.6	11,622.5

Source : IIMI (1986).

Several other socioeconomic and institutional factors have also contributed to this situation. It could be seen that there was a steady decline of traditional rural institutions such as *Vel Vidane* (Irrigation Headman) during the colonial period. On the other hand, there was no suitable atmosphere in the new settlements for the development of the social institutions required for irrigated agriculture. There was also a lack of social cohesion among the settlers due to their heterogeneous nature. The social institutions with which they were familiar within their wet-zone villages were not always useful for irrigated agriculture. The social welfare system of the government also created a dependency syndrome among the farmers which produced a negative impact on the development of local organizations.

This situation has created a system of 'agency management' with minimum farmer participation and resulting in a lack of local resource mobilization for operation and maintenance. A wide gap between farmers and the irrigation bureaucracy has been created and the farmers have become mere passive observers.

Such a system of agency management can only be sustained with an adequate supply of funds on a regular basis and the proper utilization of such funds. However, the government has not only failed to provide adequate funds over the last several years but has also failed to utilize them properly due to lack of local irrigation organizations. The following table gives the actual requirement of funds against the government allocation for O&M during the past several years.

Table 2. Actual requirements and the budgetary provision for O&M for major irrigation schemes outside Mahaweli areas (Rs '000).

Year	Actual requirements	Budgetary provision	Allocation received expressed as a % of the actual
1984	130.00	66.84	51.42
1985	130.00	78.06	60.00
1986	146.25	65.60	44.85
1987	146.25	87.84	60.06
1988	185.25	72.66	39.22

The above computation was based on the assumption that the total extent to be maintained is around 650,000 acres and the cost per acre to be Rs 200 in 1984 and 1985, Rs 225 in 1986 and 1987, and Rs 285 in 1988.

This problem of lack or resources was aggravated with the inefficiency of mobilizing the available local resources. This is an inherent weakness found in many agency-managed systems. The resulting situation was a poor physical system with low productivity of water.

Irrigation Management Division (IMD) Approach under INMAS

The long-term objective of the INMAS Programme is to change this "agency-managed system" which has led to dependency on the funds provided by the government into an independent "farmer-managed system" depending on local resources. The strategy worked out under the program to achieve this objective has two main courses of action:

1. Efficient mobilization of available government funds, and
2. Promotion of participatory management and the mobilization of local resources.

The following activities are involved in the efficient mobilization of available government funds:

a) Rational distribution of funds, and
b) Planning, programing and monitoring.

The activities involved in participatory management and the mobilization of local resources are:

a) Farmer participation in all aspects of management,
b) Mobilization of labor and other local resources, and
c) Handing over of greater responsibilities to the farmers.

It is evident that the INMAS approach to O&M problems as described above heavily depends upon an effective system of farmers' organizations. Thus the program for INMAS has given very high priority to the establishment of farmers' organizations.

EFFICIENT MOBILIZATION OF AVAILABLE FUNDS

With the gradual decline of government contribution for O&M, a need has arisen for the better management of available funds. The Irrigation Department maintains all gravity irrigation schemes above 200 acres in extent including anicut diversions, salt water exclusion, flood protection, and drainage schemes. The items to be maintained by the Department under major works comprise all components of the work excepting the field channels, the maintenance of which is the responsibility of the beneficiaries whose fields are being served by the channels. The vital key for satisfactory maintenance of irrigation systems is careful distribution of resources and the systematic organization of all maintenance activities and strict adherence to that program.

As described earlier, the proper utilization of funds for a sustainable O&M program depends upon rational distribution of finances and resources and planning, programing, and monitoring of O&M activities.

These factors are interdependent. In order to fulfill these requirements it was decided that the planning and monitoring agency should be separated from the implementing agency. Therefore, since the establishment of the IMD, the funds for O&M are being channeled through that division.

Rational Distribution of Finances and Resources

The allocation of funds for O&M costs had been distributed on the basis of the area irrigated in the past. This method assumes that the headworks and the irrigation systems in various projects are comparable.

In 1984, the IMD collected data on canals and other items which require maintenance by each Irrigation Engineer (IE) division of the Irrigation Department and made an analysis based on this data. The objective of this analysis was to distribute the limited amount of maintenance funds among 54 IE divisions of the island equitably as far as possible. Due to the wide variations in the project components and their individual needs it was impossible to devise a perfect system of equitable distribution particularly when the funds were limited.

On the basis of this analysis, a more rational system of allocation for each divisions was proposed. It was assumed that this system of allocations would be closer to the actual needs of the projects than previous methods of allocation based on the area irrigated. The O&M costs as analyzed now are divided broadly into two categories: a) operational cost and b) maintenance cost.

Operational Cost

The operational cost is allowed to meet the needs for fixed cost items that have to be incurred by each Irrigation Engineer's Division. These fixed costs are not totally dependent on the area maintained by each division. Therefore, the basic needs of each division were estimated taking into consideration the total area maintained, the number of irrigation schemes, size of schemes, and their location. The analysis of these data gave results which varied widely between IE divisions. Hence, a statistical analysis was done by the IMD to optimize these fixed costs and the total amount under operational cost of each division was allowed based on the final values.

Maintenance Cost

Once the total operational cost was known as described earlier, the balance available out of the total monetary provision for physical maintenance was determined. This was distributed for dams, roads, and canals.

For this purpose, the lengths of canals and roads, sizes of dams, and various other details were obtained from the field and different rates were computed for these items giving due consideration to the quantum of work involved in different items.

Planning and Programing

The lack of a reliable supply of adequate funds contributed in a large measure to dislocate the procedure adopted in implementing systematic O&M programs which the Irrigation Department had painstakingly developed over a long period. Thus, the vitality and importance of planning and programing received low priority. Another factor which contributed to this situation was the shortened close seasons due to the nonadherence to cultivation calendars by the farmers. Usually, maintenance works are carried out during closed seasons. Short, closed seasons made planning and programing a fruitless exercise in some instances. The need to involve farmers in planning and implementation of maintenance work had also been neglected in the past.

Under the INMAS Programme, heavy emphasis had been made on planning the cultivation season through Project Committees with the involvement of farmers' organizations. As a result, adherence to the cultivation calendar improved and the staggering of the cultivation season has significantly been reduced in Huruluwewa, Nachchaduawa, Nagadeepa, and Ridi-Bendi Ela Schemes, while in other schemes improvements have been observed. This could be treated as a significant outcome of the INMAS Programme. This situation gave sufficiently long, closed seasons for maintenance which enabled proper planning and programing of maintenance work.

Advance preparations of maintenance programs have been insisted to commence work as soon as the off-season starts in order to utilize the period fully. The following steps are now being taken to involve the farmers in planning and implementation:

1. Identification and prioritization of maintenance work jointly by farmer representatives and officials through discussions.
2. Planning and programing work according to the funds and other resources available and obtaining Project Committee approval for implementation.
3. Execution of work through distributary channel organizations which operate at subcommittee level.
4. Reporting to the Project Committee at the apex level and submission of accounts of the work accomplished.

Arrangements have also been made to submit to the Project Committee the O&M program for the main system performed by Irrigation Department officials, so that an opportunity would be afforded to farmers and other line-agency officials to understand the importance of this work component.

Distinct advantages of this organizational approach are:

1. O&M program is made a collective effort to which suggestions would be contributed by all concerned.
2. The need for accurate planning, programing and monitoring is recognized to report on progress and submission of accounts.
3. Farmers are made to feel that they are in partnership with line-agency officials who are directly dealing with productivity management in the scheme.
4. Opportunities are now afforded through the organizations to contribute voluntary labor and enhance the total value of the work undertaken.

5. Regular involvement and participation by farmers to promote a feeling of ownership among them.

Thus the establishment of farmers' organizations under the INMAS Programme has facilitated the planning, programing and monitoring of the O&M programs.

Promotion of Participatory Management and Mobilization of Local Resources

As described, the problem of physical sustainability is a result of total dependence on the state for O&M and the absence of an organized collective attempt by the beneficiaries to manage the system in order to have proper control of water. Therefore, under the INMAS Programme the IMD has laid very high emphasis in the promotion of farmers' organizations with a view to creating a self-sustaining system for the maintenance of the physical system.

Establishment of farmers' organizations has been carried out in all 35 major irrigation projects under the INMAS Programme. The main objectives of these organizations are:

1. To establish continuous dialogue and cordial relationships among farmers themselves and between farmers and officers.
2. To insure active farmer participation in the planning, operation, and management of the irrigation system and in the implementation of the agricultural program.
3. To develop a total system consciousness among the farmers and to encourage farmers to think in terms of the whole system.
4. To foster a sense of farmer ownership of the irrigation system and thereby motivate them to protect and safeguard the system.
5. Motivate farmers to obtain high production and greater productivity.
6. To further the duties and responsibilities vested on the farmers by the Irrigation Ordinance.
7. To develop self-confidence and self-reliance of the farming community.

In the formation of farmers' organizations to achieve the above objectives the concept of using catalysts has been found very successful and they were deployed in several projects to release the potential within the farming community for the establishment of their own organizations.

The field channel to turnout groups consisting of about 15-40 farmers form the base of the organizational matrix. The formal farmers' organizations have been established at the secondary level of the systems generally covering an area of a distributary channel which consists of about 250 - 300 farmers. These "distributary channel organizations" are expected to take over the responsibility of operation and maintenance of the distributary channel over a period of time.

To date 3,584 field-channel groups and 396 distributary-channel organizations have been set up in the 35 major irrigation systems under the INMAS Programme.

It is the experience of the IMD that these farmers' organizations can contribute to the sustainability of the physical system mainly in:

1. Mobilizing local resources for O&M.
2. Participating in planning and Implementing of O&M programs.

3. Establishing an efficient system for joint management.
4. Protecting the system through promoting the feeling of ownership and farmers' obligations.
5. Planning and implementation of rehabilitation programs.

ACHIEVEMENTS OF PARTICIPATORY SYSTEMS

O&M at Field-Channel Level

The existing system of irrigation management in major irrigation systems is mainly agency management. The farmers are involved only at the field-channel level. However, in the past, due to the absence of organizations and the breakdown of the traditional institutions the farmers failed to fulfill their responsibility adequately at the field-channel level. The inevitable result of this situation was the inability to deliver water in proper amounts at the proper time.

The operation and maintenance activities at the field-channel level have substantially improved over the past few years due to the activities of the farmers' organizations under the INMAS Programme. The Agrarian Research and Training Institute (ARTI) has found in their "Study on the effectiveness of INMAS" that there is a substantial improvement in maintenance of field channels by the farmers. It is reported that "in almost all schemes (eight pilot schemes selected) farmers were involved in shramadana work in canal cleaning, although the quantum of work cannot be measured due to the unavailability of proper records. The process of field-channel maintenance under INMAS programme includes farmers cleaning their portion of the field channel through shramadana or individually and getting the ID to do the structural repairs. Maintenance at the level of field channels has improved significantly due to the INMAS programme. In all schemes surveyed almost 100% of the farmers have cleaned the field canals to the required standard" (ARTI 1989). The same study has also revealed that there is an improvement of water distribution at the field channels where farmer representatives handle water delivery.

Local Resource Mobilization for O&M

Prior to the INMAS Programme collective action by farmers for O&M activities even at the field-channel (FC) level was not satisfactory. However, since the introduction of the INMAS Programme the involvement of farmers in shramadana work has remarkably increased. They were engaged mainly in weeding and desilting activities in canals. In many schemes proper records of shramadana work have not been maintained and therefore a qualitative assessment of the value of shramadana work is difficult. The mobilization of labor through shramadana work was not confined to FCs. In several schemes the farmers have shown their willingness to

contribute to the maintenance of main canals and distributary channels (DCs) too. The farmers of the Parakrama Samudra scheme in Polonnaruwa contributed labor worth Rs 67,000 in cleaning DCs and FCs in the 1986/87 maha season. In the Kaudulla scheme the value of shramadana work was Rs 75,000 for cleaning FCs and desilting of DCs in Stage III Tract 2 and 6. In the Nagadeepa scheme in 1986 farmers contributed labor worth Rs 11,000 for cleaning and weeding of the main canal (MC). They were also able to clean 20 km of DCs and desilting of 60 km of FCs. Farmers' organizations have shown their capacity not only in mobilizing labor but also in raising funds for maintenance work. Some farmers' organizations in Minneriya and Giritale projects launched a campaign to raise funds to undertake small irrigation contract works very successfully in maha 1988.

Farmer Participation in O&M Activities above FC Level

Since the introduction of the INMAS Programme, the farmers have been afforded an opportunity to participate mainly in the decision-making process of O&M activities at MC and DC levels too. A list of maintenance works for each year is prepared by the Project Committee and it is submitted to the Irrigation Engineer who prepares the estimates. As these estimates generally exceed the available funds, the priorities are decided upon jointly by the Farmer Representatives and the Engineer. This method could insure realistic planning for maintenance. The farmers are given not only the opportunity to participate in the decision-making process but also in the implementation. The farmers' organizations have been registered with the Irrigation Department as contractors and small works were given to them.

Farmer Participation in Rehabilitation

Rehabilitation is another area of activity where the performance has been really improved through farmer participation particularly in the schemes under the Major Irrigation Rehabilitation Project (MIRP) and the Irrigation Systems Management Project (ISMP). The farmers' ideas were sought at the design stage and they could participate during the execution stage too. It has been found that the farmers were more satisfied with the rehabilitation where their ideas were sought at the design stage and during implementation (ARTI 1989).

Conflict Resolution

Institutional development under the INMAS Programme also provided a better system of conflict resolution. The improvements in water supply also reduced the occurrence of conflicts resulting in less damage to structures; with the increased participation the sense of belonging too increased. This situation has given better protection to the system.

These encouraging achievements under the INMAS Programme were able to prove that the most desirable method to insure the sustainability of the physical system is to change the present "Agency Management System" into a "System of Participatory/Joint Management." The collection of O&M rates by the government is not required under a system of joint management.

In January 1989, the participatory management of Irrigation Schemes was accepted by the government as a policy. With this policy commitment of participatory management, it was recommended that:

1. Participatory management be accepted as a policy and systems based on these principles be developed and experimented with, with the objective of improving overall management and performance.
2. Farmers be encouraged to manage an operation and maintenance system in which they contribute their labor and other resources rather than just paying O&M charges to a central authority.
3. For some time to come, government funds should continue to be available to the irrigation agencies for main system management with appropriate provision for consultation with farmers' organizations in the execution of such work.
4. The management principle of village tanks is adopted in larger systems with the turnout area, the field channel, and the distributary channel, respectively, in ascending order, they being treated as the respective management units.
5. The institutions involved be strengthened providing for active farmer involvement.
6. The water users' organizations be given legal recognition.

Program for Handing Over of DCs

In response to the above recommendations, the IMD has initiated a program to hand over the management of DCs to farmers' organizations. This is a phased program depending upon the capabilities of farmers' organizations.

The objectives of the program are as follows:

1. To provide for a system of joint management in major irrigation schemes with increased participation of the beneficiaries.
2. To optimize the available funds.
3. To afford an opportunity for farmers to supplement the available funds by contributing labor and other resources in lieu of payment of O&M rates.
4. To insure better water distribution at DC and FC levels and mutual resolution of conflicts.
5. To strengthen the planning, programing, and monitoring of O&M activities at the DC and FC levels.

Method of Handing Over

Handing over of DCs means that their management will be handed over from the ID to the farmers' organizations. However, the entire system will remain as a public property.

Handing over is essentially a matter between the ID and the farmers' organizations. The IMD will facilitate this process by strengthening farmers' organizations and training Farmer Representatives to handle those new responsibilities. The IMD will also closely monitor the O&M activities by the farmers' organizations after the handing over. It has been agreed that handing over can be done only on the following preconditions:

1. The FC group and DC organizations should be stable and reasonably efficient.
2. The farmers' organizations should have confidence and mutual understanding in the officers of the ID and vice versa.
3. The DCs and FCs should be at least upto the standard which enables water to be regulated and sent down all the channels.

Turning over of Maintenance Funds to Farmers' Organizations

Funds available for maintenance of DCs and FCs will be turned over by the ID to the DC organization wherever the handing over process has been completed.

It is intended to transfer the maintenance funds allocated by the government to the farmers' organizations in recognition of them taking over of responsibility for O&M. However, until such time that farmers' organizations receive legal recognition, their method of transfer is by means of contract agreement, but the farmers' organizations will not be considered a contractor in the usual sense of the word.

The quantum of maintenance funds available in respect of each DC organization area will be intimated by the ID to the Farmer Representatives at the beginning of each year. This agreement would help the farmers to plan maintenance activities and decide on local resource mobilization. The construction activities other than routine maintenance of DCs and FCs will also be given to the farmers' organizations on contract basis wherever possible.

Achievements of the Program and Current Status

A total of 396 DC organizations have been formed under the INMAS Programme out of which 248 organizations are willing and sufficiently strong to take over the responsibility of the management of their distributary systems. Forty DC organizations have taken over the management of the channels under them. A program phased over the next three years will be implemented to hand over the balance after strengthening and training these organizations.

Collection of O&M Rates

While formulating a new policy to insure sustainability through increasing productivity under the INMAS Programme, in 1983 the government decided that the beneficiaries of major irrigation schemes should bear the cost of operations and maintenance mainly due to the pressure extended by donor agencies. The estimated costs of O&M were Rs 200 per acre per annum. The rates were initially set to cover 50 percent of the cost (Rs 100) and would gradually increase over a 5-year period to reach full recovery cost. However, subsequently it was decided to freeze the rate at Rs 100 for some more time.

The responsibility of collection has been given to the IMD although such a "fee recovery system" conflicts with the INMAS policies. The INMAS policy as described earlier depends heavily on farmer participation to improve the efficiency of the physical system. However, a system of fee recovery does not require farmer participation. A system of fee collection conflicts with the INMAS mainly on the following issues:

1. The farmers will become fee payers and service receivers rather than equal partners.
2. It works as an impediment to the development of a sense of ownership among the farmers.
3. It also works as an impediment to develop a harmonious relationship with the government irrigation organization and the farmers.
4. The charge had no relationship with the amount of water used. Hence, there was no incentive for the farmers to use water efficiently.

Thus, the IMD was given the responsibility of the implementation of two conflicting tasks simultaneously. The only recourse available to the IMD to minimize the adverse effects of the fee-collection system on the INMAS was to insure that all contributions made by farmers in a specific scheme for maintenance are used solely in the same system without allowing such funds to be used in any other scheme or lapse into revenue. Another strategy used was that in utilization of collected funds the farmers were allowed to select the priorities and the farmers' organizations were given the contracts whenever possible.

The amounts collected and the disbursement of collected funds are given in Table 3.

Table 3. Collection of O&M rates and the disbursements.

Target for the year	1984 3,621,900		1985 47,954,660		1986 37,023,502		1987 33,084,240		1988 33,166,260		Total collection for the collection year
Collection during the year		%		%		%		%		%	
1984	7,493,366	19.92									7,493,366
1985	7,201,628	19.14	3,291,017	6.86							10,492,646
1986	788,692	7.41	3,724,352	7.76	3,263	0.51					9,776,515
1987	1,041,383	2.76	1,401,621	2.92	1,010,397	2.72	1,610,842	4.98			5,064,243
1988	427,218	1.13	129,471	0.26	100,892	0.27	1,764,543	5.33	1,079,543	3.26	3,501,669
Total	16,952,289	50.36	8,546,462	17.80	4,374,760	2.99	3,375,385	10.31	1,079,543	3.26	36,328,441

Source : IMD Progress Reports (1984 - 1988).

An important feature in the disbursement of funds was the heavy involvement of farmers' organizations in almost all aspects. As an incentive for farmers and also to encourage them for regular involvement and participation in the O&M activities it was also decided to hand over small-scale contracts to farmers' organizations. For this purpose farmers' organizations were registered with the Irrigation Department on the recommendation of the IMD Project Manger. The value of each contract was initially limited to Rs 5,000 and the scheme was found to operate quite successfully in places where the farmers' organizations were strong, especially in Polonnaruwa District. Hence, Treasury approval was obtained in March 1987, increasing the limit to Rs 25,000 and two jobs at a time.

Reason for Slow Progress

As shown in the table, after some initial success the collections have progressively gone down. Several factors have contributed to the poor performance of the collection of O&M rates. The reasons given by the officers involved in the collection and by the farmers vary widely.

The ARTI has shown the following reasons as given by the officers of the line agencies:

	Reasons	%
1.	Shortcomings in the legislation on O&M recoveries	42
2.	Low yield/low income	38
3.	Noncultivation	35
4.	Unreasonable fee (too high)	08
5.	Operation of land by others	16
6.	Dissatisfaction with the method of mobilization of funds	31
7.	Lack of confidence in officers	02
8.	Ignorance of the objectives of collection	16
9.	Political reasons	22

(The total does not add up to 100 due to multiple answers.)
The same study gives the following reasons as given by the farmers (ARTI 1989:100, Table 3.29).

Table 4. Reasons for nonpayment of O&M fees given by farmers and the number of those who have never paid O&M fees (percentage reporting).

	Ridi-bendi Ela	Mee-oya	Hurulu-wewa	Nachcha-duwa	Parakrama Samudra System	Minipe	Naga-deepa	Siyaba-langamuwa	Ridiya gama
1. Non-cultivation	-	08	11	-	35	04	06	11	-
2. Crop failure	07	44	11	10	38	57	19	11	02
3. Low income	17	04	33	20	27	08	92	53	41
4. Others do not pay	52	15	33	10	12	14	06	42	29
5. Influences from certain organizations	-	50	-	30	23	22	-	-	-
6. Unreasonable fee (too high)	44	08	33	50	31	29	75	05	44
7. O&M is the duty of the government	-	25	18	-	15	-	14	16	15
8. Dissatisfied with the present method of mobilization	-	90	44	-	60	52	21	-	-
Never paid	61	65	13	09	32	38	37	44	87

In analyzing these figures one could see that the main reasons given by the farmers are:

1. Fee is too high
2. Others do not pay
3. Crop failure and low income
4. Method of mobilization unsatisfactory

On the other hand, a comparatively low percentage of farmers think that O&M is a duty of the government. This means that most of the farmers have realized that they have a greater responsibility towards the O&M of the system. In analyzing the perceptions of the farmers on the collection of O&M rates it could be concluded that the farmers are prepared to bear the cost of maintenance provided that there is a suitable system to insure that:

1. All farmers share responsibility equitably.
2. There is an equitable distribution of water.
3. The rate is decided on the actual requirement.
4. There is a proper system of utilization of collected funds to insure maximum output.

In a system of fee recovery for O&M managed by the government it is very difficult to guarantee that all who benefit contribute their share of the fee. The benefits of the system also cannot be denied to those who do not bear the cost of O&M. As Freeman puts it; ''if individuals believe that the organization will deliver its benefits without regard to member investment, then the incentive to bear obligation is diminished. It becomes rational to be a "free rider" and the organization's ability to provide good (sic) is compromised'' (Freeman 1989). Therefore, even if the farmers can understand the potential benefits of the O&M fee collection and believe that the O&M is a duty of the farmers, they choose to avoid the payments.

This could be the reason for a fairly high percentage of farmers who have indicated that they do not pay because others do not pay. The rapid deterioration of the frequency of payment of the O&M fees given below also confirms this situation (TEAMS 1989:88, Table 33):

The percentage distribution of farmers in terms of the frequency of payment of the O&M fees is as follows:

Paid 1 year	38
Paid 2 years	26
Paid 3 years	21
Paid 4 years	15
All	100

As it was impossible to deny the benefits to the nonpayers, the only alternative available for the government was to recover the rates through the courts. Table 5 gives the number of cases filed and decisions given:

Table 5. Progress of legal action to recover O&M rates up to end of August, 1989.

Total no. of cases	*Court orders given* In favor	Against	No. withdrawn	No. pending
7,604	1,729	170	640	5,065

Source : IMD Progress Reports (1985 - 1988).

The total amount defaulted up to the end of 1988 is Rs 152.5 million out of which only Rs 477,618.80 or 0.3 percent has been collected as of August 1989 through court action. It shows that this course of action did not succeed and the failure in court action was mainly due to the weakness in the law. On the other hand, the percentage of farmers who were prosecuted for nonpayment was very low. Even if the law is strengthened through amending the Irrigation Act, it is doubtful that it can give a solution to the problem of 'free rider' mainly due to the following reasons:

1. Courts system is unable to handle a large number of cases at a time.
2. This course of action is useless particularly when there is an organized resistance.
3. Politically unsound.

The TEAMS Report made the following observations with regard to the third reason given above.

"Sri Lanka's enforcement of law and procedure is well known for its "soft attitudes." Agricultural credit is often quoted as victim of these soft enforcement approaches. Enforcement of laws in respect of O&M has run into similar problems and had even acquired a political coloration as a result of opposing political parties making this an opportunity to field legal assistance in favour of persons brought before the court for non payment of O&M fees. The process of politicisation has made serious inroads into implementation of programs and officers themselves are not convinced that in absence of a firm commitment of the government, no purpose would be severed by taking a different approach through rigid enforcement of law" (TEAMS: 1989).

Another problem with the collection was that the government cannot assure the equitable distribution of water through the present system of management which has very limited farmer participation. This situation can only be changed by establishing effective farmers' organizations that can insure that the system is collectively managed to give a 'fair share of benefits' to all its members. This type of management system also requires perfect understanding between the farmers and the irrigation agencies. A system of fee recovery by the government has no place in such a system.

Another problem connected to the collection of O&M rates was the imposition of a uniform rate. It was difficult for the government organization to decide on the individual requirement of funds for each small unit (e.g., DC area) or irrigation schemes. Therefore, a uniform rate was imposed. But in some areas the farmers thought that it was unreasonable. A uniform rate also had no connection either with the yield or with the water consumption. Moreover such a system

has no room for the contribution of labor for O&M which the farmers were accustomed to over a long period of time.

CONCLUSION

The above analysis clearly shows that a system of O&M fee recovery implemented by a government agency cannot succeed in the Sri Lanka situation and the INMAS policy of participatory/joint management is a more suitable system to insure the sustainability of the physical system. The achievements realized under the INMAS Programme, inspite of some major constraints which are given elsewhere in this paper, are a clear indication of the practicability and soundness of a "Joint Management System." The TEAMS' report on "Procedures on Collection of O&M Fees" has also come to the same conclusion and stated that "it is strongly suggested that the most viable and pragmatic approach is to adopt a system based on user support which can catalyze joint management between the state and the farmers as an immediate step." It is believed that this step can be taken and implemented in practical terms in the future functioning and can be incrementally improved so that the O&M system may hopefully become "User Owned and User Managed."

The success of a joint-management system heavily depends upon the effectiveness of the farmers' organizations which provide an interface for the different and even incompatible requirements of the government agency and that of the individual farmers. The IMD has fully realized the importance of this aspect and therefore high emphasis has been given for the establishment of farmers' organizations. However, the IMD has been faced with some severe constraints and some of them are yet to be overcome.

Although the use of independent catalysts has been accepted in principle the IMD was not able to employ them in all 35 projects under the INMAS Programme due to the lack of resources. As a result, some Project Managers were unable to follow all the concepts correctly in the formation of farmers' organizations. The weakness in some farmers' organizations is partly due to this situation. However, on the other hand, it has given opportunities to the Project Managers for innovative action in formulating and implementing new strategies.

The absence of legal recognition for the farmers' organizations is another major constraint in developing them into effective and self-reliant organizations which can handle greater responsibilities. In addition, lack of political commitment also contributed to the progress in the development of farmers' organizations in some areas.

The absence of positive attitudes in the government agencies could be a major impediment to achieve a joint-management system, as a harmonious relationship based on mutual understanding is essential for such a system. It has been observed that bureaucratic apathy can frustrate willing organization in taking over of maintenance responsibilities. A clear political commitment for a joint-management system would erase such apathetic attitudes of the government agencies.

In spite of the various constraints, the implementation of the INMAS Programme during the last five years has proved the validity of the concept of joint management as a solution to the O&M

problem and also as a first step towards the total sustainability of irrigation systems. The transfer of the present "agency management system" would require very clear policies, a carefully designed program for such transfer, and the capacity for scrupulous implementation.

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Experiences of the Mahaweli Economic Agency in Resource Mobilization for Sustainable Management of Major Irrigation Schemes

H.A. Wickremaratne
and
T.D.P. Karunatilleke[4]

A BRIEF HISTORY OF MAJOR IRRIGATION PROJECTS AND HOW THEY WERE MANAGED

IN ORDER TO discuss the experiences of the Mahaweli Economic Agency in resource mobilization in management of major irrigation schemes, it is necessary to have a general idea of how major irrigation schemes were managed in Sri Lanka during the last 75 years. In Sri Lanka, major irrigation reservoirs and systems had been in operation for over 1,500 years. Most of the ancient schemes had been abandoned at various periods. During the last 75 years and especially during the period 1948 to 1960, restoration work was accelerated and almost all the ancient irrigation works were restored. A major new irrigation project was implemented at Gal Oya during this period. The major reservoir constructed for this project is the largest in Sri Lanka. Most of the irrigation projects were implemented by government departments except the Gal Oya project which was implemented by the Gal Oya Development Board. The Irrigation Department with the assistance of the Survey Department, the Land Commissioner's Department, the Department of Agriculture, the Land Development Department and other organizations was responsible for implementing most of the projects. All aspects of the Gal Oya Project were handled by the Gal Oya Development Board.

During the period 1956 - 1960, new projects were investigated. Most of them were multipurpose projects for the generation of power and the provision of irrigation water for agricultural pur-

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[4] Chief Irrigation Engineers, Mahaweli Economic Agency.

poses. Major reservoir basins like Mahaweli, Walawe, Kelani, Kalu etc., were investigated for this purpose. Most of these studies were done by the Irrigation Department with the assistance of other relevant government departments and foreign consultants.

The second new multipurpose project to be commenced was that of Walawe. The feasibility studies for the Walawe project were also done by the Irrigation Department. It was taken over by the River Valleys Development Board (RVDB) at the construction stage. Except for the Gal Oya and the Walawe schemes, all other major irrigation schemes were maintained and operated by the Irrigation Department. After a considerable period of operation, the Gal Oya Project was handed over to the Irrigation Department in the mid-sixties and the Walawe Project to the Mahaweli Authority of Sri Lanka (MASL) in 1981. At present, all the irrigation systems under major reservoirs are maintained by the Irrigation Department and the Mahaweli Economic Agency (MEA). Headworks of the Mahaweli systems and the Walawe reservoir are maintained by the Headworks Administration Operation & Maintenance Unit of the MASL. All other headworks of major irrigation reservoirs are maintained by the Irrigation Department. In the schemes managed by the Irrigation Department, it is responsible for maintenance of the reservoir and the irrigation system. Other organizations are responsible for settlement and post-settlement activities. The Land Commissioner's Department and the Department of Agriculture are responsible for settlement and agricultural-extension work. Government Agents of the respective districts coordinate activities of the various departments. In schemes managed by the Mahaweli Economic Agency (MEA) the Agency is responsible for all the activities.

The Gal Oya Development Board was formed in 1952 with the intention of performing all the activities from construction to settlement and post-settlement. The Gal Oya Project was operated and maintained for nearly 20 years by the Gal Oya Development Board before it was handed over to the respective line departments. The River Valleys Development Board (RVDB) was formed in 1964 with the same intention of carrying out all the activities from construction to settlement. Most of the staff from the Gal Oya Development Board was absorbed into the RVDB. The RVDB completed the construction of the Walawe Project and operated it for about 12 years before handing it over to the MEA. However, the originally planned extent of this project was not developed.

The main allegation against these organizations was that they were concentrating on design, construction, and settlement only. The post-settlement activities were neglected or were paid less attention. Irrigation management and post-settlement activities were alleged to have been neglected. According to the allegation, full benefits as planned were not realized from these schemes due to poor irrigation management. After considering all these shortcomings and the problems in those projects, it has been decided to form a separate settlement division in the Mahaweli Authority of Sri Lanka (MASL) in order to take over the completed irrigated systems and to attend to all the settlement activities in the Mahaweli Project.

FORMATION OF ORGANIZATIONS FOR POST-SETTLEMENT ACTIVITIES (INCLUDING IRRIGATION MANAGEMENT) IN THE MAHAWELI PROJECT

At the feasibility stage of Mahaweli Phase I, Project I, Stage II (Bowatenna and System 'H'), the consultants (SOGREAH) have considered the defects mentioned in Section I with regard to irrigation management. The Mahaweli Development Board (MDB) was formed with the intention of remedying all the defects in the previous systems. Most of the alleged defects were at the post-settlement stage mainly in irrigation management. However, the UNDP/FAO report of 1968 has recommended that the MDB should hand over the irrigation systems to the normal government administration at an appropriate time. Operation, maintenance, and organization for operation and maintenance after settlement had been considered at the design of the project (Project I, Stage II). The design had been done to facilitate operation with a considerable amount of flexibility. Settlement activities had taken place along with construction and settlers were involved with the construction work.

When the construction work in System 'H' was in progress, a Resident Project Manager (RPM) was appointed in 1975 to attend to all the post-settlement activities. Settlement was done by the Deputy General Manager/Settlement (DGM) through his staff with support services from the Land Commissioner's Department. The RPM was not responsible for settlement. He was responsible for all the post-settlement and other related activities of the settlers. A very senior engineer was appointed to this post and a lot of responsibilities were given to the RPM. At the time of his appointment only 5,000 acres (2,000 ha) of irrigable land were provided with irrigation facilities. He had to assist the settlers to establish in their new allotments and was responsible for all the community-development work. Settlers were involved in the construction work of the irrigation systems and in operation and maintenance activities of the completed irrigation systems. Irrigation facilities to the extent of 2,000 ha were not fully complete but they were sufficient to issue water when the RPM took over the irrigable area. Settlers were used to do the balance work. Agricultural-extension services, provision of agricultural inputs, marketing, health care, etc., were the other responsibilities of the RPM. Basic facilities of the settlers were provided by the DGM through his staff at the time of settlement. On completion of the settlement, some of the staff attached to the DGM were transferred to work under the RPM. In the same way, some of the construction staff (engineering staff), on completion of irrigation systems, were also transferred to the RPM to work under him.

When the canals were ready for water issues they were handed over to the RPM and the balance work was done with the water issues by the RPM through his staff. In this manner, the same engineering staff who were responsible for construction work in a particular irrigation system were responsible for operation, management, and water issues in the same system under the RPM. This procedure was adopted to build up engineering staff under the RPM. Within a short period the irrigable extent in System 'H' under the RPM increased considerably and the following staff were working under him:

Deputy Resident Project Manager (DRPM) Water Management and supporting staff absorbed from the Construction Division;

DRPM/Agriculture and supporting staff released from the Department of Agriculture;

DRPM/Community Development and supporting staff absorbed from the DGM/Settlement Division.

The first area to come under the RPM's management comprised the first reach of the Kalawewa left bank irrigable area (H-1). His office was set up at Galnewa. The balance construction work of the irrigation systems, operation and maintenance work, was done by employing settlers directly. Jungle clearing in the irrigable areas and on-farm development work were done by awarding contracts to groups of settlers through the Construction Division. This process insured settlers of an income until such time they were able to receive an income from their farms.

As the irrigable area under the Resident Project Manager increased, it was divided into units. Each unit covered an irrigable area of 6,000-8,000 acres (2,500-3,300 ha). Officers of three disciplines (Irrigation, Agriculture, and Community Development) were posted to the units. The most senior of the three officers administered the office. There were supporting staff for the unit. Most of them were recruited from second-generation farmers. Financial control of the work in the unit was exercised by the RPM. There were subunits under this unit. These subunits were the smallest administrative units under the MDB organization. Each subunit had the services of an Agricultural Instructor, an Engineering Assistant, and an Assistant Community Development Officer. The subunit was in direct contact with the settlers. The Agricultural Instructor was assisted by the KVS (Agricultural Extension Worker) and the Engineering Assistant by a *Jala Palaka* (Water Issue Laborer). The multidisciplinary approach of management and farmer involvement in construction were introduced to the Mahaweli Project in this manner. This system of operation continued up to 1980 and by that time the major part of system H (Kalawewa, Kandalama, and Dambulu Oya) was provided with irrigation facilities. The entire extent except for about 10,000 acres, (4,050 ha) in Kalawewa Right bank in System H was in operation under the RPM.

FORMATION OF THE MAHAWELI AUTHORITY OF SRI LANKA (MASL), THE MAHAWELI ECONOMIC AGENCY (MEA), AND THE IRRIGATION MANAGEMENT ORGANIZATION WITHIN THE MEA

The Mahaweli Authority was formed by an Act of Parliament in 1979 and the Mahaweli Development Board (MDB) became an Agency under the MASL. Subsequently, MDB (now Mahaweli Engineering and Construction Agency [MECA]) was entrusted with the following functions only: planning, design, and construction of down-stream development (irrigation and social welfare). The Settlement Division of MASL (now MEA) was entrusted with the post-construction implementation of projects including

a) Settlement, operation, and management of irrigation systems developed under the Mahaweli Programme;

b) On-farm development;
c) Agricultural development and water management;
d) Community development;
e) Distribution of agricultural inputs/outputs (Marketing);
f) Agricultural and other advisory services;
g) Land allocation;
h) Promotion of secondary industries.

Under the Mahaweli Act of 1969 these functions had been under the MDB.

The Settlement Division of MASL was established in 1980 and was entrusted with a small area (H5 - 10,000 acres) in System H to commence operations as a pilot project. A new system of post-construction management was tried out in this pilot project. It is the Unit Manager in the Block Manager system where a Unit Manager (from the Settlement Division) is appointed to look after post-settlement activities of 100 farmer families (subsequently, this number was increased). He is assisted by a Jala Palaka and by a Field Assistant. The Unit Managers are selected from those who have completed a 2-year diploma course in agriculture or a degree course in social science or in a related field. The administration of the 100 farmer families is done through the Unit Manager and he has to attend to all problems of the farmers. The area of authority of a Unit Manger is called a unit. About 20 units consisting of an irrigable area of about 5,000-7,000 acres form an administrative block. The Block Manager administers the Unit Managers and other staff in that block. The Block Manager (BM) is responsible for all the post-settlement activities in that block and he provides services to the settlers through the Unit Managers. The following officers assist the BM: the Irrigation Engineer (or Block Engineer), the Agricultural Officer, the Land Officer, the Community Development Officer, the Marketing Officer, and the Administrative Officer. These officers are assisted by supporting staff.

Problems and suggestions of farmers on all disciplines are forwarded to the Block Manager through Unit Mangers. The Block Manager directs them to the relevant officers for attention. The relevant block officer through his staff and the Unit Manager has to look into the problems or suggestions and prepare proposals to solve them. Basic qualifications for the post of Block Manager are the same as for the Unit Manager (UM) but the BM should have a good record of experience in settlement activities. The Irrigation Engineers or Block Engineers are holders of a national diploma in technology or technical assistants of the Irrigation Department with a good record of experience on irrigation work. Fresh graduate engineers who are appointed as Civil Engineers can be posted as Block Engineers; Block Agricultural Officers are also appointed in the same manner. The BM has administrative and financial control of all the activities in the Block. The Block Managers are directly responsible to the Resident Project Manager.

The Resident Project Manager who is responsible for all the activities in the project administers the project through the BMs and the UMs. The Resident Project Managers are assisted by Deputy Resident Project Managers (DRPMs) or by the Project Officers in various disciplines. The RPM should be a graduate with a very good record of experience in settlement and administration work. A few nongraduates with experience on required disciplines have been appointed as Resident Project Managers. The DRPM (Water Management [WM]) who has to guide the RPM on all irrigation and civil-engineering work in the project should be a chartered civil engineer with at least 10 years' experience in irrigation works (design, construction, operation and maintenance). The DRPM (Agriculture) has to be a graduate in agriculture with

very good experience. Most of them are on secondment from the Department of Agriculture. Whenever it is not possible to find a suitable person to work as a DRPM, a person with lesser qualifications designated as Project Engineer is appointed to perform the functions of the DRPM.

At the initial stages it was difficult for the settlement division to find suitable candidates to work as DRPMs (WM). As such, engineers were seconded from the MDB when the settlement division took over other areas of System H (other than H5 area). The DRPM (WM) who has to guide the RPM on management of the irrigation system has few supporting staff directly under him in the RPM's Office. His instructions to the Block Engineer is through the Block Manager. H5 Pilot area had a lot of supporting staff at the beginning. The total irrigable extent under the RPM was about 10,000 acres. There were two administrative blocks under the RPM. There was only one Engineer to assist the RPM in operation and management. However, there were sufficient Engineering Assistants and work supervisors to assist the Irrigation Engineer.

In 1981, the settlement division took over the other completed areas in System H. Irrigation facilities were almost complete for the whole of System H by that time. The Resident Project Manager's Divisions of Galnewa and Tambuttegama were taken over from the MDB. Most of the MDB officers continued to work under the settlement division. The irrigable areas under Kalawewa Left Bank, Kandalama, and Dambulu Oya were considered as the project area of the Galnewa RPM. Part of Kalawewa Right Bank irrigable area (H4) and the old settlement area under Kalawewa Yoda Ela were considered as the project area of Thambuttegama. The pilot H5 area functioned under the RPM, Nochchiyagama.

RPM divisions were established in Systems C and B under the settlement division while the construction work in the irrigation systems was in progress. The Walawe Project was also handed over to the settlement division and it was treated as a special project as it is outside Mahaweli. In 1982, the name of the settlement division was changed to Mahaweli Economic Agency (MEA) of the MASL.

The main problem at that time was the recruitment of engineering and agricultural staff to the MEA for management of projects. Most of the other staff were absorbed from the MDB and some were new recruits to the MEA. Arrangements were made to get agricultural staff on secondment from the Department of Agriculture as it was done under the MDB. Recruitment of engineering staff was a major problem as there was a severe shortage of engineers and supporting staff in Sri Lanka at that time. The Head of the Mahaweli Economic Agency was the Executive Director who was also a member of the Board of Directors of the MASL. The Executive Director was assisted by Heads of Divisions of various disciplines and Project Coordinators. Project Coordinators were appointed for all the systems (one for each system). A Chief Irrigation Engineer was appointed to assist the Executive Director in all irrigation and other civil-engineering work. Agriculture, finance, administration, supplies, lands, equipment, and community development divisions were established under the Executive Director and the required staff, recruited. Some of the staff as required were released from the MDB. The name of the MDB was also changed to Mahaweli Engineering and Construction Agency (MECA) in 1982. By 1983, the MEA was functioning as a major unit of the MASL. New RPM divisions were established in System G, and in System C (Zones 3-6). An important feature of the administration setup of the MEA is that the normal line-department management is not there. For example, the Engineering staff in the projects are not directly responsible to the Chief Irrigation Engineer and the engineering staff in the Blocks are not directly responsible to the DRPM (WM). The Chief Irrigation Engineer's instructions to the

project engineering staff have to go through the RPM. The area of irrigation management under the MEA increased gradually and the present extents are given in Table 1.

PERFORMANCE OF THE MEA IN IRRIGATION MANAGEMENT

After a short period of operation it was found that the RPMs under the MEA had to perform almost all the functions performed by the RPMs under the MDB. Initially concentration was on settlement, community development, and agriculture activities. However, it was realized that a strong irrigation-engineering division was necessary to take over the irrigation systems from the MECA and manage them. Irrigation systems were taken over from the MECA only after one or two seasons of water issue, and a lot of work remained to be done after taking over. Modifications and minor improvements were necessary during the first few years of operation.

Table 1. Irrigable extent under irrigation systems managed by the MEA at the end of 1989.

System	Present irrigable extent		Final irrigable extent	
	Acres	ha	Acres	ha
System H				
Kalawewa Left Bank	15,500	6,100	15,000	6,100
Kalawewa Right Bank	32,850	13,300	32,850	13,300
Kalawewa Yoda Ela	11,600	4,700	11,600	4,700
Kandalama	12,100	4,900	12,100	4,900
Dambulu Oya	5,200	2,100	5,200	2,100
System C				
Ulhitiya/Rathkinda	39,500	16,000	51,850	21,000
System B				
Maduru Oya Left Bank	29,600	12,000	49,400	20,000
Walawe	28,650	11,600	Not finalized	Not finalized
System L	1,000	400	4,000	1,600
Total	176,000	71,100	-	-

The type of (uncompleted) work that had to be completed after taking over are as follows: construction of secondary drainage channels, field-channel roads, rock excavation in channels up to correct grade, earth filling in settled channel embankment, minor deviation of field channels,

adjustments and modification of channel structures, construction of damaged structures etc. Attending to improvements in this manner with the water issues is common to any irrigation system. During construction, emphasis is to complete as far as possible and to issue water enabling settlers to commence cultivation as early as possible. If water can be issued at least one or two seasons earlier in this manner, a major part of the cost of the irrigation system can be recovered from the value of the crop from the two seasons.

Another reason for these initial problems and remedial improvements is as follows: construction drawings are prepared based on irrigable area engineering surveys and minor topographical details are not covered by the engineering surveys as the ground levels are taken long distances apart. As such, it will be necessary to make adjustments and deviations to the channels during construction. If it is not done during construction, it has to be done with the water issues. It is almost impossible to complete all the work in an irrigation system and hand over just like a building or a bridge. It will take a very long time to complete the system up to that level and it is not economical to do so. It is better to issue water early so that farmers can get the returns early.

The only important aspect is that the balance work should be done and funds should be provided for same. This is the main reason for the MDB to adopt the procedure mentioned under the second main heading of this paper. In order to attend to such improvement works, the MEA required a lot of engineering staff. In Systems "C" and "B," most of this work was done by the MECA as the MEA was short of engineering staff. The problems were identified by the MEA staff. In System "H," most of the improvement works were done by the MEA as the engineering staff recruited from the MECA were working in the MEA.

Recruitment of Engineering Staff to the MEA

It was very difficult to recruit engineering staff to the MEA because it was considered as a nonengineering organization. Graduates and Chartered Engineers were not willing to join the MEA. It was realized that the services of experienced Technical Assistants of the Irrigation Department and Engineering Assistants of the MECA would be very useful and sufficient to perform the functions of a Block Irrigation Engineer in the MEA. There was a severe shortage of engineers in the country during this period (1982 - 84) and Irrigation Technical Assistants and MDB Engineering Assistants with 6 years of good experience in irrigation works were recruited as Irrigation Engineers. They were posted as Block Irrigation Engineers and 2 DRPMs (WM) were released from the MECA to work in System 'H.' A few Irrigation Technical Assistants who had 15 - 20 years' experience were posted as Project Engineers. A few Graduate Engineers also joined the MEA during this period and it was in a position to manage all the systems taken over.

Within a few years, a problem about the Irrigation Engineer designation came up. In the Irrigation Department, a Technical Assistant can get his promotion as an Irrigation Engineer only after about 20 years of service. As such, designating Technical Assistants or Engineering Assistants with 6 years' service as Irrigation Engineers was considered improper. In consultation with the MECA it was decided to recruit only Irrigation Technical Assistants with 15 years' service as Technician Engineers and not to give them the Irrigation Engineer designation. However, the few officers who were recruited as Irrigation Engineers remained as Irrigation

Engineers. After 1985, a lot of graduate engineers joined the MEA and a few Senior Chartered Engineers were appointed as RPMs. Even though a graduate engineer is not very suitable to work as a Block Engineer, experience as a Block Engineer is very important to perform other engineering functions under the MEA. Some graduate engineers were posted as Block Engineers and some of them are performing very well. All the RPMs posted to System 'B' after taking over of the main irrigation system (all concrete lined canals) are Chartered Engineers. This is a very important decision in view of the cost of the irrigation channels in System 'B.' A slight damage to the channels due to improper operation can cost millions of rupees.

Allocation of Irrigation Management Functions in a Project

The DRPM (WM) is responsible to the RPM for all the engineering activities in a project. Technical instructions are given to him by the Chief Irrigation Engineer. He has the Flow Monitoring Unit and the Main Channel Unit directly under him. A Civil Engineer (graduate engineer), an Engineering Assistant, a Draftsman, and a Clerk are the staff who work directly under the DRPM (WM).

The Flow Monitoring Unit is headed by an Engineer (graduate engineer or a technician engineer) and he is assisted by one or two Engineering Assistants, a Draftsman, two Technical Officers (work supervisors), and a few laborers.

The Main Channel Unit is headed by an Engineer (civil engineer or a technician engineer) assisted by two or three Engineering Assistants (depending on the project), a Draftsman, two or three Technical Officers, and Water Issue Laborers (depending on the project).

Other resources (transport, materials, equipment etc.) for these two units are provided through the DRPM (WM) by the RPM. There are Mechanical Engineering Service Units functioning directly under the DRPM (WM) or under the RPM. Machinery and equipment for irrigation improvements and operation and maintenance work are provided by the Mechanical Engineering Service Unit which is headed by a Mechanical Engineer. The Main Channel Engineer is responsible for operation, maintenance, and improvement work of the main channel and branch channels feeding more than one block. He has to issue water according to the requirements of the Block Engineers.

Flow Monitoring

In order to have an efficient system of management, accurate flow measurements commencing from the main sluice to the field channels are necessary. This has to be done by a (separate) unit other than the main canal unit or the block irrigation unit. In addition to the measurement of discharges in the main and branch canals and distributary and field channels, rainfall observations, discharges in the drainage channels etc., are also necessary to analyze the efficiency of

irrigation management. Records of water issues, rainfall, conveyance losses in the channels etc., and records of operation of the reservoirs have to be maintained. Flow Monitoring Units have been established in all the projects under the MEA to fulfill the above functions. At present, the Flow Monitoring Unit in System 'H' is functioning properly. In other systems it will take some time to reach the accepted levels.

Measuring Devices

In the channel system, measuring devices have been provided at the heads of all channels and also at intermediate points in some channels. Parshall flumes have been provided for main and branch canals, and for some distributary channels. It has been found that most of the parshall flumes provided in large channels function properly because high submergence can be allowed in large channels. Seventy percent submergence can be allowed for flumes of 1-8 feet (ft) width and 80 percent for flumes of 8-50 ft width. Most of the measuring devices (including weirs) up to the distributary channels are functioning properly.

The measuring devices in most of the field channels (mostly weirs) are not functioning, mainly due to poor maintenance of the field channels. When the field channels get silted and when weeds grow in them higher heads are required at the beginning to get the required discharges. As a result, free-flow conditions or tolerable submergence limits cannot be maintained and the measuring devices cease to function. This has happened in a few distributary channel and branch canal parshall flumes too, as the canals and the channels have not been excavated to correct levels at those sections or as excessive siltation has taken place.

For the gauging stations where the measuring devices were submerged rating curves have been established by current metering. The current metered rating curves are fairly accurate provided rating is carried out frequently. The rating curves of the measuring devices have also been checked by current metering. The intention is not to gauge the structure by current metering but only to insure that the structure has been constructed properly. In most of the measuring devices, slight errors during construction (e.g., in proper location of the gauges etc.) can lead to considerable errors in the measurements of discharges. If the rating curves obtained by current metering are fairly close to the rating curves of the measuring structures, these can be used. Otherwise the dimensions of the structures and the elevations of the crest, transition etc., have to be rechecked and corrected.

Functions of the Flow Monitoring Unit (FMU)

1. The FMU headed by an engineer checks the accuracy of all the measuring devices in the system up to distributary channels by current metering and comparing the readings with discharge curves of the measuring devices. This is done on a regular basis. If the Main Channel Engineer or the Block Engineers inform about any discrepancies, the FMU checks them immediately.

2. Readings of measurements from all the measuring devices are collected by the FMU from the Main Canal Unit on a weekly basis. Rainfall records from the rain gauge stations at the Block Office and other key locations are also collected on a weekly basis.

3. Instructions are given to the Block Engineering Staff regarding operation and maintenance of measuring devices in the field channels. Sometimes Engineering Assistants and Technical Officers from the FMU carry out current metering jointly with the Block Engineering Staff when there are problems.

4. After collecting and checking all the records the data are fed to the microcomputer where set programs have been prepared. Following are the inputs to the programs.
   Daily discharges in the main and branch canals.
   Daily issues to the distributary and minor branch channels from the main canal.
   Daily rainfall.
   Daily reservoir elevation.
   Daily inflow into the reservoir (diversions).
   Cultivated extent in the respective administrative blocks.
   Date of commencement of water issue in each channel etc.

5. At the end of the month a report is prepared indicating monthly water issues in the main canals, issues to the blocks, rainfall in the blocks, extent cultivated, conveyance losses in the main canal, conveyance losses within the administrative block etc. The corresponding data from the seasonal operational plan are also compared with these values. A separate water-balance statement is prepared for the reservoirs and it will indicate reservoir storage, evaporation losses, inflows (from catchment and from diversion), issues from the reservoir, etc.

6. This report indicates water consumption at different levels, losses from the reservoirs and main canals and from irrigation systems of the blocks. Beginning from the end of the first month of the cultivation season by comparing these values with those of the seasonal operating plan (SOP), it is possible to assess the efficiency of irrigation management or to find out the problem areas. Remedial measures can be taken to correct any faulty operations or alternative action can be taken once the problems are highlighted. This information is useful for planning of water issues in the same system in the future and also for planning water issues in other systems.

Block Engineers are responsible to the Block Manager for all the Engineering work in the block. He is assisted by three Engineering Assistants, a Draftsman, three Technical Officers and Water Issue Laborers. All the resources are provided to him through the Block Manager. Technical instructions are given by the DRPM (WM). The Block Engineer has to get the mechanical engineering services through the DRPM (WM).

The above functions of the different divisions were fixed after a few years of operation.

Procedures Adopted for Attending to Maintenance, Irrigation Improvements, and Other Civil Engineering Work

As mentioned earlier, immediately after taking over the irrigation systems, the MEA had to attend to a lot of irrigation improvements. At the initial stage it was not possible to decide on a procedure as to how improvements should be done. As such, in the three projects in System 'H' improvements were done by the RPMs on the recommendations of the DRPMs (WM). For irrigation work, Nochchiyagama project area was considered only as a block. There was only one Irrigation Engineer and he functioned as the Project Engineer. He had the services of more Engineering Assistants and Technical Officers than in the other projects. The irrigable area under Nochchiyagama was about 10,000 acres in 1981. It increased to about 11,500 acres by 1983. Each of the other two projects in System 'H' was managing about 30,000 - 35,000 acres at that time. A lot of improvements were done to the irrigation systems during this period (1981 - 1983) as there were a lot of problems in water issues.

There were complaints that a lot of money was being spent on improvements on a completed irrigation system. At this stage the Executive Director instructed the Chief Irrigation Engineer (CIE) to investigate whether all such improvements were necessary and if so to propose a system for implementing essential improvements. During investigations it was revealed that most of the work done had been very effective in improving the efficiency of the irrigation system. However, some work had been done without proper investigations and analysis of the actual problems. Most work was in the Nochchiyagama project where a DRPM (WM) was not present. Some of such work had been done due to a lack of understanding of the design principles of an irrigation system. Only very few such improvements had been done in the other areas where all improvements were approved by the DRPMs (WM). Some work done under improvements were additional facilities not provided in the original design (e.g., additional bridges, channel crossing, etc.). The overall benefits from the improvements done during this period are very high compared to the cost of improper or unnecessary items of work. The cost of all such work is only a very small fraction of the total expenditure on irrigation improvements.

On receipt of investigation reports regarding irrigation improvements from the CIE, the Executive Director decided that the MEA should adopt a proper system in implementing irrigation, maintenance, improvement, and other civil-engineering work. In 1984, the MEA decided on the following procedure. Maintenance work is considered as a minor repair to an irrigation channel or channel structure and the remedial work involved should only be able to bring it back to the original condition. Desilting, weed clearing in channels, repairs to structures etc., are considered as maintenance work. Maintenance work has to be identified at the unit level by the Engineering Assistants who have to prepare proposals and estimates and submit them to the Block Engineer. The Block Engineer submits them to the DRPM (WM) after checking and amending them wherever necessary. The estimates are approved by the RPM on recommendations of the DRPM (WM). Priority of the implementation will be decided by the Block Manager.

Any modifications of the irrigation system, reconstruction, provision of additional facilities etc., are considered as improvements. Irrigation difficulties, proposals for improvements, additional facilities etc., are brought to the notice of the Block Engineers through the Unit Managers or by the Engineering Assistants. They are investigated and proposals are formed by the Block Engineers with the assistance of the Engineering Assistants and in consultation with the

DRPM (WM) wherever necessary. These proposals along with the estimates are submitted to the DRPM (WM). The DRPM (WM) after checking and making amendments submits the list of such improvements along with the estimated cost to the CIE of the MEA. The CIE should inspect the sites if necessary, go through the proposals and inform the RPM whether to proceed with the work or not. Sometimes, alternatives are suggested for such work. The DRPM (WM) has to amend the proposals according to the CIE's observations.

The estimates for the improvement works are approved by the RPM on the DRPM's (WM) recommendations within his financial limit of Rs 500,000. If the cost of an improvement is above Rs 500,000 the estimate has to be approved by the CIE on behalf of the Executive Director. Contracts for work costing between Rs 500,000 and Rs 1,000,000 are awarded by the General Manager's (MEA) Tender Board. Contracts for work above Rs 1,000,000 are awarded by the Executive Director's (now Managing Director) Tender Board. The present financial limit of the Managing Director's Tender Board is Rs 2,000,000. By this procedure any work identified by farmers or officers at any level is investigated. Proposals will be implemented only on approval of the CIE. The prioritization is by the Block Manager and the RPM depending on the availability of finances. Decisions regarding other civil engineering work (roads, buildings etc.) are taken by the RPM in consultation with the Executive Director. The same procedure as for irrigation improvement works has to be followed in implementation of the same.

Operation of the Irrigation System

The releases of water for irrigation and power generation from the reservoirs and diversions of various systems are being done according to seasonal operating plans approved by the Water Management Panel. The Director General of the Mahaweli Authority of Sri Lanka is the Chairman of the Water Management Panel. The Heads of other organizations which use the Mahaweli waters, the Director of Agriculture, Secretaries to the Ministries concerned with Land, Irrigation, and Mahaweli Development, and the Government Agents of respective districts are members of the panel. The Water Management Panel is advised by the Water Management Secretariat (WMS), whose head office headed by a director is in Colombo. Seasonal Operating Plans (maha and yala) are prepared by the WMS in coordination with the Mahaweli Economic Agency, the Irrigation Department and the Electricity Board. The operating plans are finalized at the water management panel meetings. The headworks operation and maintenance unit is responsible for the issue of water from major control points according to the seasonal operating plan (SOP). The Mahaweli Economic Agency and the Irrigation Department are responsible for the issue of water in the areas controlled by each organization.

Seasonal Operating Plan

The seasonal operating plan as approved by the Water Management Panel forms the basis for operation of the irrigation systems. The factors considered in the preparation of the plan are as follows:

a) Inflows to the main Mahaweli reservoirs and at diversion points. Inflows to the other reservoirs and diversion points from those catchments.
b) Rainfall in the project areas.
c) Cultivation periods, the first and the last dates of water issues, period of land preparation (with staggering), type of crops, duration of crops etc.
d) Water requirements for land preparation, evapotranspiration for various crops, infiltration and percolation losses at the farms, conveyance losses in the channels and operational losses.
e) Accepted farming practices in the respective areas. The draft plan is prepared by the staff of the Water Management Secretariat (WMS) in consultation with the MEA and the Irrigation Department about 2 months before the cultivation season. The Chief Irrigation Engineer represents the MEA on all matters connected with the preparation and implementation of the SOP.

The SOP indicates diversions (under average and at 80 percent dry conditions) at main diversion points of the rivers, details of energy generation at various power plants, the date of commencement of water issues in each system or subsystem, the last date of water issues, monthly issues from the reservoirs of the subsystems, monthly diversion to other systems if any, etc. Projected reservoir storage under average and at 80 percent conditions are also given in the SOP.

The Chief Irrigation Engineer in consultation with the Agronomists and Deputy Resident Project Managers (Water Management) prepare the preliminary proposals for submission to the Water Management Secretariat. The Agronomist at the MEA Head Office consults the DRPMs (Agriculture) of the projects in providing information for framing proposals. The RPMs and Project Coordinators are consulted wherever necessary. The preliminary proposals submitted to the Director, Water Management Secretariat are indicated to the RPMs in order to be presented to the farmers through the Block Managers, the Unit Managers and the farmers' organizations. These proposals are discussed at the block level by the project staff along with the farmers' representatives and any suggestions for alterations etc., are presented to the Resident Project Managers.

The Director, Water Management Secretariat (through his staff) prepares a draft SOP based on the preliminary proposals given by the MEA, the Irrigation Department, and the Electricity Board. Adjustments are made wherever necessary. The CIE of the MEA or the representative of the Irrigation Department is consulted in case of major changes. The SOP is prepared with the help of a macro-level computer program. A preliminary water-panel meeting is held about one and a half months before the commencement of the cultivation season. All the members of the Water Panel along with the supporting staff attend this meeting. Any variations or amendments to the draft SOP have to be presented at this meeting. The various amendments as presented are discussed at the panel and decisions taken on agreement of all the parties concerned. This is necessary because alterations in one subsystem can affect the other subsystems. The Director, Water Management Secretariat prepares the final SOP after incorporating all the accepted amendments and presents it to the Water Panel. This is approved at the final water-panel meeting. After the preliminary water-panel meeting, RPMs conduct cultivation meetings in the projects based on the decisions taken at the preliminary water-panel meeting. Any changes are possible at the cultivation meetings only within the broad outlines of the SOP.

Implementation of the SOP

At the subsystem level main and large branch canals feeding more than one administrative block are considered as the main canal unit. Minor branch canals and distributary channels along with the field channels are considered in a similar manner. The approved seasonal operating plan forms the guide for operations. It is not possible to operate exactly according to the SOP, because actual diversions and rainfall differ from assumptions. As such, the MEA adopts the following procedure in issuing water in order to minimize operational losses, to make the best use of rainfall in the irrigable area, to make use of available farm power, and to get the cooperation of the farmers.

1. Cultivation schedules are prepared by the Engineering Assistants for land under each field channel. This is done in consultation with the Unit Managers. From the cultivation schedules water-issue schedules are prepared for field channels, distributary channels, and minor branch canals. In preparation of these schedules factors such as available farm power, best stagger to make the best use of available farm power and labor-minimizing operation losses, probable rainfall in the farms, etc., are considered. The Block Engineers check the schedules and in consultation with the Block Agricultural Officers make changes wherever necessary. This is done about two weeks before the first date of water issue. The schedule will indicate the period of land preparation for each farm, quantity to be issued to each farm depending on the type of soil, frequency of issues, duration of each issue, etc. Water-issue schedules in all the irrigation channels in the blocks are finalized by the Block Engineers and weekly requirements of each distributary or minor branch canal are given to the Main Channel Engineer a week ahead of the first date of water issue.

2. The Main Canal Engineer collects the water orders of the blocks and prepares schedules for water issues in the main and large branch canals based on the block orders. The DRPM (Water Management) checks the water-issue schedules of the main canal and makes adjustments wherever necessary. Sometimes it becomes necessary to change schedules of the block too. Commencing from the first date of water issue the Main Canal Engineer keeps on issuing water according to the approved schedules.

3. Block Engineers submit weekly schedules and the Main Canal Engineer keeps on issuing accordingly. The Block Engineer's schedules are based on assumed rainfall in the block at the time of preparation or without considering any rainfall. In case of any changes in rainfall or changes in any other programs which require changes in water issues in the channels in his block, he informs the Main Canal Engineer on a daily basis.

   For example, due to rains on a particular day (rainfall recorders are available at all Block Manager Offices), the Block Engineer finds that he does not need water for two days in some channels, so he informs the Main Canal Engineer the next day before 9.00 am. The Main Canal Engineer collects such data from all Block Engineers and adjusts distributary-channel issues accordingly. Sometimes the sluice issues will have to be adjusted. These are done on a daily basis after collecting the data. If the Main Canal Engineer does not receive any requests for changes it means that no changes are required from the weekly schedules. The additional

water in the main canal due to the time-lag between operation of distributary channels and main sluice in case of a reduction in block issues, is stored in the balancing reservoirs of the main canal. This storage is also used to meet the immediate additional demands when more water is required for blocks than the quota requested in the weekly schedules (opposite of the previous case).

4. As long as there are no shortages or excesses of water in the reservoirs or in the system, this operation could continue. When there are shortages or excesses fresh decisions have to be taken in consultation with the Water Management Secretariat. Wherever such a situation arises the DRPM (WM) informs of it to the Chief Irrigation Engineer of the MEA. After evaluation of the situation in consultation with the Agronomists, the Project Manager and others, the Director, Water Management Secretariat is briefed and decisions are taken to prevent or minimize a possible disaster. Sometimes it becomes necessary to reduce the issues in the system or to postpone or advance the dates of water issues etc. A very clear advantage in the Mahaweli Irrigation Systems is that the discharges in the main canals and branch canals can be varied through a large range while maintaining peak discharges in distributary channels. This is due to the provision of adequate regulators in the main and branch canals.

5. This process as described in 1-3 above allows the system to operate on a flexible rotation rather than on a fixed rotation. It will be efficient only if the Block Engineers and Engineering Assistants prepare water-requirement schedules after proper assessment of the field conditions. The assessment should commence at the field-channel level. Some farms may require less water from the irrigation channels than others depending on the location and type of soil. The irrigation staff and the agricultural staff should identify the requirements at the field-channel level, take decisions and prepare water-requirement schedules accordingly. This requires frequent inspections, daily changes to the schedules, and very good communication. The MEA cannot claim that this is happening exactly as indicated. Efforts are being made to operate in this manner.

6. Different programs for land preparation are being tried out, for example to issue water to well-drained soils in the upper slopes first, enabling poorly drained soils on the lower reaches to receive the return flows. The most important step is that once water is issued for land preparation the farmers who are scheduled to commence land preparation should actually do so. Otherwise, the water will go waste. The schedules are prepared in such a way that once water is issued to certain areas the best use of the buildup of the water table is made.

7. Every attempt is being made to commence land preparation with initial rains in the project area. Farmers are advised to form proper field dikes to retain rain water and also to commence dry plowing.

8. Various methods of land preparation for growing upland crops are being experimented. The main purpose is to prevent crop damage due to high water table in case of heavy rains and to reduce losses during the dry period.

9. Improving drainage channels in order to provide effective drainage to the poorly drained LHG soils.

10. Buildup of salinity is being monitored in the whole project area.

11. Marketing studies are being done to recommend profitable crops to the farmers. At present most of the upland crops other than chili do not bring profits as high as rice. Cultivation of chili requires a lot of labor and it will be very difficult for a settler to cultivate 2.5 acres of chili with his family labor. If chili is grown on all the well-drained soils, marketing will be a big problem.

12. Efforts are being made to measure water issues up to the head of the field channels. Reliable measurements are being made up to the head of the distributary channels at present. Attempts are also being made to measure the return flows. It has already commenced in a few selected areas. Groundwater-level observations are being made at selected locations.

13. Educational and training programs for the farmers are being conducted. Benefits of economizing water, benefits in working in groups etc., and all other relevant findings of on-farm development are being explained to the farmers. It is intended to hand over the operation and maintenance of the field channels entirely to the farmers. In the preparation of cultivation programs farmers' suggestions are also considered and adopted whenever possible.

14. In case of unexpected weather conditions following the preparation of the seasonal operating plan, farmers are consulted and cultivation programs adjusted to suit the conditions. In order to achieve this it is necessary to maintain very close contact with the farmers' organizations.

Farmers' Organizations

As described earlier farmer participation is essential for efficient irrigation management. In order to implement the procedure as described, farmers have to be consulted at various stages. Different types of farmers' organizations have been tried out at different projects. The turnout leader is common to all farmers' organizations. The main objective is to bring officers and the farmers together and to take collective decisions. Whenever farmers have to be consulted in taking decisions, it is not possible to summon meetings and address all the farmers. As such, an organization as described below will be of much use to sort out the problems. The smallest organization under this system is the Unit-Level Committee which covers an irrigable extent of about 200 ha. It comprises Unit-Level Officers and all turnout leaders. The Chairman and Secretary will be appointed from the turnout leaders. The Engineering Assistant covering that Unit will be advising on all irrigation matters. The next organization is the Block-Level Committee which is chaired by the Block Manager. The Block Irrigation Engineer is the Secretary to that Committee. The Chairman and Secretaries of the Unit-Level Committees are members of the Block-Level Committee. Whenever the Block Manager wants to consult the

farmers and take decisions, it is done through the Block-Level Committee. In preparing cultivation schedules etc., the Engineering Assistants work through the Unit-Level Committees.

Another type of organization is the D-Channel Committee System. The Committees are formed by electing a few turnout leaders or by electing any of the farmers receiving water from a D-Channel. These organizations are also functioning in some areas. The MEA management has not approved a particular system for formation of farmers' organizations. It is not desirable to do so. However, the MEA officers make suggestions to streamline the functions. Otherwise, the farmers can feel that the management is forcing them to form organizations in a set way. None of these Committees are involved in the collection of O&M fees. If the farmers' organizations want to play an active role in management, Block-level Committees have to be formed. This has not happened except in zone 2 of system 'C.' A major problem with the D-Channel or Field-Channel Committees is that they try to look after their own interest at the expense of others. There is no coordination between the D Channel Committees. It is not possible for farmers to form Block-Level Committees without the support from the Management.

In preparation of cultivation, the land preparation, and water-issue schedules Engineering Assistants consult TO leaders and D-Channel Committees direct or through Unit Managers. Approved schedules can be adjusted but this should be within the limitations of the irrigation systems. There may be instances when it is not possible to accommodate all preferences of the farmers. Then the Engineering Assistants have to take the decisions and farmers have to follow them. Sometimes farmers make requests for additional facilities which affect farmers under other D-Channels. There again the Engineering Assistants or the Block Engineer has to take the decision. If we take statistics of all farmers' organizations in the Mahaweli, we will find that only a few are functioning efficiently. The efficiency of tertiary system management depends on the efficiency of the EA, the UM, the TO leaders, the D-Channel Committee leaders and the Water Issue Laborers. Sometimes the EA has to take sudden decisions (e.g., closing of a field-channel gate after a short period of rains or when he finds that farmers are not making use of water issued). During such a situation the EA may or may not be able to contact the TO leader but he has to take a decision immediately. Otherwise water will go waste. If the TO leaders of the D-Channel group is active the EA can consult them and take decisions. In some areas the Engineering Assistants adopt different approaches during land preparation. Instead of fixing the schedule for land preparation he fixes the period during which water will be used for land preparation in consultation with the TO leaders or the D-Channel group leader. If the farmers fail to prepare the land during the given period, they are given a few more issues if the delay is due to unavoidable circumstances. If he finds that farmers are not making use of the water he closes the channel till the farmers are ready. This method has worked well in some areas.

Land leasing is a major problem which affects the participation of farmers' organizations in irrigation management. The persons who lease or the persons who get the land on lease are not interested in any organization. They will not coordinate which will result in a lot of problems. There are few farmers' organizations which have helped their members to take back the leased land.

Farmers' organizations should be formed for all connected activities with the Irrigation Management. Other functions like agricultural extension, marketing etc. should be combined. There could be separate representatives for different disciplines but all functions should be under one organization.

According to our experience farmers' organizations can be used very efficiently for the following purposes.

1. To operate and maintain the field channels (turnout).
2. To insure proper distribution of water from distributary channels to field channels.
3. To prepare workable rotation schedules and staggered cultivation programs, making use of available farm power and other resources.
4. To eliminate wastage of water (avoiding surface runoff from farms to drainage channels).
5. To prevent encroachments into channel reservations and to prevent damages to channels.
6. To do small-scale contract work in maintenance and improvements.
7. To face crisis situations e.g., sharing of water when shortages occur, organizing *bethma* cultivations etc.
8. For crop diversification.
9. For effective marketing of produce.
10. For proper use of inputs.

In order to achieve the above benefits some authority has to be given to the farmers' organizations. This is a major problem because it involves legal, administrative, and other matters. The organization as mentioned here (System 'C' zone 2) has the advantage of implementing decisions through the Block Manager. For any farmers' organization (on irrigation management) to be successful, the officer responsible for maintenance and water issues has to work in very close coordination with the farmers. In the MEA the Engineering Assistant is the most important person in this exercise. He has to play a vital role. It has been found that in all successful farmers' organizations, Engineering Assistants of the MEA or Technical Assistants in the Irrigation Department have played the key roles.

There are proposals to hand over the entire operation from the distributary channel downwards to the farmers. In our opinion this is not desirable. Any sensible farmers' organization under the present social setup in this country will not like to take that responsibility. Responsibility should be shared and decisions taken in consultation with farmers' organizations.

Cost of Operation and Maintenance of Irrigation Systems

As already indicated, immediately after handing over an irrigation system a lot of work remains to be done with the water issues. The cost of such work cannot be considered as maintenance. It is only after a period of about five years of operation that the system can come under normal maintenance. It is generally accepted that farmers should pay for operation and maintenance of the irrigation systems. During 1982 - 83 attempts were made to evaluate the average operation and maintenance cost per acre of irrigable land in all major irrigation projects. After collecting the available data from various projects under the Irrigation Department and the MEA, it was agreed that Rs 200 per acre per year is the average value. This figure does not include some of the overhead expenditure in the form of salaries and other allowances of the engineering and supporting staff.

A detailed analysis was made of the total operation and maintenance expenditure in selected administrative blocks in three projects under the MEA. The first two are new areas where irrigation facilities were provided under the Mahaweli. The third one is an old area (Pimburettawa scheme) taken over from the Irrigation Department. All the possible expenditure incurred for operation and maintenance was taken into account. The values are given in Table 2.

In addition to this operation and maintenance expenditure it is necessary to provide funds for irrigation improvements annually. The annual cost of improvements to maintain the irrigation system in a reasonable state amounts to the same amount per acre as operation and maintenance cost of Rs 200 per acre. This is after an initial maintenance period of four to five years. The cost of additional work during the initial period is much higher and it has to be considered as balance construction work. If this is not done the system will deteriorate and it will not be possible to issue water to the farmers in an equitable manner. If neglected continuously for 5 - 10 years the whole system will have to be rehabilitated. This is exactly what has happened to the irrigation systems in the Walawe project and many other major irrigation projects.

Table 2. Total O&M cost per acre (1983 to 1986), in three selected administrative blocks under the MEA.

Year	O&M cost per acre in Galnewa project Galnewa Block Rs	O&M cost per acre in Tambuttegama project Talawa Block Rs	O&M cost per acre in system 'B' Pimburettawa Block Rs
1983	230	Not available	Not available
1984	335	340	515
1985	305	345	Not available
1986	Not available	410	375
Average	290	365	445

The entire right bank irrigation system of the Walawe project is being rehabilitated at an estimated cost of US$20 million. The actual cost will be much higher. The total irrigable area in the right bank is 29,400 acres (11,900 ha). It is expected to irrigate an additional 5,450 acres (2,200 ha) after rehabilitation. The rehabilitation envisages a lot of improvements to the system which were not provided originally. Additional facilities like service roads etc., are also included in the rehabilitation program. However, very little work has been done under rehabilitation up to date. The design and construction drawings are nearing completion. The following problems have come up in implementing rehabilitation proposals.

1. Firm design concepts have been established and they were followed without the required deviations wherever necessary.
2. The construction work has been awarded as major construction packages.
3. Very rigid operation procedures have been proposed.
4. Introduction of measuring devices to the existing irrigation system has restricted the discharges in the channels to the design limit (allowing for overload). As a result, it is not possible to take a higher discharge in critical situations as was done during the past.

Action is being taken to remedy these defects. Provision of measuring devices into an existing irrigation system has to be done very carefully because the downstream conditions (downstream of the measuring device) are fixed and the required head for the measuring device has to be obtained by adjusting the upstream water level. Sometimes this is very costly and may need provision of additional regulators which can create problems at some places.

Expenditure on operation, maintenance, and improvements can be reduced by providing machinery and equipment for that work.

One good example is the use of a drag line for desilting. The work can be done with the water issues.

Machinery required for this purpose, being not very expensive, should be provided immediately after completion of construction. A few examples are given below:

Class 2 tractors, front-end loaders, agricultural tractors for haulage, motor graders etc. Usually these machineries are provided by the donors who finance the projects.

If the farmers' organizations can provide the labor component very little extra money will be required, to purchase fuel and lubricant, and other materials like cement, rock aggregates etc.

It has been found very often that the machinery allocated for this purpose is being used for other work. As a result, machinery will not be available for maintenance and improvement works and this work has to be done on contract at a very high cost.

The MEA commenced collection of operation and maintenance charges from 1984. It was decided to collect only 50 percent of the actual cost (Rs 100 per acre) for 1984 and to increase the collection gradually by increments of Rs 20. Thus, the rate should have been Rs 200 in 1989. The progress of collection is given in Table 3. As seen in the table, there had been a good response in System 'H' initially but it has come down after 1986. Farmers in System 'C' have responded very favorably. There are many problems in collecting these charges due to the prevailing situation in the country. It is preferable to have alternative methods (in addition to direct collection) to recover the O&M cost.

Instead of directly paying O&M charges, farmers can contribute towards the labor component of the operation, maintenance, and improvement works. In order to achieve this, work should be programed properly. The contribution of the farmers' organizations can be fixed in terms of the number of labor days. Farmers' organizations should be able to undertake to provide the number of labor days according to a predetermined program. This should be in addition to the maintenance work they have to do in the field channels.

It has been suggested to collect an extra fee from the farmers who cultivate rice on the well-drained soils which are ideal for the other field crops. It is correct in principle but not so easy to implement.

Making Use of the Resources Available from Donors

Various donor agencies who provided funds for the projects have insisted on proper operation and maintenance after construction. Finances were made available to purchase machinery and equipment for operation and maintenance, training of personnel (officers and farmers) etc. In some projects, operation and maintenance specialists were posted to train the MEA staff. Various

Table 3. Progress of collection of operation and maintenance charges up to 29.02.1988.

	Amount due	Amount collected	Percentage collection
1984 - Rate Rs 100			
System - H	5,733,500	5,081,325	88.6
System - B	337,759	280,050	83
System - C	525,250	331,058	63
Total	6,596,509	5,692,433	86
1985 - Rate Rs 120			
System - H	7,071,300	4,466,320	63
System - B	411,540	153,060	37
System - G	630,378	160,509	25.4
System - C	383,500	370,500	97
Total	8,496,718	5,150,389	60.6
1986 - Rate Rs 140			
System - H	8,373,240	2,502,560	30
System - B	835,760	211,190	25.2
System - G	634,566	132,871	21
System - C	957,430	870,210	91
Total	10,799,996	3,716,831	34
1987 - Rate Rs 160			
System - H	9,500,410	344,460	3.6
System - B	1,092,365	343,275	31
System - G	840,400	11,672	1.38
System - C	1,553,115	1,109,820	71
Total	12,987,115	1,809,227	14

B. *Actual payments in all systems during each calendar year are as follows:*

YEAR	1984	1985	1986	1987	Total
Amount paid (Rs million)	4.2	2.9	6.3	2.9	16.3

proposals and suggestions have been made by the specialists as well as by the Review Missions. A very useful suggestion by a World Bank Review Mission was the proposal for establishment of Flow Monitoring Units. This was started in System 'H' and now the MEA has decided to establish similar units in all the projects. This unit is functioning very efficiently in System 'H' and at critical periods it has provided valuable services. The equipment and other facilities for the unit in System 'H' were provided under a loan. The machinery and equipment provided for operation and maintenance under the loan to system 'H' were found to be very useful. However, in order to obtain the best services from this machinery a very efficient Mechanical Engineering

Service Unit is necessary. Under certain circumstances there will be no alternative but to use the machinery directly. For instance, a main canal breached during the first few days of water issue at a section where an inlet structure had been constructed; by making use of the available machinery it was possible to reconstruct the canal embarkment within two days.

A lot of training programs have been arranged for the MEA staff with the funds provided by the donors. Under these training programs it was possible for the MEA staff to inspect how operation and maintenance work is being done in other countries. It has been found that some of the operation, maintenance, and water management specialists who had come to prepare O&M programs and train the MEA staff did not have sufficient experience in that type of work. Their qualifications and experience had not been evaluated by qualified personnel before approving the assignments.

ADVANTAGES AND DISADVANTAGES OF THE PRESENT ORGANIZATIONAL SETUP

Advantages

1. All disciplines are represented in the MEA and it has the in-house capacity to attend to settlement and post-settlement activities. This is very vital for irrigation management. In the Head Office, the Executive/Managing Director of the MEA with the advice of Heads of Divisions can attend to all the activities. In case services are required from other organizations Heads of Divisions are there to advise him. All the information on activities in the projects is available with the project coordinators.

2. The Executive/Managing Director has the overall financial and administrative control to take decisions regarding all activities in the projects with the advice from Heads of Divisions of respective disciplines.

3. The RPM with the assistance of the DRPMs (or Project Officers) of respective disciplines has the capacity to attend to all the activities in the projects. He has the financial and administrative control. All the resources (personnel, finances, machinery and equipment, materials etc.) are managed by him. If the resources are used correctly with the advice from his assistants the project can function very efficiently. He can consult the Executive/Managing Director whenever there are problems.

4. The RPM has to operate through the Block Managers and the Unit Managers and farmer's problems come to him without much delay. This is very important in irrigation management because he can find solutions to problems of farmers without any delay.

5. Farmers have the advantage of bringing all their problems or getting all the required services through the Unit Manager. The Unit Manager has personal contact with the farmers in his unit

and he can provide the services to the farmers by taking their problems to the Block Manager and getting the services of the Block Officers. Most of the irrigation problems can be solved in this manner very easily. Under this setup it is not necessary for a third person to act as a contact between the Unit Manager and the farmers.

6. As the MEA has direct contact with the farmers through the Unit Managers it is very easy to take decisions on cultivation programs, amendments to programs due to various problems, and to share the available water etc. Taking early decisions during an emergency or during a critical situation is very important. The Chief Irrigation Engineer (CIE) in the Head Office will be able to take major decisions regarding diversions from the main Mahaweli system according to the decisions taken at the projects.

7. Operation and maintenance responsibilities have been given to various units (main channel unit, administrative block, FMU etc.) and each unit has the required staff to perform the functions under that unit. The responsibilities are well-defined in this manner and it is not possible for one person to blame the other for any irregularities.

8 During the last few years, System 'H' experienced severe water shortages. During such critical periods, the available water was shared in the best possible manner and the crops were saved. This would not have been possible in other schemes. During certain periods, water was issued on 10-day rotations, 12-day rotations etc. After realizing the overall benefits of such action, farmers agreed to the restricted issues. Bethma cultivation is being done effectively during yala seasons in System 'H.'

Disadvantages

1. The CIE in the Head Office issues instructions to the Project Engineering Staff through the RPM. All instructions other than those based on water-panel decisions need not be implemented by the RPM. Priority in implementation is decided by the RPM through the Block Managers. Due to this, important instructions as far as irrigation systems are concerned, can be given less priority than solving immediate minor problems of the farmers. Some of these minor problems may be due to the negligence of the farmers or it may be an additional facility to some farmers, for example when improvements to a minor reservoir in the system can be delayed in favor of providing an additional bridge across the channel.

2. Sometimes Engineering Staff in a project may attend to irrigation problems without investigating them properly. The Block Engineer may do something without proper engineering analysis just to satisfy the Block Manager or the RPM. In such an event, if the DRPM (WM) or the CIE finds fault, the officers are not concerned because it is the Block Manager and the RPM who will decide on their performance. As a result, the Engineering Staff can neglect the proper approach to the problems and the irrigation systems will suffer.

3. The required facilities may not be given to the Engineering Staff to carry out analyses of engineering problems properly. In order to analyze most of the irrigation problems a lot of surveying and leveling work is necessary. To do that work transport and laborers have to be provided. Sometimes these facilities are not provided but the RPMs and the Block Managers expect the officers to do some remedial work. Sometimes the DRPM (WM) will be helpless as the resources are not available with him e.g., the Block Manager may notice overflowing in a channel or flowing up to the bund top-level in a channel. He will instruct the Engineering Assistant or the Block Engineer to fill the bunds at that place. This type of work is being done very frequently. To analyze such a problem it is necessary to take levels (longitudinal sections and cross sections) along the channels, measure the flow in the channel, check on the channel structures etc. In order to do that resources have to be provided. It is only after proper investigations that the actual defect can be detected. These problems may be due to one or more of the following defects:

   Due to under-excavations at a few sections downstream of that point.
   Due to under-excavation of rock or not excavating rock to correct line and grade.
   Due to overloading of the channel.
   Due to a faulty construction of a structure downstream of that point.
   Due to silting or weed growth.
   Due to settlement of channel embarkment.

4. The DRPM (WM) will not be able to make the best use of available resources (like transport vehicles, labor etc.) within the project, as such facilities are not directly available with him. They are available only with the Block Manager or the RPM and it is at their discretion that the facility will be provided.

5. Major damages unnoticed by the Block Managers or the RPMs can be neglected even if the Engineering Staff insist on correcting them, e.g., growing of trees on reservoir dams and channel embarkment close to channel structures etc. A non-engineer may not realize the damage that can be caused because such damages cannot be noticed immediately.

6. Completely avoiding the line organization is not desirable, e.g., the Engineering Staff not being responsible to the Head of Division in Engineering or the Block Engineer not being responsible to the DRPM (WM).

7. In making use of resources from donor agencies for operation and maintenance work, the CIE is not directly involved in taking decisions. Sometimes decisions on engineering aspects are taken by others without realizing their adverse effects.

Resource Mobilization in Irrigation Management: Myths and Realities in a Comparative Perspective

Khin Maung Kyi[5]

INTRODUCTION

THE PURPOSE OF this paper is, first, to synthesize experiences of various Asian countries with regard to mobilization of resources for operation and maintenance of existing facilities, and second, to analyze the alternative resource mobilization methods and options available and present a clear picture of each of these alternatives. It is intended that this paper will suggest concepts or ideas that could be used in analyzing the options and problems of resource mobilization in Sri Lanka.

The paper is based mainly on two previous works. The first, "Financing of Irrigation Services" (Small et al. 1989), presents case studies from Korea, Indonesia, Nepal, the Philippines, and India regarding the recovery of irrigation costs including both operation and maintenance costs and capital costs.

The second study on which this paper has drawn is an unpublished report, written by this author as a follow-up of the above mentioned one, to find out changes that have taken place since the case studies were written in 1984 and also to ascertain whether any of these countries are interested in forming an irrigation finance network to coordinate research and related activities regarding irrigation finance. In addition to these studies, the present paper also uses various other works on irrigation finance. However, it mainly derives its conclusions from the experiences of the countries in which IIMI's previous projects were carried out.[6] The more recent study on a research network on irrigation finance, in Thailand, Malaysia, Bangladesh, and Indonesia are included.

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[5] Senior Management Specialist, International Irrigation Management Institute, and formerly of the National and University of Singapore.

[6] IIMI is grateful to the Asian Development Bank for its support of this work on financing irrigation.

The present paper will also avail itself of experiences regarding recovery of irrigation costs in Sri Lanka as well (Kyi 1989).

FINDINGS OF RESEARCH STUDIES

Before we delve into details of the experiences of these countries regarding the recovery of irrigation costs and resource mobilization, let me summarize a few important points from these studies. First, most countries we have researched are conscious of the need for the recovery of at least operation and maintenance costs. The necessity arises because of the financial stringencies in the countries themselves, or because of the difficulty of obtaining funds from the international donors or lending organizations to finance rehabilitation costs which will surely be incurred if the systems are not properly maintained for some years. In the past, in some countries, irrigation systems were not maintained at the desired level and were left to decay for some years and were rehabilitated at a later stage, usually with international assistance. This option is becoming more difficult because donors are unwilling to finance this "neglect and rehabilitate" option and insist on proper maintenance to be financed by the users themselves. Under these circumstances, all these countries are making efforts to mobilize resources internally so that systems could be maintained at a reasonable level of efficiency.

The second point is that though most countries subscribe to the idea of recovery of operation and maintenance costs to the fullest extent, the full recovery of the capital costs is not accepted or acceptable in most cases. The reasons are obvious. If the full capital costs were to be recovered from the users or the farmers, under the existing economic structure of farming in Asia, which includes largely very small marginally profitable farms, a very substantial part of the family income will have been taken away. It will be suicidal, politically, for any government to introduce this type of measure. It is unlikely that the full recovery of capital costs will be attempted in any country in the region.

Methods of Resource Mobilization

Four methods of resource mobilization are commonly recognized. The first is the collection of irrigation fees or irrigation charge. This is collection based on irrigated area, and collected annually or semiannually from the farmers or the users as in the case of the collection of traditional revenues. The assumption here is that for the services provided at the existing level of efficiency, the user or the farmer should pay a certain fee. The fee, in most cases, does not recover the full costs of O&M and is collected by the revenue agencies or irrigation agencies themselves. Very often, the revenue collected will go directly into the treasury. The money provided for operation and maintenance costs comes directly from the budget allocated, with no relationship to the amount of money collected.

The second method is the collection of requisite service fees for an enhanced level of service. This method is different from the previous one because it implies the idea of a contract. Under this concept, the irrigation agency is required to provide an acceptable level of service to the farmers so that the users or the farmers will be willing to pay for it. In other words, the level of service provided must be enhanced so that the needs and requirements of the user will be satisfied and the user will pay for the service for what it is worth. The concept of reciprocity and mutual obligation on both sides is implied here. This new innovation is just introduced in Indonesia and we will be returning to this aspect later in this paper.

The third option is the turnover of the tail end of the operations of the irrigation system to the farmers, particularly management and operations of distributary and farm channels to the farmers' organizations. It may be like a reverse vertical integration; operation of part of the system or the tail end of the operating system is given over to another organization, a smaller and less powerful one, the opposite of vertical integration in economic terms. However, in this case, the other organization may not have existed at the time of the transfer and, therefore, a new organization has to be set up so that this function could be undertaken. This is presently a very popular option for mobilizing the resources of the farmers. It envisages that, by sharing responsibility with or giving responsibility to the farmers' organizations, not only will their contribution be mobilized but also the operation itself will be user-oriented and, therefore, likely to be more efficient than the one operated by the agency.

The fourth option is the complete transfer of smaller systems to the users or the farmers' organizations. Many countries find that it is more economical and efficient for the users to manage the smaller systems by themselves. In Nepal, the smaller systems, which were previously developed by the government, and which could now be handled or managed by the farmers, are transferred to them. In the Philippines, the small systems which are not paying for the operation and maintenance costs are transferred to the users themselves. Likewise, in Indonesia which has had a long tradition of the farmers owning and managing small systems, smaller systems which have been developed with the assistance of the government are being transferred to the farmers' organizations. However, this option is not really an alternative to the previous three because it relates only to smaller systems which farmers can manage completely, whereas the other three alternatives are related to larger systems which individual farmers' organizations cannot possibly operate or take over. Only a portion of the operation and management of the facilities is involved and the ownership and organization remain unchanged.

This is a very brief summary of what has been practiced, especially in Asian countries, regarding the recovery of irrigation costs. Next, we shall discuss research findings on the various practices of resource mobilization such as the question of collection and ability to pay. Then, we shall discuss the four alternatives mentioned in-depth from both the organizational and economic points of view, and evaluate their chances for success and their pros and cons. It should be noted that irrigation cost recovery is principally a concern of the larger systems. Therefore, the examples used and problems discussed will be limited to the problems of resource mobilization of the larger systems. Problems of the smaller systems are not discussed here.

Highlights of Experiences in Asia

Let us first deal with the experiences of the various countries regarding the amount of expenditure spent for irrigation operation and maintenance. The performance characteristics covering the recovery of irrigation are summarized in Table 1 for the countries studied in the IIMI project.

O&M expenditures vary from US$216.8 per hectare (ha) for Korea to US$6.8 per ha in Bihar, India. The variation is wide because of differences in price levels and costs and also because the systems are maintained at different levels of effectiveness and efficiency. In Korea, a very high per hectare expenditure is spent on O&M. The operation and maintenance of both medium and large irrigation systems are managed and financed by 215 Farm Land Improvement Associations, cooperatives consisting of farmers, whereas in most other countries the irrigation departments maintain the systems including distributaries, often with some contribution from the farmers such as labor.

Table 1. Relative expenditure of O&M operations, level of service fees, and farmers' contributions (1982-1983).

	Korea	Indonesia	Nepal	The Philippines	India (Bihar)
1. Average O&M expenditure per hectare	216.8	20.22 a	6.4-14.2	28.26	6.8
2. Desired level of O&M per hectare	-	31.9 a	13.7-41.2	34.26	10.56
3. Actual O&M as percent of desired level of O&M	-	34-63	46	82	64
4. Farmers' contribution - irrigation fee per hectare	196	4	6	17	6
5. Who is responsible for O&M					
Main System	Co-op	Agency	Agency	Agency	Agency
Distributary	Co-op	Agency	Agency	Agency	Agency
Farm Outlet	Co-op	Farmers	Farmers	Agency	Agency
6. Rate of collection of irrigation fee	Very high	Very high	Low to medium	Medium 50	Low
7. Fee or charge as percent of actuals	92.9	18.6	18.9-37	74	57
8. Fees collected as percent of assessment	100	x	1.5 - 52 (20)	50	26

Per hectare rates are all in US dollars

Source: Small, et al. (1986, 1989).

Another observation we can make is that except in Korea, in most other countries the amount spent on O&M and the desirable level of O&M expenditures differ widely. In most cases, actual O&M as percentage of the cost of the desired level of O&M cost varies from 34 to 82. In the Philippines, the desirable level of O&M and the actual cost of O&M are closer than in other countries. The next observation is the amount of irrigation fees collected in different countries; it again varies. In Korea, the farmers' contribution is almost equal to the O&M expenditure, whereas in Indonesia, Nepal, Thailand, and Malaysia the amount contributed by farmers forms a small part of the actual irrigation expenditure. Even in Malaysia where the irrigation system is well-managed, the fees collected were found to equal only 20 percent of the actual O&M cost.

In many instances, the amount of irrigation fees imposed is nominal. Many governments are reluctant to impose the recovery of full irrigation costs. For instance, in Thailand, the State Irrigation Act of 1942 permitted the Royal Irrigation Department (RID) to collect a water charge of 0.5 baht per rai per year from farmers who received water from the systems. This provision was never enforced. But on the RID's recommendation a bill was submitted to the parliament in 1975 to raise the water charge to a level sufficient to cover the O&M cost at the time. Though the bill was passed, the water charge was limited to a ceiling of 5 baht per rai per year. The Ministry of Agriculture & Cooperatives had attempted to raise this limit from time to time, without any success. Currently the Royal Irrigation Department is planning another attempt to present a new bill to the parliament on similar lines.

Likewise, in Malaysia, charging the full cost of O&M was considered out of the question as farming is already heavily subsidized and yet the rice farmers are the poorest stratum of the society. In Indonesia, irrigation fees, as such, were never really collected. Instead, there were different types of land tax, which siphoned away part of the income of farmers but never explicitly as an irrigation tax.

Similarly, in Bangladesh, charging of irrigation fees is very reluctantly being introduced. Under the Irrigation Ordinance of 1963 and Irrigation Rules of 1965 a maximum rate of 10 percent of irrigation gross increased benefits to the land or to the occupier was to be imposed. Under this ordinance, the government decided to impose a water rate of 3 percent of the gross increased benefits. However, this policy was never practiced because of difficulties, particularly, in assessing the benefits to the farmers. Under the new ordinance which came into effect in 1984, a flat rate per acre per crop season for each individual project was to be imposed to cover the annual O&M cost. This fee is collected in 12 existing irrigation projects, but the amount imposed, which is about 250 Taka per acre to 100 Taka per acre, does not add up to the full cost of O&M in all these projects. The assessed amount is still far short of the actual total cost of O&M.

With regard to the collection of assessed fees, except in the case of Korea and the Philippines, in all other countries the fees collected, as percent of assessment, turn out to be very low. The rate of collection as percent of assessment is about 20 on the average in Nepal, 26 in India, and much lower in the case of Thailand. In the Philippines, collection as percent of assessment is 50. In the case of Korea, it is almost 100. When we take into account the cost of collection a more serious picture develops. In Bihar, India, in 1984/1985 when the cost of collection was taken into account, actual collection became negative. In other words, the expenditure on revenue collection as a percent of annual amount collected turned out to be 132. This is because in Bihar an elaborate revenue collection system was set up and assessment, billing, and collection are done by the Revenue Department. However, when its costs are taken into account the collection cost

is higher than the amount collected. This shows that the cost of collection is another important factor we must seriously pay attention to in selecting any resource mobilization alternative.

Regarding farmers' ability to pay the full cost of O&M, Leslie Small's book (Small et al. 1989) points out that even the full cost of O&M will still form a very small percentage of the total benefits of irrigation, implying that it is within the capacity of the farmers to pay the full O&M cost. They also point out that the full cost of O&M plus a certain portion of the capital cost can be paid by the farmers or the users in most cases, without significantly reducing their income level or taking away much of the benefits. However, they clearly indicate that the full recovery of O&M plus capital costs will not be possible under the present economic conditions. The full recovery of these two costs will take away 50 percent or more of the farmers' additional benefits from irrigation; this step will definitely reduce the standard of living of the already impoverished farmers. They also point out that even relatively more affluent farmers, such as Korean farmers, will find it hard to pay the full costs of O&M and capital unless other parameters such as prices given for the crops are changed drastically.

Let me summarize what these various findings have indicated.

1. The average O&M expenditures spent per hectare is still only a part, in many cases a small part, of the desired level of O&M. Contribution from the farmers, either by way of money or labor contribution is still short of the actual cost of O&M except in Korea.
2. The cost of collection, i.e., transaction costs, is often higher than the revenue collected.
3. The farmers have the ability to pay the full cost of O&M, measured by the relative percentage of the O&M cost to the additional irrigation benefits.
4. In spite of this, in countries where small marginal farming predominates, the collection of full costs of O&M is reluctantly attempted.

ALTERNATIVE OPTIONS AND RELATIVE MERITS AND DEMERITS

Irrigation Fees

One of the obvious solutions for the recovery of costs is revamping the collection of irrigation fees. This usually involves rationalization of the fee structure, development of collection machinery, and stricter enforcement of rules. This option is tempting especially if it is assumed that farmers, even under the existing income structure, are considered to be in a position to pay the full costs of operation and maintenance. Of the five countries studied, Small et al. (1989) have pointed out that the farmers can pay even under the existing circumstances. Since this is a beaten track and is the easiest solution to the problem, many countries would like to pursue this line of thinking. Recently, Bangladesh introduced an apparently vigorous campaign to collect irrigation fees from the irrigation systems. In Thailand, too, the farming areas which have been modernized by land consolidation to enjoy the full benefits of irrigation are supposed to pay both the full costs of O&M as well as the cost of the land consolidation.

But the results so far, in both cases, have been disappointing. In the last three years, the rate of collection under the new procedure was still very low. Only a small fraction of the assessment has been collected. In Bangladesh, in the largest of the irrigation projects, the GK system, of a

total assessment of 91.96 million Taka, only 2 million was collected in 1989. Similarly, in Thailand the collections are far behind what was expected. One report indicated that in one particular area called Nongwai, the collection rate had fallen after 1985 and out of 170 water-user groups in the area, 22 groups are not collecting anything at all. Among the groups enforcing the collection rules, 27 groups, 18 percent of the collecting group, collected 1,000 baht or less. As most of the activities for each group will cost much more than 100 baht, the collected amount is almost meaningless.

One important question regarding this option is that the percentage of additional benefit the farmer has to sacrifice for the payment of O&M costs is a good indicator of their ability to pay. Here, Small et al. (1989) imply that the smaller the percentage of additional income the O&M cost forms, the more the chances that the farmers will be willing to pay. Alternatively, they are contending that it is economically feasible for the farmers to pay the full costs of O&M. How far this contention is correct needs to be examined. My observation is that it is not the relative percentage of sacrifice that will be a determining factor in the collecting of the fee; the absolute level of income also must be taken into account. Five percent out of an income of Rs 1,000 will be different from 5 percent out of an income of Rs 10,000, if one looks at it from the point of view of farmers. It will be harder for one from the smaller income group compared to the farmers who have a greater absolute level of income, to part with the same percentage of income. This is very important in the sense that in many parts of Asia, farms are very small and farm incomes are also equally small, many living at or below the line of poverty. Will these people be willing to part even with a small portion of their income, however small it may be, to the government as irrigation fees? For a small farmer, even a small sum of money has many other contending uses. Will the farmer be willing to part with this money which could be used to pay the school fees or the cost of school books for his children? With such a level of poverty, is it reasonable to expect that these people will be willing to pay the full cost of irrigation fees when they have not paid any amount in the past? To test this question, Table 2 was prepared. Here we have eight countries in Asia in which relative yield per hectare of rice is mentioned against average size of the holding in the respective countries.

In this table, yield per holding indicates how average farms in various countries fare in terms of their relative volume of production compared across countries. The gross physical production

Table 2. Yield per hectare, average size of rice farms, and yield per average holding in selected rice growing countries in Asia.

Country	The Philippines	Sri Lanka	Indonesia	Malaysia	Thailand	Nepal	Korea
Yield (1987)(t/h)	2.63	2.63	4.05	2.95	1.98	1.76	6.38
Average[7] holding	1.95	0.76	0.50[8]	2.09	2.69	1.34	0.59
Yield per holding	5.14	2.00	2.02	6.16	5.32	2.36	3.76

Source : World Rice Statistics, 1987, IRRI; 15 and 145.

[7]Generally for the average holding, the nearest year figure is taken when the figure for 1987 is not available.
[8] Estimated.

per average farm in Korea, the Philippines, Thailand or Malaysia is higher than that in Sri Lanka, Indonesia, or Nepal. If the relative prices are not taken into account, the average farm achieving greater volume of production could be taken as being better off and better able to pay the O&M cost. When this piece of information is brought to bear on the information given in Table 1, it becomes apparent that differences in levels of absolute gross output of farms are related to the level of irrigation fee imposed or the rate of collection of the fee. Sri Lanka, Indonesia, and Nepal, whose farmers enjoy lower absolute output, also happen to be countries in which the rates assessed stand far below the irrigation cost and there is a difficulty of collecting it, as indicated by the rate of collection. It is often argued that Sri Lanka having had a farming structure in irrigated agriculture along with rain-fed rice cultivation, similar to what has been found in the Philippines, the rate of assessment and collection of fees should be at the same level and that Sri Lanka farmers should be equally qualified to pay for full cost of O&M as in the case of the Philippines. The facts indicated by the table question the soundness of this surmise. The average size of Sri Lankan farms is smaller and as a result their gross output is smaller even though the productivity per hectare is the same.

A similar point will also be seen when the output of the farms in Indonesia is compared with those of the farms in other countries of the region. Indonesian farms are relatively worse off because of their extremely small farm size though their per hectare output is high. This fact is further illustrated in Table 3, in which the ratios per farm household income and national average household income are computed. The farm household incomes in Indonesia and Sri Lanka are only one tenth and one fifth respectively of their national average household income. The variation between the levels of farm and national household incomes is not as wide as in the case

Table 3. Ratio of estimated per household rice farm income to national average household

	Indonesia (Rupiah)	Sri Lanka (Rs)	The Philippines (Peso)	Korea (Won)
Average rice farm income	222,550	13,313	22,226	5,128,244
National average household income	2,475,000	68,700	42,203	5,641,020
Average rice farm income as a percent of average household income	9.0	19	53	91

Sources: Small et al. (1989) and Social Indicators of Development, World Bank Bulletin.

of the Philippines, forming only half of the national average household income. This again strengthens the assertion that the extent of poverty of farmers in Indonesia and Sri Lanka compared with that in other countries with a similar background in the region has a definite influence on the collectibility of charges for irrigation services.

We still have to explain the relatively good performance in resource mobilization of irrigated farms in Korea in spite of the low output of the average farms. The yields of the average Korean farm equal more or less those of the farms in Indonesia and Sri Lanka and yet high O&M costs are easily collected and the systems are well managed by farmers' organizations. This supposed anomaly is explained by the fact that the subsidized price of rice in Korea is set very high above the world price level thus indicating the artificial increase of farm income and the relatively well-off conditions of rice farmers, which again is possible only because of the level of industrialization and resulting prosperity of the country.

In considering this option as a possibility, the question of cost of collection and the difficulties likely to be encountered in enforcing stringent collection rules must also be addressed. We have seen that in Bihar, India, the collection cost is higher than irrigation revenue collected, the price that had to be paid for a vigorous attempt to collect irrigation dues from very poor communities. Besides, the notion that the farmer has the right of free access to water just as the ruler has the obligation to provide enough water to farmers, the long-held cultural tradition in Asian countries, plays its part in this relationship between the farmers and state agencies. All these factors make it difficult for these countries to introduce a vigorously enforced campaign to collect the enhanced fee from the already very poor farmers.

Service Fee

The second available option is the introduction of the concept of service fee in the water distribution arrangements. The concept of service fee explicitly implies a contractual arrangement. The term "service fee" is similar in meaning to that prevailing in the public utilities industries with respect to product or service provided. The term implies that the party or person receiving the service has a legal obligation to pay for the service provided and he also has a right to expect a reliable predetermined quantum and reasonable quality of service from the supplier or provider. On the other hand, the provider or the supplier of the service must be able to fulfill his obligation under the contract. That means he must provide the service on a mutually agreed predetermined basis. The introduction of this concept in the relationship between the user and the supplier in irrigation systems will revolutionize the long-standing practices of water distribution in irrigation management. Gone are the notions that water is a gift distributed as and when available and also that the user has no particular obligation to pay for it.

In the classic *warabandi* systems, the available water is distributed equally to the users so that each user can make the best of it. In that system the distribution of water is a pure allocation among the different contending users and the allocation is decided on the basis of some concept of equality. In contrast to this notion, the new concept implies that a satisfactory and reliable service will be provided. That means the system will be reasonably efficient to provide water at

the right time in the right quantity. On the other hand, the user must also be prepared to pay for the services provided. Both parties are legally bound to observe their mutual obligations. It is also to be noted that while the providers of the service are irrigation systems, the users are the farmers and, therefore, the contract signed will be between the system managers and the users, the farmers; each contract will be drawn on the basis of needs of a particular system.

However, realities of the field situation do not permit a purely economic contract in which the system will supply water at the farm gate measured by a volumetric method and the farmer will best use the water available at the gate. Under the existing physical conditions and also with the prevailing management practices, this is hardly possible. At this stage, the system could not possibly provide volumetric water delivery at the farm gate as in an electricity company. It is most likely that volumetric delivery at the tertiary gate, however, is within the capability of these systems. If water is distributed at the tertiary gate and the farmers' organizations are to take over from there, the farmers will have to evolve a system among themselves for distributing water, collecting fees, and arbitrating the problems arising therefrom. In other words, the water will be sold on a bulk basis and the farmer association must pay for it.

The attractiveness of this option is obvious. The economic use of the water resource will most likely be accomplished under this kind of arrangement. Water will be diverted on the basis of payment, and different contending users will be given water on the basis of their ability to pay. In other words, where the water goes will ultimately be determined by the economics of particular users' groups. There will be pressure on the part of the systems to be more efficient and to observe their obligations, and also on the part of the users to economize and to make the best use of the water available.

The success of this new arrangement will depend on a number of preconditions. One of them is that the systems must be prepared to deliver the water on a demand basis. That means that the whole practice of management of water will have to be changed. Planning and distribution must be properly synchronized and the physical systems must be updated so that new requirements could be accommodated. In other words, drastic changes in the practices of water management and improvement in the physical conditions of the system are called for in this exercise.

The importance of this point is often overlooked. Many of the systems in the past have been operating on an allocated basis. To change them into a system responsive to demand will require a tremendous organizational and management improvement. Proper planning systems and distribution systems must be set up and the personnel must be made to understand that they are performing a service which has to be sold and for which the user will be paying. In addition, the idea of accountability will also have to be introduced as they are now providing a service which is sold. The best way of running the system will be to put it on an accountable basis, a change that will revolutionize the whole concept of management as it moves from the departmental system to an economically independent unit.

In addition, if the service cannot be provided at the farm gate, an intermediate association handling water from the tertiary level to the farm gate will have to be organized. What is needed here is not simply mutual sharing of activities but the machinery to make basic collective decisions. The association will have to allocate water among different groups, settling disputes arising from sharing water between users, determining the fees that each farmer contributes, and collecting them and paying fees to the service-providing organization. All these will have to be done by the farmers' organization. The launching and preparation of this type of organization is another precondition for the success of this new innovation.

In Indonesia, where the concept of fee has been introduced there are numerous problems yet to be solved. Although the idea of contract is accepted, the peculiar nature of the Indonesian administrative system is such that irrigation systems are run by the Provincial agencies while fees are traditionally collected by the Ministry of Home Affairs. Coordination between the revenue collector and the service provider and relating the fee collected to the service provided are still to be sorted out. Another important condition of the new arrangement is that the rate structure of the service fees will have to be mutually agreed upon. Since the cost is the only basis available at present, the service fees will probably be decided on the basis of the cost of O&M or costs of these systems supplying the amount of water demanded. Under this situation, the questions arise, 'How do the farmers know that the O&M costs defined and collected as service fees are reasonable?' 'What defence do they have if the O&M costs are not properly managed or padded up?' 'Will the farmer have to pay for all the inefficiencies of the irrigations agency?' In other words, in this kind of relationship between the two parties, where no comparable market exists and where there is unequal strength between the parties with regard to information, the question of what is a reasonable price becomes a very difficult one.

With respect to this problem, Indonesian managers are planning to involve the farmers or the farmers' representatives in overseeing both the compilation and allocation of the operation and maintenance costs. In other words, whether the costs incurred by the irrigation agencies or systems are reasonable or not will be assessed by the farmers' representative. There still are problems in this type of arrangement. Will the farmers be technically able to do that job? It is a difficult thing for farmers to go into a large organization and assess the acceptability or otherwise of the cost incurred there. Even if this is permitted and accepted, it is still a very difficult task for the farmers to accomplish reasonably well.

In spite of these problems, the idea of service fees and mutual obligations between the user and the supplier is a sound economic concept. By this new innovation, the economic use of water could be accomplished, and in the long run the alternative uses of water between different types of crops and allocation between agricultural and industrial uses of the water can be more rationally made and the idea of economic goods is introduced in water management.

Turnover

The third is the most difficult of the three options in the mobilization of resources for irrigation management. It is concerned with the turnover of operations of tertiary and distributary systems to farmers' organizations. That means, farmers' organizations will carry out system planning and management as well as the distribution of water to the farmers. In addition, these organizations will also determine what the obligations of the farmers are with regard to payment of water charges and arbitrate when disputes arise between the various users. If this option is adopted, the irrigation agency will have no obligation except delivering water at the system gate and any problems beyond this point will be the responsibility of the farmers' organizations. This proposition is very attractive, especially to the irrigation agencies and the government. A lot of problems and hazards borne by the agency will now be transferred to the farmers' organizations.

Advocates of this proposal foresee a number of advantages. It has been recognized that there existed an informational gap between the users and the suppliers in the past, suppliers not knowing the users' requirements and demands and not being able to respond, and also users themselves not knowing the limitation of these systems. This problem will be largely solved because from now on the users themselves will be managing the systems. The coordination between the users' requirements and the suppliers' functions will be easily accomplished. Another advantage foreseen is that under this scheme, farming will become an integrated system, just as in agribusiness. As the farmer would also be taking over the function of getting resources in an integrated unit, getting and using resources will be done under the same management more effectively. It is also supposed that farmers knowing best, entrusting them with the responsibility and letting them cooperate among themselves to do the job will enhance their participation, motivation, and hence productivity in water management. Loopholes will be closed, and more economic methods will be looked for as it is now in their own interest to do so. The expectation is that this system would be more productive and more efficient than previous ones without additional cost to the state. It is also consistent with the current trend of ideology that has been gaining currency in this part of the world, known by various names such as people's participation, decentralization, or even privatization.

Let us examine these claims very carefully. What are the real comparative advantages of this arrangement over the older system or over other alternatives? What are the conditions for its possible success? Will this proposition be acceptable to the people who will implement it? First of all, let us examine what real comparative advantage this system has over the others. It has been claimed that in user-managed systems more coordination between the users and the system can be achieved since users themselves are now managing the systems. It may be said that the supplier-user relationship involving such questions as at what time and what quantity to be supplied, will be accomplished logically at more aggregate levels under this new system. But it is still doubtful that there will be a real gain in this regard. Previously, users, the farmers and suppliers, the manager of the system, met, bargained, and compromised on how allocation has to be done. Under the previously mentioned service contract arrangement, each one is trying to maximize his own benefits, each one responsible only for his own part and obligated to do the job he is concerned with and, therefore, responsibilities are clear. The process of each one optimizing for his own best interest also assures that a mutually agreeable minimal economy in resource allocation will be achieved.

Under this third alternative when water management and distribution functions are taken over by the farmers' organizations, it can be assumed that the boundary relations between users and the supplier no longer exist. The users have taken over part of the supplier's functions and have internalized it. It will be difficult for the user to perform the allocation function now in contrast to the situation where both parties are trying to reach an agreement on a bargaining basis, because here the users have to see to both the functioning and the requirements of the system on the one hand, and the requirements of the farms on the other hand. These two functions have to be coordinated now by the users themselves; in other words, the bargaining and compromising function has now blurred. It will be quite difficult for the user association to reach a reasonable solution between these two contending requirements when users themselves have an interest in both sides. Apart from this point, which has doubtful merit, whether any other comparative advantage is possible or attainable by the new arrangement is difficult to visualize. The internal operations of this association regarding planning and management functions will probably remain the same. In

irrigation organizations -- who opened the gate and at what time, who is responsible for what -- all these decisions relating to the design of work will still be made in the same "rational" fashion as before.

On the other hand, a number of weaknesses can be seen in the new arrangements. First, since the farmers' association will have taken over the tertiary and distributary systems a new boundary is created. The previous boundary at the farm gate between the system suppliers and the users is now replaced by the boundary at the main system gate where the water will be delivered to the farmer associations. The same kind of relationship that exists between the user and supplier at the farm gate will now be faced at the main system gate. If the new arrangement is to fulfill its promises, coordination between the main and the tertiary systems or the efficacy of the main system to satisfy the demand of the tertiary systems will become very important.

The second important point we have to stress is that the new organization this option entails cannot be built overnight. New system managers, farmers' representatives, and professionals operating it will have to arrive at a reasonable working arrangement. All these would necessitate the development of acceptable expectations, obligations, and relationships. This takes time and the learning period has to be accounted for. In addition, the lack of skills on the part of the new system managers will be another problem. It is true that farmers know best how to operate their own farms, knowing the terrain, water flow, and all the peculiarities of their own farm; but when it comes to system management it is an entirely different ball game. This is a modern system run on the principles of rational organization of work, in which some of the technical demands are very specific and exact. In other words, the lack of skill on the part of the farmers about managing this system will also be a constraint. The next question we should note is that under this system the farmers or farmer associations will have to assume, wholly, risk and uncertainty which in the past had been shared. In the previous situation farmers were on this side of just receiving water; they run only their own farm operations and their involvement is limited to that; whereas now they are taking over the operations of the water distribution systems and any foul-up, any breakdown in the newly acquired systems, will directly affect their financial and economic interests. They have assumed risks involved in managing the new functions and also in the possibility that the new relation may not really work out as expected.

The next question to solve will be how to motivate the farmers to accept and participate in the new system of arrangements. Many may believe that farmers will love to participate and take over the responsibilities. Farmers are cooperative animals and the chance to participate, decide, and take over responsibility will all be to their liking. We wonder whether these assumptions are correct. Will the farmer be really motivated to accept and perform under this proposed arrangement when it is known that the costs of failures and the risks are theirs? Farmers are known to be very rational individuals. They try to do their best within their limitations and the horizon they can see. They, in effect, are optimizing within their own limited sphere. They are also known to be risk averters. That is understandable because farm sizes are small and the margin of error they can afford is so small that they cannot possibly take a big risk. One crop failure would mean almost starvation in many instances and, therefore, it will be difficult for farmers to really take risks. It is also known that their time horizon is short-term oriented. This, again, is understandable. First of all, for that matter, most people are short-term maximizers. For marginal farmers, to think about what the environment would be or how the irrigation system will deteriorate in ten years or five years from now may be of no consequence when they are trying to do their best now. Farmers are also known to be conservative because traditions they follow and the system of

relationships they have built are longstanding, their world more or less stable and almost unchanging, and any departure will put them in risky and unchartered situations. We doubt that farmers could be motivated to really accept and contribute to this new innovation of turnover.

First of all, farmers are most likely getting water now at a very nominal rate from systems managed by the government. Will farmers see themselves or their representatives taking over this part of the system to manage, for which they had no responsibility before and no risk was taken? Will they see managing the system by the farmers as a more efficient way of delivering water? Under the new system, farmers will have to take full responsibility for paying the cost of operating systems and take the risks involved. Transaction costs that will be involved to establish farmers' organizations; days of meetings, collaboration, and participation will be needed. In addition, any failure in the system will be assumed by farmers or their representative and all the costs involved will become their responsibility. Under these circumstances what motivation will farmers have to take over the system? Advantages must be so clearly seen for farmers to assume all risks and responsibilities. They may be "tempted" or "persuaded" into it but basic reasons for them to participate effectively do not exist.

CONCLUSION

This paper argues that out of three alternative options available for mobilization of resources for O&M of irrigation systems, the idea of service fee has better chances of success and a logical economic basis to support it. The other two options are considered to be lacking either economic rationality to fulfill the necessary conditions or organizational logic to support a viable organization. It is argued that persuading farmers to pay for water which has been provided almost free is extremely difficult especially when farmers are in abject poverty, the state most of them are in, and have to forgo a number of contending uses of the money collected as fees. There needs to be some positive motivation for the farmers to part with even that small sum which some well-meaning economists have contended is affordable. We consider that farmers are incrementalists and the move from the present state of nonpayment or free service to fee paying users stage will need compelling reasons or incentives. We also posit that regarding option three a successful switch from a more passive role of receivers of benefits or social goods to the role of manager of the systems with all the attendant risks and difficulties will be possible only if certain preconditions are fulfilled and proper organization is established.

In introducing an integrated organization, two possibilities exist. One may be that the internal organization will be run on the same rational basis as before and a farmers' committee would work as a board of management. In this case no economic and comparative advantage is gained. The internal organization remains more or less the same. On the other hand, if farmers' preferences are brought to on the management process itself, instead of cost revenue, output or acreage, new collective criteria such as preference of different groups or different priorities will be used and new organizational relationships and problems created in the process will have to be taken into account. Whether the new organization will perform better than the existing organization to serve

the farmers' needs and whether the farmers will be willing to pay for the cost of the service will be doubtful.

It is argued that there is no clear comparative advantage of the new arrangement over agency operations except some improvement in boundary relations between water users and suppliers, which again is counterbalanced by new developments such as the difficulty of making rational choice by users when they are responsible for system management. It is pointed that the integration between two functions -- farming and water distribution -- is attended by new risks and uncertainty.

It is also contended that assuming farmers as rational, risk averting, conservative decision makers, this alternative will be neither preferred nor supported by farmers. The paper emphasizes the importance of basic economic rationality, the lack of which dooms the new social arrangement.

Next, we posit the view that farmers' organizations are not necessarily better or worse than any other form and it all depends on the intended functions, the type of organization adopted, and economies and diseconomies or comparative advantages arising therefrom. We view that when the farmers' organization takes over the water distribution function from main system gate downward, it is a kind of reverse integration -- smaller fish swallowing big fish. Problems of boundary relations between farmers or farmers' organizations at the farm gate or distributary gate are internalized and, as such, some transaction costs, such as those involved in adjusting, bargaining, and compromising process may be saved. Some informational advantage, farmer-managers of the system knowing better the farmers' requirements, will also be attained. But reconciling different claims of individual farmers, synthesizing their respective needs and arbitrating contending interests will still have to be done at the higher aggregative levels. Whatever principles are used, there will be gainers and losers, and dissatisfaction will arise.

In contrast, the market solution or near-market solution at the boundary level is rather neat; each side knows what it wishes to maximize or optimize, and tries to arrive at a solution acceptable to both. The limits of the group solution should also be recognized; in very small-scale operations, with the established face-to-face contact, the group solution may be very effective. Once the scale of operation becomes larger, routinization, and systematization become necessary, and the comparative advantage of groups will dissipate. What happened in large-scale collective farms in Eastern Europe is a testimony to the monumental failure of large-scale group exercise.

Another important conclusion we can draw from the experiments in the past is that whether a contractual service or the takeover by the farmers' organization is introduced, concomitant improvement of the main system is a precondition for the success of these innovations. Unless the main system is ready and prepared to serve the new demands of service arrangements, the very basis of the service concept will falter. Streamlining the planning and management of water delivery functions such as improving operational plans will have to precede the introduction of new innovations.

In conclusion, this paper stresses that without hard knocks, economic thinking, or economic basis or without changing the basic parameters, suggested organizational remedies will be more 'snake oil' than real medicine. We most often are happier to be deluded than to be demystified or exorcised.

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Management of Irrigation Systems Maintenance: Desirable Levels, Estimated Cost, and Institutional Requirements Based on a Case Study in Sri Lanka

Wimal Gunawardena and K.D.P. Perera[9]

INTRODUCTION

SRI LANKA IS an island nation situated in the Indian Ocean between 6° and 10° north of the equator with a gross land area of about 25,000 square miles. The island receives most of its rainfall from the northeast and southwest monsoons. Due to the characteristics of the topography and the monsoons nearly two thirds of the land called the dry zone receives an average annual rainfall ranging from 35 to 75 inches. The rest of the land located in the southwest of the island receives an average annual rainfall in excess of 75 inches and is referred to as the wet zone.

The lack of significant mineral resources makes it necessary for Sri Lanka to depend primarily on its agriculture for the sustenance of the population of about 15.6 million. Great emphasis is placed on the increased production of rice, which forms the staple diet of the population. The wet zone produces most of the exportable agricultural crops. The distribution of rainfall being inadequate, irrigation is necessary for the cultivation of rice in the dry zone.

Sri Lanka's ancient history records a civilization based on a highly developed irrigation system. From early historic times -- 6th century B.C. until the 13th century -- the social, political, and economic activities of the island were located in the dry zone. The large number of ancient reservoirs, diversion weirs, and extensive irrigation canal systems bear testimony to the thriving economy of an agrarian society. The subsequent interference by external forces caused these systems to collapse and allowed the jungle to take over.

During ancient times the maintenance of the irrigation schemes was given very high priority by the kings. The management system insured the active participation of the farmers in all

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[9] TEAMS (Pvt) Ltd. - Consultants in Technology, Management & Development Studies.

operation and maintenance (O&M) activities. Equitable distribution of the available water to all farmers helped to achieve adequate production of rice to sustain the population. The ancient rock inscription at Kondawattawan stipulated the fines that would be levied on farmers who neglected their responsibilities in the farming activities. This helped to sustain an actively participating farming community in the locality.

In the 1930s the high demand for land in the wet zone, due to increasing population, created a need to go back to the dry zone. Restoration of abandoned ancient irrigation works for new settlements was started at this time, to shift the excess population in the wet zone to the dry zone. This is the birth of the modern era of irrigation development in Sri Lanka.

The approximate extent of land cultivated under rice at present is about 1,850,000 acres of which approximately 865,000 acres are covered by major irrigation schemes while about 430,000 acres are being fed by minor irrigation schemes. Out of the total land area under irrigation at present, about 740,000 acres are managed by the Irrigation Department (ID) of Sri Lanka while 125,000 acres are managed by the Mahaweli Authority of Sri Lanka (MASL) and 430,000 acres in minor irrigation schemes (each less than 200 acres of irrigable area) by the Department of Agrarian Services (DAS). The ID manages all schemes irrigating over 200 acres up to a maximum of 110,000 acres except those falling within the area of authority of the Mahaweli Authority of Sri Lanka (MASL).

In order to improve and sustain the living standards of the people in Sri Lanka, the government lays great emphasis on the development of rice cultivation under irrigation. Hence, the agencies managing irrigation schemes have as their main objective the achievement of increased production.

In order to increase production further which is essential due to the growth in population there are two possibilities, namely,

* increasing production from existing irrigation schemes, and
* developing new lands under irrigation.

Since most of the land and water resources available for irrigated agriculture are already developed the feasibility of developing economically viable new irrigation schemes is rather limited. Therefore, the present policy of the government is to emphasize the need to increase production from the existing systems. Considering all relevant facts this is a more attractive and economically viable proposition. However, the achievement in this direction depends on the rehabilitation of most of the irrigation schemes to a level where it becomes possible for the farmers to obtain the best possible production from their lands and then the adaptation of adequate O&M measures to sustain the level of production.

Most of the infrastructure in irrigation schemes has deteriorated gradually over the past years due to inadequate maintenance. This has been due mainly to the lack of adequate funds, poor management of resources, and inadequate cooperation of the farmers.

The major part of the lands in the irrigation schemes is state-owned and the size of a farm is about 2.5 acres. The irrigation distribution system has to provide the required irrigation water to each of these farms individually and therefore the network of canals in many schemes is very long and intricate. The efficient O&M of the canal network is an essential task which needs a highly efficient management system to optimize the use of limited available resources. Undoubtedly,

this is a perquisite for Sri Lanka to achieve the objective of increasing production of rice to meet the increasing demands under existing resource constraints.

BACKGROUND TO THE CASE STUDY

Several studies have been done by agencies such as the International Irrigation Management Institute (IIMI) for the purpose of identifying the existing constraints and finding feasible solutions to improve the performance of irrigation schemes. At the same time a number of major irrigation schemes are being rehabilitated with financial assistance from donor countries and international lending agencies.

Donor agencies financing rehabilitation programs are, quite rightly, concerned about continuity of adequate maintenance for sustained performance of the rehabilitated schemes.

Under the Irrigation Systems Management Project (ISMP), financed by USAID, a case study is being done at present by TEAMS (Pvt) Ltd., under the direction of IIMI. The theme of this study is to identify a desirable level of O&M of irrigation schemes in order to sustain their efficient functioning after a program of rehabilitation is implemented.

This study consists of 2 phases. Under Phase I, the O&M activities, management system, farmer participation, and utilization of financial and other resources have been studied in two major irrigation schemes in Sri Lanka, namely Giritale Scheme in Polonnaruwa District and Ridi Bendi Ela Scheme in Kurunegala District. This presentation is primarily based on the findings of Phase I of the study and is supported by the conclusions derived from a previous study carried out by TEAMS (Pvt) Ltd. on Procedures on Collection of O&M Fees.

In a reservoir scheme the headworks consists of an earthen dam across a valley to impound the runoff from the catchment, a spill, and one or two sluices. In a diversion scheme a weir with movable gates constructed across a perennial stream and sluices on either bank constitute the headworks.

In the Giritale scheme the reservoir headworks consists of an earthen dam about 1,600 feet long, a spillway and one sluice. The total area irrigated is 6,192 acres. The Giritale scheme impounds the runoff from its own catchment of 10 square miles and in addition, it is supplemented by water diverted through a feeder canal from Elahera - Minneri Yoda Ela which receives water from the Mahaweli System.

The Giritale scheme constructed in 1954 is a land settlement scheme where each farmer has been allocated a rice allotment of 3 acres, and a highland allotment of 1 acre. The main canal is 11 miles long while the total length of distributary channels and field channels is about 30 miles.

The settlers in this scheme have been selected from various parts of the country and therefore the development of a socially cohesive agricultural community is still continuing. This could be a problem facing the promotion of active farmer participation in the management of the scheme.

In the Ridi Bendi Ela scheme a diversion weir on Deduru Oya diverts water into a feeder canal which supplies water to Magalla wewa. Thus, Magalla wewa impounds the supply from its own catchment of 21 square miles in addition to the supplies diverted from Deduru Oya. The total area irrigated by this scheme is 5,087 acres.

The Ridi Bendi Ela scheme can be described as a village expansion scheme because most of the settlers have been selected from villages located close to the scheme. This would be a positive factor for promoting farmer participation in the management of the scheme.

The distribution system in each scheme consists of main canals, distributary channels and field channels.

NATURE OF OPERATION AND MAINTENANCE OF IRRIGATION SYSTEMS

The objective of good O&M is to insure that the farmers are supplied with adequate irrigation water at the proper time, maintaining equity. Irrigated water distribution among farmers is of paramount importance to insure the farmers' confidence in the irrigation system. This will encourage the farmers to take a positive attitude in their farming activities, by improved inputs such as good seed varieties, fertilizer, weed and pest control methods which would result in increased agricultural production.

In order to insure an efficient distribution system, good maintenance is extremely important. But due to the lack of adequate financial allocations during the past years it had been virtually impossible to insure a good level of maintenance. To some extent this constraint can be reduced by adopting improved management of the available resources. Even in spite of these efforts there could be a gap between actual maintenance effected and the actual maintenance required. Therefore, the only available way to bridge this gap is to mobilize the collective efforts of the beneficiary farmers.

The maintenance activities on the headworks of a reservoir scheme can be identified as follows:

* Clearing of shrubs and weeds on embankments;
* Earthwork for filling minor scours and removal of anthills;
* Repairs to rip-rap protection;
* Cleaning and repairing of toe-filters;
* Repairs to concrete works in spill and sluices;
* Repairs to gates, lifting arrangements, and other timber and metal items in spills and sluices;
* Painting and greasing of metal components; and
* Repairing potholes on the road.

On the other hand, the maintenance work on main canals and distributary channels can be identified as follows:

* Clearing weeds, shrubs, and minor jungle along the canal banks;
* Removal of water plants and desilting in canals;

* Repairs to scours on canal banks;
* Repairs to stop seepage losses in canal bunds;
* Repairs to minor depressions on canal banks; and
* Repairs to structures on canals, metal work, gates, U/S and D/S protection works.

According to the practices of the recent past, maintenance of field channels irrigating less than 50 acres is the responsibility of the farmers. However, the concrete structures in these canals are being maintained by the Irrigation Department. Thus, the farmers have to attend to any earthwork on the canal bunds, desilting, weeding, and clearing shrubs.

Furthermore, all roads in the scheme except those along field channels have to be maintained by the Irrigation Department. The items of work involved are:

* Filling scours and potholes;
* Periodic graveling; and
* Weeding and clearing shrubs and minor jungle along the road reservation.

Most of the maintenance work is done by manual labor. In exceptional circumstances light machinery and transport vehicles are used. The employment of manual labor could be on force-account or by employment of contractors.

ANALYSIS OF EXISTING LEVELS OF MAINTENANCE

To study the existing levels of maintenance the consultants collected past data from 1985 to 1989, regarding the items of work done and the expenditure incurred in the two schemes.

The data were collected by:

* Interviewing Range Deputy Directors;
* Interviewing Divisional Irrigation Engineers and Technical Assistants;
* Interviewing other staff in the divisions;
* Interviewing farmers and others in the scheme; and
* From votes, ledgers, and other accounting documents.

Furthermore, the procedures related to Financial Allocation and Estimates for O&M were analyzed in depth. It was found that the request for consolidated fund allocations from the General Treasury consists of two parts.

i. Funds for O & M works in major irrigation schemes to meet expenditure on casual labor wages, transport, materials etc., allocated under the Ministry votes.
ii. Funds for the payment of salaries to permanent work supervisors and laborers in the Irrigation Department engaged in O&M works in major irrigation schemes allocated under the Irrigation Department votes.

Table 1. Summary of allocations.

	1985	1986	1987	1988	1989
1. *Operation and maintenance (IMD)*					
Giritale	420,000	443,000	613,900	450,000	542,870
Ridi Bendi Ela	575,000	537,800	569,200	411,445	589,000
2. *Wages and allowances of works supervisors and laborers on O&M (ID)*					
Giritale	214,700	208,400	216,500	199,400	141,750
Ridi Bendi Ela	124,100	173,000	192,000	141,300	130,000
3. *Farmers' collections*					
Giritale	356,819	462,007	292,095	32,116	-
Ridi Bendi Ela	49,500	78,000	-	19,788	-

Table 2. Summary of estimates.

	1985	1986	1987	1988	1989
a. *O&M under IMD funds*					
Giritale					
Full	1,020,000	1,020,000	1,050,000	1,080,000	1,200,000
Appd	420,000	380,000	595,000	460,350	1,200,000
Ridi Bendi Ela					
Full	830,000	850,000	1,000,000	1,000,000	1,130,000
Appd	950,000	561,300	569,200	400,000	870,000
b. Works supervisors and laborers on O&M under ID funds (The estimates are prepared on the basis of funds actually collected).					
Giritale					
Full	196,152	213,912	217,632	297,852	307,440
Actual	199,152	216,672	220,512	288,336	312,480
Ridi Bendi Ela					
Full	182,704	199,224	202,704	277,212	286,560
Actual	117,400	127,920	130,160	177,928	184,080
c. Maintenance with farmers' collections					
Giritale	295,024	361,478	154,383	-	-
Ridi Bendi Ela	34,650	55,560	-	11,410	-

In addition to the above funds, a fee is collected from farmers at the rate of Rs 100 per acre per annum. Hence there are three sources of funding. The allocation of funds for O&M work of Giritale and Ridi Bendi Ela in terms of the above three sources over the past five years can be summarized as per Table 1 (page 94).

The amount indicated above are on the basis of the initial allocations at the beginning of the year and additional allocations made during the course of the year.

The summary of estimates for O&M over the past five years for Giritale and Ridi Bendi Ela are given in Table 2 (page 94).

It was found that O&M work is generally carried out throughout the year except some special maintenance work that cannot be done during water issues, such as desilting, repairs to structures, etc., which are undertaken during the closed season. Weeding in canal reservations is done, generally, twice a year and priority is given to this item of work particularly within the water-flow section. Desilting, especially at critical locations such as drainage crossings etc., is also carried out on a priority basis. During the course of the year priority maintenance items are identified by the inspecting officials such as the Range Deputy Director, the Irrigation Engineer, the Technical Assistants and the Work Supervisors. Furthermore, on representation received from farmers, directly or through Project Committees, special maintenance works are carried out, depending on the availability of funds. In this manner some of the O&M works are done on a routine basis and some special maintenance is done as priority items during the course of the year. Thus, it would be seen that some O&M works executed are outside the estimates prepared at the beginning of the year.

In the case of maintenance work with farmers' collections, the items to be executed are identified on a priority basis and estimated, and thereafter carried out. When done on force account, there may be some deviations.

The summary of O & M expenditure for Giritale and Ridi Bendi Ela for the last five years can be visualized from Tables 3 and 4.

Table 3. Summary of O&M expenditure.

	1985	1986	1987	1988	1989 (up to June)
Fund					
1. *O&M (IMD)*					
Giritale	466,327	612,634	671,756	467,988	356,223
Ridi Bendi Ela	589,269	586,387	567,562	409,541	312,458
2. *Work supervisors and laborers on O&M (ID)*					
Giritale	199,152	216,672	220,512	288,336	121,680
Ridi Bendi Ela	112,822	154,938	167,983	185,498	98,196
3. *Farmers' collections (maintenance)*					
Giritale	173,536	349,641	191,471		
Ridi Bendi Ela	33,707	47,672	-	4,482	

Table 4. Analysis of expenditure on O&M.

Ridi Bendi Ela (Average expenditure 1985 - 1988)

	ID	*IMD*	*Total*
Operation	100,615 65%	88,893 17%	189,508 27%
Maintenance	-	306,143 57%	306,143 45%
General	54,674 35%	143,153 26%	197,827 28%
	155,289	528,189	693,479

Giritale (Average expenditure 1985 - 1988)

Operation	161,319 70%	15,520 3%	176,829 23%
Maintenance	-	328,866 59%	328,866 42%
General	69,850 30%	210,290 38%	280,140 35%
	236,169	554,676	785,845

From the above it is seen that the Irrigation Department allocation is spent on operation and general charges and IMD allocation is used mainly for maintenance, 59 percent in Giritale and 57 percent in Ridi Bendi Ela. The charging of expenditure between operation and general charges would be rather indistinct. Therefore, if we add up expenditure on operation and general charges this would come to 58 percent in Giritale and 55 percent in Ridi Bendi Ela leaving only 42 percent and 45 percent for maintenance in Giritale and Ridi Bendi Ela, respectively.

The staff employed for O&M under each scheme would be more or less the same in number from 1985 to 1988. However, the expenditure on salaries, traveling etc., would increase due to increased salaries, increments, cost of fuel, vehicle maintenance etc. Therefore, the funds that could be allocated for maintenance would be the balance available after expenditure on operation and general charges. As the allocation got reduced from 1985 to 1988 the expenditure on maintenance has also reduced as seen from Table 5.

This is clearly seen in Ridi Bendi Ela where the expenditure on maintenance has steadily declined in amount as well as in percentage. In 1988, when the allocation was drastically reduced, the steadily increasing operations and general charges had also been reduced. This may be an attempt of the Irrigation Engineer to prune down his O&M staff to try and meet the effects of reduced allocation. But still the main casualty has been maintenance. In the case of Giritale expenditure actually increased from 1985 to 1987 and then in 1988 it went down. But the operation and general costs have steadily increased in amount as well as in percentage. In 1988, the expenditure on maintenance has been drastically reduced.

Table 5. Expenditure on maintenance.

	1985	1986	1987	1988
Giritale				
Total expenditure	665,479	829,306	892,268	756,324
Maintenance	289,987	361,560	406,309	257,608
	44%	44%	45%	35%
Operation and general	375,492	467,746	485,959	498,716
	56%	56%	55%	66%
Ridi Bendi Ela				
	1985	1986	1987	1988
Total expenditure	702,091	741,325	735,455	595,039
Maintenance	380,491	326,396	296,945	220,742
	54%	44%	40%	37%
Operation and general charges	321,600	414,929	438,510	374,297
	46%	56%	60%	63%

Table 6. Analysis of average maintenance expenditure on important items.

Giritale	Rs	Percent
Weeding etc.	131,106	40
Desilting	39,235	12
Earth work	96,976	29
Repairs to structures	46,553	14
Graveling	-	-
Other items	14,966	5
	328,866	100
Ridi Bendi Ela		
Weeding	100,723	32
Desilting	50,451	18
Earthwork	34,598	12
Repairs to structures	62,894	20
Gravel	4,306	2
Other items	47,170	16
	306,142	100

The analysis is revealed that, to get the best out of the O&M allocation there is a need to look closely at the staff employed in O&M and the cost of traveling charged under general charges.

In Giritale 40 percent of the maintenance cost is for weeding and 29 percent for earthwork. Repairs to structures and desilting were only 14 percent and 12 percent. Weeding and earthwork would make the scheme look nice but the low expenditure on desilting and repairs to structures could give problems in water issues.

From the above it is seen that in Ridi Bendi Ela 32 percent of the expenditure is on weeding which should really take a lower priority than other items. Normally priority should be on 1) repairs to structures, 2) desilting, and 3) earthwork on critical sections of channel. These are the essential items to achieve the required water issues and controls of the distributary system.

The observations made from the analysis of expenditure for Ridi Bendi Ela are fairly similar to those of Giritale.

IDENTIFICATION OF "DESIRABLE LEVEL OF MAINTENANCE"

One of the main objectives of this study is to identify the "desirable level of maintenance" of major irrigation schemes. The work was commenced, first, by investigating the notion of desirable level of maintenance in a conceptual form and then by improving such understanding, making use of information gathered from field observations and data collection. For this work the list of questions presented in the original proposal by the consultants was used as a basis.

In order to understand the notion of desirable levels of maintenance the definitions of different levels of O&M were visualized as follows:

No maintenance. After some years of construction/ rehabilitation, canal discharge will be grossly inadequate to meet the cultivation requirements, resulting in continuous crop failures. Also the physical system will deteriorate rapidly to a total collapse. Maintenance cost is nil.

Poor maintenance. To carry out maintenance only at very critical sections. The canals will discharge significantly but still not adequately in the sense of sufficiency and timely distribution. Crop failures are likely as a result of this level of maintenance. Also the physical system will deteriorate badly and will be in need of rehabilitation at frequent intervals to avoid collapse of the system. Maintenance cost is low.

Adequate maintenance. To enable the canals to function at its existing capacity during the particular year under consideration and prevent deterioration at critical locations. At this level crops will not fail. However, significant deterioration of the physical system may take place every year and a full-scale rehabilitation will have to be undertaken after, say, about 10-15 years of construction/rehabilitation. Maintenance cost is medium.

Well-maintained. Well-maintained implies adequate level plus maintenance activities that will prevent significant deterioration. Rehabilitation may not be undertaken full scale for a long time except some selected improvement works. Maintenance cost is high.

Full maintenance. To keep the system at or near its original operating and physical conditions. This is almost a minor rehabilitation each year and no rehabilitation on a full scale will be required during the life span of the scheme. Maintenance cost is very high.

Technical levels are not the only criteria to decide on a "desirable" level. The O&M level should also be economically and institutionally "desirable." Thus, the concept of technically desirable level of O&M irrespective of resource constraints may not be appropriate for analysis under this study.

Immediate costs associated with well-maintained or full-maintenance levels may not be balanced by benefits from such maintenance levels, since there is a time lag between maintenance expenditure and related benefits. The canal system is usually designed and constructed/ rehabilitated to discharge 5 percent to 15 percent more than the requirements for the planned acreage. Hence, even with a low level of maintenance with the canal sedimented and overgrown with weeds, the canal could discharge the requirement and it takes some years for the canal not to discharge the required quantity. Even with slightly lesser discharge, the crop yields may not decrease significantly.

Even with the last two levels of maintenance some deterioration is inevitable. Further, the irrigation system is of a dynamic nature with new concepts of water management, agro-technical methods, changing ideas and policies, and sophistication of operation procedures, etc.

Thus, maintenance levels to keep a system at or near its original operating and physical conditions are not feasible. A lower level of maintenance (causing a certain degree of deterioration) and periodic rehabilitation will be "desirable" economically. In addition to the technical aspects and consideration of the dynamic nature of the system, the economics of different levels of maintenance, that is low-cost of low-maintenance level together with high-cost of full-scale rehabilitation, versus high-cost of higher-maintenance level coupled with low-rehabilitation cost, should be analyzed to determine the best level of maintenance to be adopted.

As mentioned earlier, the study commenced with a theoretical notion of "desirable level" of maintenance. This understanding was eventually updated based on the observations gained from the investigations carried out in Giritale and Ridi Bendi Ela. The views of the consultants are given here.

The "desirable level" of O&M can be defined as the level of O&M which satisfies the following criteria:

* The technical needs of the schemes;
* Economical viability; and
* The needs of the farmers and the level of O&M which are therefore socially acceptable.

We have given definitions of five levels of O&M beginning with the case of "no maintenance" and increasing upto a level of "full maintenance." Since these two can be considered as the two extremes the "desirable level" of maintenance should be between these two levels.

In selecting a "desirable level" we have to be realistic as far as possible to the existing circumstances and therefore the selection criteria should not be purely theoretical. However, as we have used the word "desirable" to define this level we need not be concerned too much with the existing constraints, in particular the finances. Therefore, the selection should be guided by experience and sound judgment.

To understand what the technical needs are that should be satisfied, it is necessary to look at what is the main function of the system. In short, it can be said that the basic function of an irrigation scheme is to store and divert the natural flow of a river/stream to farmers' land as required. If the various components of the scheme, namely headworks, main canals, branch canals, distributary channels and field channels can be made to function as expected above, then the scheme satisfies the basic technical needs.

In going through the various levels of O&M defined earlier we see that the definition of "adequate maintenance" just reaches this level. We see that "well-maintained" will give a

greater degree of confidence. But considering the realities of financing we should not desire too much. The "desirable level" is person-specific. We try to convince the persons concerned to accept this as an acceptable definition.

Under "adequate maintenance" it is stated: "To enable the canals to function at its existing capacity during the particular year under consideration and prevent deterioration at critical locations." Thus, under this level of maintenance the canal should continue to discharge the required volume of water as a continuation of the previous years' level of functioning. However, certain components of the scheme will deteriorate but such level of deterioration would be confined to safety margins already built into the system. The level in canal bunds would reduce during the year; minor defects in structures, such as cracks and scours may occur. Roads would start settling and potholes would begin to appear. However, critical items would be repaired and kept functional. Over a number of years the defects above would accumulate and gradually the scheme will degrade, maybe in 10-15 years, to a state when rehabilitation would become necessary.

The amount of funds required to maintain the scheme at "adequate level" would be different from location to location and according to how well the scheme was originally designed and constructed. Hence, it is not possible to give a definite period for the rehabilitation cycle. Even to arrive at the period of rehabilitation cycle for a particular scheme it would be necessary to monitor the expenditure, physical work done, discharges in canals, and other relevant data for about 10 years. It is improbable that reliable data for such an analysis are available for any irrigation scheme in Sri Lanka.

To satisfy the second criterion for the "desirable level" of maintenance, it is necessary to establish the economic viability of adopting the "adequate level" of maintenance. In economic terms, desirable level of maintenance is the level which maximizes the net present value of the future benefit/cost streams at the current "social rate of discount."

The technically desirable level has been defined as a level of maintenance which will permit adequate performance of the system for a reasonable period before rehabilitation. Economically desirable level on the other hand, is based on the technical relationship between the economic costs and benefits attached to alternative technically acceptable maintenance regimes.

This requires the identification of the intertemporal (over time) relationship between costs and benefits for technically acceptable alternative maintenance regimes.

The information required is:

a. the effect of each alternative regime on project life from construction to rehabilitation.
b. the annual project benefits over the time span (which varies according to the maintenance regime from construction to rehabilitation). This recognizes the fact that project performance deteriorates for any conceivable maintenance regime. In other words, the life span of a man-made artifact or for that matter any material thing is finite.
c. shadow prices for all quantified costs and benefits as at the date of analysis expressed preferably at the midpoint of project life.

The social-institutional point of view is determined by what the society and the institutions can sustain over time. This can differ from the technically and economically desirable level.

Costs which appear to be economically justified may not be feasible from socio-political and institutional points of view. The growing literature on O&M fee collection bears ample witness to this point.

The economic methodology to determine the desirable level of maintenance of any major irrigation scheme needs a careful analysis of a number of factors affecting an irrigation scheme.

The approach with the highest level of theoretical soundness and analytical rigor has been described earlier.

In spite of the great deal of effort applied on information-gathering in our study, it became apparent that a "first best" approach of the type discussed is not feasible with given information, time, and other resource constraints. Hence, a "second or third best" approach has to be used.

If time and other resources were available, and O&M problems could await findings of a "first best" approach solution, then the answer is to carefully monitor several selected schemes for a long period. This, clearly is not an available option.

The other acceptable means of constructing the benefit/cost relationship over time is to select a number of irrigation schemes which represent different stages of a typical scheme over the economic life from construction to rehabilitation. The greatest challenge here is to abstract from problems of location specificity. Thus, the accumulated experience of irrigation engineers will have to be relied upon to select schemes which have more or less similar design, command area, natural environment, and socioeconomic environment.

Then information-gathering can commence in a scheme just constructed, another midway in the cycle, another "just-before" rehabilitation, and finally a scheme which has just been rehabilitated.

Thus, it will be possible to determine whether the present O&M regime (average) is economical. However, the selection of an optimum regime would require educated guesses. The difficulty here is in judging what changes are brought about by incremental changes in the O&M regime.

Yet another possibility is to develop a theoretical model which relates O&M costs into known, measurable variables and then statistically estimate the coefficient of the independent variables of that functional relationship. Apart from the derivation of the functional relationship by theoretical means, this involves the generation of data on the relevant variables from a sufficiently large sample of irrigation schemes.

This is an option discussed at length by the consultants, but discarded due to measurement problems and the prohibitively high resource requirements of such an exercise to cover the necessary observations' number which will give the required degrees of freedom for statistical estimation. Another major problem is location specificity and the large number of environmental variables which affect the performance of irrigation projects.

Considering the facts discussed above it may not be possible to determine accurately the economically desirable level of maintenance.

The third criterion to be discussed is the acceptance of this level of maintenance by the farmers. It can be stated that the farmer is mostly concerned with the availability of water in his allotment to carry out his agricultural activities to his satisfaction. For this purpose the distribution system must deliver water to his farm in adequate quantity at the proper time. If this function could continue year after year he would have confidence in the irrigation system.

This is a basic need for him to give his best efforts and investments to the cultivation and the result would be an optimal level of production. If the level of maintenance defined as "adequate" could satisfy this need during a rehabilitation cycle then we can assume the farmer would be satisfied with the system and therefore it would be socially acceptable.

The above analysis for the purpose of establishing that the "adequate level" of maintenance can be considered as the "desirable level" of maintenance, has given positive responses in two of the three criteria stated earlier. The second criterion is accurately indeterminate under the present study. Since, according to this analysis, two of the criteria are satisfied, it is recommended that the "adequate level" of maintenance be accepted as the "desirable level" of maintenance.

INSTITUTIONAL STRENGTHS AND WEAKNESSES

The present study clearly indicates that the actual level of maintenance is far below the adequate level and the main difficulty in achieving the desirable maintenance is due to restrictions in obtaining necessary financial resources. It was also found that the only possible improvement in this direction is to increase institutional strengths while minimizing the present weaknesses so that the limited funds can be utilized in a more productive form.

In trying to comprehend the institutional strengths and weaknesses relevant to operation and maintenance (O&M) of major irrigation systems two major dimensions, namely: (i) state dominated irrigation management system and (ii) the role of farmers as "users" of irrigation systems need to be embraced.

The study revealed that the existing state-dominated irrigation management system works greatly with central control while aiming to insure uniformity at national level. As a result, the importance given to implementing maintenance programs of a project in the light of its specific needs is inadequate. The existing management system is too much concerned about maintaining its accountability to the Treasury and to the Auditor General rather than about the effectiveness of the programs to be implemented.

It is evident that in actual practice the estimates of O&M are made only for the purpose of "requesting and granting" an allocation without reflecting a plan of action based on real needs. In actual fact in the two schemes which were studied in detail, there is no connection between estimates and expenditure.

Furthermore, the management system at present has failed to concentrate on maintenance programs in terms of priorities of the specific schemes. The major portion of the budget is being spent on weeding and earthwork even though the priority area is the maintenance of the structures.

The existing monitoring mechanisms for allocation of funds, their readjustment, and appropriate use of such limited funds are inadequate. Such poor monitoring coupled with cutbacks of allocations not only reduces the efficiency and effectiveness of maintenance programs but deteriorates the motivation and confidence among farmers and officials. Also the present management system seems to measure its performance mostly in terms of allocation received rather than the achievements made in terms of spending money productively while creating benefits for the farmers. Perhaps, the time has arrived in these terms for the officials to recognize

that the efficiency of the organization and management is as important as receiving funds for O&M works.

The study concludes that the present management control system heavily depends on its bureaucratic institutional framework which is being operated at the consumption of a fairly high percentage of limited funds available for maintenance of irrigation systems. It was found that the bureaucratic system is ineffective due to staff inefficiency and lack of vigor in action-oriented management.

The active participation of the farmers is essential for the efficient management of any irrigation scheme. During the past few years an explicit attempt has been made to mobilize farmers' participation as well as the integration of the services rendered by various government and semigovernment organizations involved in irrigated agriculture. The Programme for the Integrated Management of Major Irrigation System (INMAS) started by the Irrigation Management Division (IMD) of the Ministry of Lands, Irrigation and Mahaweli Development has this objective in its primary function. This program was started in 1984 and a high degree of success has been achieved in this direction.

The irrigation systems used for the present case study (i.e., Giritale and Ridi Bendi Ela) are both covered by the Irrigation Systems Management Project (ISMP) which can be considered as a further development in the direction of institution-building initiated by the INMAS Programme. Specially, in another study carried out by TEAMS (Pvt) Ltd. and financed by the USAID/IIMI, it was found that the institution-building at subproject level and field-channel level is taking place quite positively. Certainly these developments will have a tremendous effect in the direction of efficient management of O&M while ascertaining farmer participation which can reduce cost.

With the commencement of the INMAS Programme the government decided in 1984 that the cost of O&M of irrigation schemes larger than 200 acres should be paid for by the farmers who are the beneficiaries. This cost is estimated at Rs 200 per acre per annum (1982). The balance Rs 100 should be paid by the farmers at the initial stage. According to this formula, gradually the contributions by the government will decrease in steps of Rs 20 per year and correspondingly the farmers' contribution will increase.

The collection of this fund has been implemented from 1984 in 17 of the 24 districts in Sri Lanka. These 17 districts are in the dry zone of the country which constitutes the area where most of the major irrigation schemes exist. The level of collection of funds from the farmers has gradually faded out and hence the overall outcome is a failure.

Recently, the government decided not to collect this fund from farmers in schemes less than 200 ha as they are considered too small to warrant the effort of collection. In these schemes farmers are encouraged to maintain the distribution system by their own efforts with assistance from the Irrigation Department.

Another decision taken recently is to limit the farmers' contribution to Rs 100 per 0.4 ha per annum for those cultivating two seasons a year and Rs 60 per 0.4 ha per annum for those cultivating one season per year. The decision to increase 20 percent per year as decided earlier is suspended for the present. This was done to give some relief to the farmers and also to allow them sometime to get used to the idea of contributing to the O&M fund.

The experience gained from a number of studies undertaken by TEAMS clearly indicates that what is more important in this direction is to determine ways and means of insuring user support in the management of O&M activities rather than searching tactics to ascertain farmer contribution to the O&M fund. The achievement initiated by the INMAS Programme and exemplified by

the ISM Project are rewarding steps in this direction, even though these innovations are yet to be improved.

The execution of O&M activities as a joint-management venture between farmers' organizations and state institutions can reduce cost and hence will facilitate O&M work. Also the 'user support' for such joint management of O&M activities will create a feeling among farmers that the irrigation system is 'theirs' and hence it should be looked after. This is an important preventive maintenance measure quintessential in an effective O&M strategy.

What Can Farmers do for Irrigation System Sustainability?

N.F.C. Ranaweera and S. Somasiri[10]

INTRODUCTION

CROP PRODUCTION UNDER major irrigation systems has been one of the most significant areas in agriculture development in Sri Lanka and other developing countries during the last decade. Substantial amounts of resources, both financial and human have been invested in developing irrigation systems, in order to increase crop production with the dual objective of import substitution or export expansion. New settlements in these systems have led to the migration of labor from overpopulated areas leading to changes in the rural-urban balance as well as in the labor profiles.

A major question is being raised regarding the performance of these irrigation systems from the point of view of the systems to provide the required commodity outputs and the consequent well-being of the farmer community.

The total production from these irrigation systems has been significantly high -- though not meeting the originally targeted levels. However, questions are being raised regarding the income levels the farmers obtain and consequently their ability to meet some of the maintenance cost of the systems as well as to contribute to the long-term stability and sustainability of the systems. Even though substantial capital investments have been made by governments over a long period in developing the irrigation infrastructure of the country, the benefits do not appear to be commensurate with the investment. This is attributed to the lack of the sustainability of the systems caused mainly by poor maintenance and rehabilitation, adversely affecting the distribution as well as the receiving of water by farmers.

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[10] Deputy Director of Agriculture, Division of Agricultural Economics and Projects and Head, Land and Water Management Research Centre, Department of Agriculture, respectively.

This paper attempts to focus some of the issues involved in the farmers' ability to contribute to the sustainability of the system, and discuss alternative means of mobilizing some of the resources available to farmers.

Rice Farming under Major Irrigation

Prior to the late 1960s major irrigation schemes provided a basis for the development of irrigated rice farming in the dry-zone regions of Sri Lanka. These irrigation systems consisted of reservoirs which derived their water supply entirely from their own catchments and which have command areas exceeding 200 ha. They were designed to grow rice in the whole command area during the main rainy season (maha) and a part of the command area during the minor rainy season (yala) as determined by the water availability in the reservoir concerned.

In most major schemes, the water is distributed over the command area through a system of main canals, distribution channels and field channels. These early designs have been made to provide a continuous flow irrigation, which necessarily limits the flow into individual farms to very small volumes.

In the development of the Mahaweli Ganga diversion project, irrigation water distribution systems have been designed with broader objectives. There has been a major effort to promote non-rice crops in irrigated areas under the Mahaweli Project.

Water Requirements for Crop Production

Although the rice plant is capable of growing under a wide range of soil and water conditions, ranging from soil at field capacity to different levels of inundation the most common system of rice farming in major irrigation schemes in the dry zone is referred to as "wet lowland rice." The main features of this system include two or three tillage operations under wet soil conditions in bunded level basins, followed by puddling and leveling for transplanting or broadcasting of sprouted seeds of rice. The fields are kept inundated with 5-15 cm of standing water during most of the growth, reproductive, and maturing stages. The irrigation water requirements for rice farming include the water for land preparation and for the crop in all its stages upto ripening.

Water requirements for land preparation are determined by the time taken for completion of land preparation, soil properties, and the atmospheric conditions. During land preparation, water is needed for initial soaking of the soil and then to keep soil and weeds submerged for better initial weed control and to facilitate puddling. The preferred duration for land preparation is from two weeks to one month; however, in most schemes it takes more time than that. From initial soaking to planting, the water gets freely evaporated from standing water and water is also lost through deep percolation and seepage. Therefore, the total water required for land preparation is the sum of daily evaporation, seepage, and percolation for the entire land preparation period. The experimental values reported for land preparation are about 150 mm for Low Humic Gley soils and 300 mm for Reddish Brown Earths for a two-week period. If the land preparation period is extended to 4-6 weeks, the water needed for land preparation may be as high as 600-700 mm.

The water requirements for a rice crop depends on the age class of the crop, the season, and soil properties. The total water requirement during crop growth is obtained by the sum of the evapotranspiration of rice, seepage, deep percolation, surface drainage, and bund leakages from the fields.

The evapotranspiration of a rice crop is almost a fixed quantity for all schemes in the dry zone, as it is determined by atmospheric conditions. The variations are due to the age class of the crop. The evapotranspiration ranges from 450 mm to 830 mm depending on season and the age class.

The total water requirement which includes, water for land preparation and crop growth, ranges from about 1,057 mm to 1,751 mm on Reddish Brown Earths, and 402 mm to 1,128 mm on Low Humic Gley Soils (Lewis 1976, Nayake Korale 1981). The water requirements for other field crops are lower than for rice.

Availability of Water for Crop production

Availability of water in adequate quantities year after year, for the crop grown is a major factor that insures a stable high level of production which in turn allows the farmers' capacity to contribute to the proper maintenance of the system. If the water delivery to farms is reliable, perhaps it would be easier to convince the farmers the importance of the maintenance of the system for effective water delivery.

The adequate and timely water availability at the farm level depends on several factors, such as the available reservoir storage, efficiency of the delivery system, designed delivery rate from the field channel to the farmer allotment, the level of maintenance of the delivery system and the flexibility of the systems to control and regulate flows etc. Out of these factors what farmers can contribute to at the most is the maintenance of the delivery system from the field to the secondary level. However, this would depend, to a large measure, on the additional benefits that the farmer could get because of his contribution to the maintenance of the system. In this regard several questions may be raised: Is the storage adequate? Can the delivery system distribute water equitably and effectively? and Are the farm outlets of suitable size for improved distribution on farms? All of the above issues should be examined for each major scheme and should satisfy the requirements at the farm level to encourage the farmers' participation and contribution to the maintenance of the system.

The average water supply conditions for several major schemes are given in Table 1 for maha and Table 2 for yala. For most seasons, the average duty of irrigation water is within the water requirement range. However, in some seasons in some schemes, the water duty has been much higher than the total water requirement. Nevertheless, if conveyance loss is taken into account, the excessive use of water is the exception to the normal pattern of water use. In some of the schemes, the average duty has been just about the consumptive use. Table 2 also shows that during yala season, the water availability is highly variable. Minneriya and to some extent Kaudulla schemes are able to provide irrigation water to meet the water requirement in general in every season. In others, only a part of the command area has been cultivated (Tables 3 and 4). In all other schemes including Mahaweli H areas, the total extent available for the maha season has not been cultivated. In Mahaweli H, during the yala seasons, it had become necessary to resort to *bethma* because of the inadequacy of water for full irrigation.

Detailed studies as well as general observations show that in all schemes, there is inequity of water distribution. The water duty is variable from scheme to scheme, and within a scheme the water availability differs among the distributaries. Sometimes even under a field channel the water distribution between the allotments is not uniform. Thus, irrigation water supply is highly variable. Even in some of the rehabilitated schemes like Dewahuwa, the variation in water delivery at the various levels of the distribution system is significant. The variability is higher, particularly during periods of low water supply in the system.

The willingness of farmers to contribute to operation and maintenance would at least partly depend on the ability of the farmers to pay. Further, the irrigation systems design with a consistent pattern of field-level channels provides a basis for group formation that in turn could contribute towards better management of the system (Groenfeldt 1987).

Returns from Crop Production

An analysis of the profitability of crop production under irrigation systems, is presented in Tables, 5, 6, and 7. (For the purpose of the discussion data under irrigation conditions from four representative districts namely Amparai, Anuradhapura, Kalawewa, and Polonnaruwa, have been selected. These districts contain most of the major irrigation schemes identified in Tables 1 and 2.) An examination of the data indicates that the net returns per year range between Rs 1,230 per ha for Anuradhapura in 1987 to Rs 4,990 per ha for Kalawewa for the same year. This works out to approximately Rs 500 per month at best from cultivating one ha of land during two seasons.

Theoretically, it is arguable that farmers should be able to pay Rs 500 required per year for the irrigation water. However, in practice it becomes difficult to argue with a farmer whose level of income is so low that he has hardly any surplus left for consumption. Assuming a median salary of approximately Rs 20,000 for a laborer per year, a farmer makes only 20 percent of this. The question of why farmers failed to pay their irrigation charges could be attributed primarily to the low net-income levels. There may be other reasons as well. The ability to pay does not necessarily mean that the willingness to pay exists. Willingness to pay arises when the surpluses are large enough, and when farmers are convinced that payment will lead to an increased efficiency in the system which in turn will provide them with higher incomes.

Future Prospects

Research and field experiences show that net returns from rice farming is low compared to what is possible from cultivation of other field crops (OFCs). Thus, in order to improve farm income it is very necessary to diversify cropping at least in the yala season. From the late 1960s, a concerted effort was made to encourage other field crop cultivation in irrigated schemes. However, the farmers tend to prefer rice farming to OFCs. Probably there are many constraints to OFC production in major irrigation schemes, developed prior to the 1960s. Some of the identified constraints are: inequity of water delivery, unreliability of water supply, inability to provide water on time, and inability to control and monitor the deliveries.

Most of the older schemes do not have the flexibility to provide irrigation water requirements to other field corps. These schemes have been designed to provide continuous irrigation of small quantities of water, while in the newer schemes like Mahaweli System H, System C, etc., distribution systems have been designed to deliver 14 l/s to 28 l/s (one half to one cusec) per farm at a time. The older designs do not have controlling structures or measuring gates, and the irrigation water is delivered through a pipe opening into each farm, at a continuous rate. The water delivery is highly variable; usually the farms at the tail end get much below the requirements while the farmers at the head end may be well-supplied. Further, in older schemes, the farm deliveries are made directly from distributary channels to some of the farmers. Thus, rotational issues of irrigation water are not quite easy in the older schemes. Most of the schemes do not have adequate control of the water supply. Initial designs do not include adequate regulators and measuring gates, etc. Although at "kanna" meetings, farmers agree to cultivate OFCs, rice is grown in the same tract, sometimes within the same command area of a field channel. Under such conditions, proper water management would be extremely difficult. Very often the OFC may be adversely affected by the high water table conditions created by the adjacent farm.

The reliability of water supply is far more important in the cultivation of other field crops, than in rice farming because of higher investment for OFC production. It has been shown in some older schemes, even after rehabilitation, the variation in the water delivery is high; it ranges between 313 mm and 1,018 mm at the farm level and with a high coefficient of variation (Panabokke, 1989). It also indicates the high degree of unreliability of water supply.

The drainage systems of the older schemes do not operate adequately. In some schemes even the natural drainage does not operate. As a result, some lands are waterlogged and develop salinity leading to very low levels of crop production. Most farmers do not have an efficient drainage system installed. Under such conditions, production of high value crops cannot be undertaken. Studies at Kaudulla schemes show that drainage losses are almost equal in magnitude to the crop water requirements in the yala season. Such losses in the head-end areas would normally cause the water tables to rise in lower parts of the landscape, forcing the farms in lower slopes to cultivate nothing but rice and be satisfied with lower incomes, etc.

For the purpose of improving the farmer participation in operations and maintenance, the systems will have to be changed to insure adequate and reliable water supply, to control and deliver adequate quantities on time, and provide drainage for farms and the whole scheme to improve the conditions necessary for high value crop production.

An examination of the incomes from other field crop cultivation is presented in Table 8. It is clear that there is a significant increase in incomes between rice farming per se and other field crop cultivation.

From an annual returns' point of view too, the net returns from a rice-OFC combination is higher than a rice-rice combination. However, it should be noted that care should be taken in the identification of the OFCs. As shown in Table 9, a rice-cowpea combination can lead to a significant loss. Furthermore, attention must be given to the attendant problems in OFC cultivation from a marketing and pricing point of view -- a problem that is relatively minimal in rice cultivation.

Another issue is the availability of labor to meet the requirements of OFCs. The labor requirement for chili is 510 man-days/hectare (md/ha), for onion 715 md/ha, and for cowpea 350

md/ha compared to rice which uses 130 md/ha. The timely availability of this increased number of labor must be considered, particularly if large extents of these OFCs are planned for cultivation.

How Can Farmers Contribute to Maintaining the Systems?

From an economic point of view, there appears to be insignificant incentives for farmers to actively participate in the maintenance of the irrigation systems. Given the present levels of profitability of crop production farmers do not make adequate profits to participate in the maintenance.

However, with greater emphasis on crop diversification, if in the medium-to short-term farmer profits do increase, it is then possible for them to contribute to system maintenance. However, as indicated earlier, dependence on OFCs to increase incomes should be considered with care.

Having said that, what alternatives can we examine other than charging a direct irrigation service fee? Some of the options can be:

Greater Farmer Participation

It is generally agreed that attempts should be made to organize farmers so that they can participate in the maintenance of field channels. This could to some extent change the attitude of farmers whose willingness to pay is lost. Through group action, particularly by providing the labor, farmers may be able to save on cash expenses as payments. A noteworthy factor though, is that over the past two decades experience of group farm action in Sri Lanka indicates very few successful examples that can be looked upon as a model. The cause for this is unclear but certainly it needs examination. If it can be agreed that farmer groups can be organized then such an attempt is worthy to be examined.

Provide Incentives to Farmers

Providing incentives to farmers who participate in the maintenance of their distribution channel may be an option to be considered. The incentives can be in the form of negating the O&M charge or provision of selected inputs such as quality seed rice for cultivation. This may be used as a trigger mechanism to organize farmers to maintain the system.

Reorganizing Farm Size

A fundamental question that has to be asked is whether the farmers, in the future, could manage with 1 ha of land that they generally cultivate. It is clear from a profitability point of view, that

the income earning capacity from 1 ha of land is limited. Consequently, in whatever manner we attempt to change the cropping intensity the physical limitation of 1 ha does not provide much opportunity to increase incomes.

Consequently, it may be pertinent and topical to raise the issue whether the farm size should be increased to a new optimum which can provide greater opportunity for incomes to increase through diversification. This subject needs careful examination and consideration. It is an accepted fact that with increasing family size there can be further fragmentation and very little consolidation. If a dispassionate view is taken on whether the farm size now allotted is really the optimum, then consider the feasibility of increasing it.

Another aspect to be considered is to increase incomes from off-farm and non-farm activities, if it is a considered view that farm size cannot be increased over 1 ha. This needs careful examination as possible opportunities may be available in the different regions or schemes to initiate activities that will increase off-farm and non-farm income-earning opportunities. It would be short-sighted if the only option considered to collect O&M costs is through farmers' organizations.

Conclusion

Given the present profitability of crop production, there appears to be very few options for farmers to participate in maintaining the systems. However, with crop diversification and possible increase in incomes, farmers may be able to provide more in the future. Greater emphasis should be made to provide other sources of income different from farm incomes.

Agricultural development and farmer welfare are a multifaceted process often looked at from a narrow point of view. The welfare of a farmer and his family must be considered from a holistic aspect if we must attempt to solve his problems and offer him a better quality of life.

Table 1. Irrigation duty in major schemes for maha season.

Unit 1

Name of scheme	Actual duty in each season (mm)			
	84/85	85/86	86/87	87/88
Nachchaduwa	1,744	-	1,177	1,108
Padaviya	2,220	-	na	747
Mahakandarawa	-	-	na	1,185
Huruluwewa	2,160	-	1,401	927
Minneriya	2,240	-	1,011	977
Kaudulla	1,690	-	974	1,023
Kantale	1,280	-	na	na
Senanayake Samuddra	na	-	762	674
Mahaweli System H	na	-	na	na

na - data not available

Table 2. Irrigation duty in major schemes for yala season.

Name of scheme	Actual duty in each season (mm)					
	84	85	86	87	88	89
Nachchaduwa	920	1,866	2,258	nc	1,028	1,431
Padaviy	1,483	nc	na	nc	na	nc
Mahakandarawa	na	nc	1,506	nc	nc	nc
Huruluwewa	1,049	-	na	1,512	nc	2,002
Minneriya	na	1,281	1,367	1,436	1,005	1,072
Kaudulla	1,322	3,639	1,468	1,950	1,768	1,598
Kantale	1,826	1,173	1,868	na	1,239	1,231
Senanayake Samuddra	na	1,560	na	1,063	1,089	961
Mahaweli System H	-	-	-	-	-	-

na - data not available
nc - not cultivated

Table 3. Maha cultivation in major irrigation schemes.

Scheme	Command area (ha)	Actual extent cultivated in each season (ha)			
		84/85	85/86	86/87	87/88
Nachchaduwa	2,936	1,533	na	2,383	2,936
Padaviya	5,585	5,585	na	na	5,585
Mahakandarawa	2,567	na	na	na	2,469
Huruluwewa	4,090	4,087	na	3,852	3,852
Minneriya	8,903	8,903	na	8,903	8,903
Kaudulla	4,856	4,272	na	4,856	4,856
Kantale	9,919	677	na	na	na
Senanayake Samuddra	44,572	na	49,410	33,295	40,223
Mahaweli System H	29,652	28,740	28,438	28,968	28,735

na - data not available

Table 4. Yala cultivation in major irrigation schemes.

Scheme	Command area (ha)	Actual extent cultivated (ha)					
		84	85	86	87	88	89
Nachchaduwa	2,936	2,832	1,533	1,033	na	1,500	344
Padaviya	5,585	5,585	nc	na	nc	na	nc
Mahakandarawa	2,567	na	nc	1,053	nc		
Huruluwewa	4,090	4,087	ms	na	486	nc	1,012
Minneriya	8,903	na	8,903	8,903	8,903	8,903	8,903
Kaudulla	4,856	4,856	404	4,852	1,565	2,348	2,357
Kantale	9,919	4,987	4,988	na	nc	3,437	1,170
Senanayake Samuddra	44,572	na	29,948	26,407	39,402	32,200	43,017
Mahaweli System H	29,652	22,345	18,537	21,410	11,676	14,300	na

na - data not available
nc - not cultivated

Table 5. Production, gross income, cost and returns per 1 - ha farm during maha season.

District	Average yield (kg/ha)	Con-sump tion	Market-able surplus (kg)	Average price (Rs/kg) (kg)	Gross income (Rs)	Cost of cultiva-tion inclusive of family labor (Rs)	Cost of cultiva tion exclu-sive of family labor (Rs)	Net Return inclu-sive of family labor (Rs)	Net Return exclu-sive of family labor (Rs)
Amparai									
1989	3,109	400	2,709	3.4	9,211	9,263	7,765	-52	1,446
1986	4,111	400	3,711	3.54	13,137	10,755	9,809	2,382	3,328
1988	3,720	400	3,320	3.31	10,989	9,925	6,490	1,064	4,499
Anuradhapura									
1985	3,760	400	3,360	3.25	10 920	8,102	6,436	2,818	4,484
1986	3,592	400	3,192	3.43	10,949	10,030	6,389	919	4,560
1987	3,929	400	3,529	3.4	11,999	8,866	6,434	3,133	5,565
1988	3,983	400	3,583	3.69	13,221	12,027	8,243	1,194	4,978
Kalawewa									
1985	4,281	400	3,881	3.08	11,953	7,193	5,291	4,760	6,662
1986	4,482	400	4,082	3.29	13,430	8,509	6,114	4,921	7,316
1987	4,693	400	4,293	3.59	15,412	10,133	6,823	5,279	8,589
1988	3,860	400	3,460	3.39	11,729	11,490	8,365	239	3,364
Polonnaruwa									
1985	4,513	400	4,113	2.88	11,845	10,943	8077	902	3,768
1986	4,910	400	4,510	3.32	14,973	11,336	6849	3,637	8,124
1987	4,507	400	4,107	3.28	13,471	11,361	7772	2,110	5,699
1988	4,438	400	4,038	3.4	13,729	11,025	7608	2,704	6,121

Source : Department of Agriculture, Cost of Cultivation of Agricultural Crops.

Note : Consumption requirement of rice is estimated assuming a per capita rice consumption of 104 kg/ annum and average family size of 5 members. Cropping intensities assumed were 100 percent and 60 percent, respectively, for maha and yala.

Table 6. Production, gross income, cost and returns per 1 - ha farm during yala season.

District	Average yield (kg/ha)	Consumption	Marketable surplus (kg)	Average price (Rs/kg) (kg)	Gross income (Rs)	Cost of cultivation inclusive of family labor (Rs)	Cost of cultivation exclusive of family labor (Rs)	Net return inclusive of family labor (Rs)	Net return exclusive of family labor (Rs)
Amparai									
1986	3,026	400	2,626	3.83	10,058	6,283	5,705	3,775	4,353
1987	2,248	400	1,848	3.26	6,024	5,569	4,346	455	1,678
Anuradhapura									
1985	1,973	400	1,573	3.42	5,380	5,312	4,028	68	1,352
1986	1,895	400	1,495	3.9	5,831	6,689	3,732	-858	2,099
1987	1,706	400	1,306	3.67	4,793	6,696	458	-1,903	206
Kalawewa									
1985	2,109	400	1,709	3.48	5,947	4,623	3,289	1,324	2,658
1986	1,907	400	1,507	3.41	5,139	5,260	3,837	-121	1,302
1987	1,995	400	1,595	3.58	5,710	5,999	4,294	-289	1,416
Polonnaruwa									
1985	2,396	400	1,996	3.17	6,327	5,207	4,051	1,120	2,276
1986	2,179	400	1,779	3.49	6,209	5,698	4,577	511	1,632
1987	2,384	400	1,984	3.67	7,281	6,282	4,651	999	2,630

Source : Department of Agriculture, Cost of Cultivation of Agricultural Crops.

Note: Consumption requirement of rice is estimated assuming a per capita rice consumption of 104 kg/ annum and average family size of 5 members. Cropping intensities assumed were 100 percent and 60 percent, respectively, for maha and yala.

Table 7. Annual net income per 1-ha farm.

District and year	maha		yala		Total	
	NR incl fam labor (Rs)	NR excl fam labor (Rs)	NR incl fam labor (Rs)	NR excl fam labor (Rs)	NR incl fam labor (Rs)	NR excl fam labor (Rs)
Amparai						
1986	-52	1,446	3,775	4,353	3,723	5,799
1987	2,382	3,328	455	1,678	2,837	5,006
Anuradhapura						
1985	2,818	4,484	68	1,352	2,886	5,836
1986	919	4,560	-858	2,099	61	6,659
1987	3,133	5,565	-1,903	206	1,230	5,771
Kalawewa						
1985	4,760	6,662	1,324	2,658	6,084	9,320
1986	4,921	7,316	-121	1,302	4,800	8,618
1987	5,279	8,589	-289	1,416	4,990	10,005
Polonnaruwa						
1985	902	3,768	1,120	2,276	2,022	6,044
1986	3,637	8,124	511	1,632	4,148	9,756
1987	2,110	5,699	999	2,630	3,109	8,329
1988	2,704	6,121	-	-	-	-

Source : Tables 5 and 6.

Note: fam = family
incl = inclusive
excl = exclusive
NR = net return

Table 8. Yield, gross income, cost, and return per hectare in OFCs cultivation in Mahaweli System 'H' during yala.

Crop/year	Av yield (kg/ha)	Av price (Rs/kg)	Gross income (Rs) labor (Rs)	COC incl fam labor (Rs)	COC excl fam labor (Rs)	NR incl fam labor (Rs)	NR excl fam labor (Rs)
Cowpea							
1985	845	10.8	126	7,864	2,294	1,262	6,832
1986	1,016	12.13	12,324	12,884	3,033	-560	9,291
1987	1,045	12.58	13,146	14,467	2,913	-1,321	10,233
1988	973	11.47	11,160	19,630	7,024	-8,470	4,136
Big onion							
1986	7,374	11.09	81,778	30,320	13,851	51,458	67,927
1987	4,159	9.02	37,514	32,374	13,239	5,140	24,275
1988	11,218	10.28	115,321	40,958	20,258	74,363	95,063
Chili							
1985	1,719	30.77	52,894	21,354	9,930	31,540	42,964
1986	1,165	26.25	30,581	18,386	11,126	12,195	19,455
1987	1,234	35.1	43,313	21,327	11,587	21,986	31,726
1988	897	40.25	36,104	30,183	14,984	5,921	21,120

Source : Department of Agriculture, Cost of Cultivation of Agricultural Crops.

Note: ind = inclusive
excl = exclusive
fam = farm
Av = average
COC = cost of cultivation
NR = net return

Table 9. Annual net income per 1-ha fam (Rice-OFC systems) in Mahaweli System 'H' .

District/year	maha		yala		Total		Surplus over rice system	NR rice excl fam labor (Rs)
	NR incl fam labor (Rs)	NR excl fam labor (Rs)	NR incl fam labor (Rs)	NR excl fam labor (Rs)	NR incl fam labor (Rs)	NR excl fam labor (Rs)	incl fam labor	
Rice/Cowpea								
1985	4,760	6,662	757	4,099	5,517	10,761	-567	1,441
1986	4,921	7,316	-336	5,575	4,585	12,891	-215	4,273
1987	5,279	8,589	-793	6,140	4,486	14,729	-504	4,724
1988	239	3,364	-5,082	2,482	-4,843	5,846		
Rice/Big onion								
1986	4,921	7,316	30,875	40,756	35,796	48,072	30,996	39,454
1987	5,279	8,589	3,084	14,565	8,363	23,154	3,373	13,149
1988	239	3,364	44,618	57,038	44,857	60,402		
Rice/Chili								
1985	4,760	6,662	18,924	25,778	23,684	32,440	17,600	23,120
1986	4,921	7,316	7,317	11,673	12,238	18,989	7,438	10,371
1987	5,279	8,589	13,192	19,036	18,471	27,625	13,481	17,620
1988	239	3,364	3,553	12,672	3,792	16,063		

Sources : Tables 6 and 8.

Note : 1. An assumption is made that 60 percent of the available land will be planted with the respective crop during yala season.

2. incl = inclusive
fam = farm
excl = exclusive

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Resource Mobilization for Sustainable Management of Major Irrigation Schemes: Overviewof Future Policy Directions

Ananda S. Weerasinghe[11]

INTRODUCTION

THE ESTABLISHMENT OF irrigated agricultural settlements in the "Land Resource Frontier" of the dry zone of Sri Lanka has constituted the main thrust in agricultural development for more than 50 years. Major public investment in irrigated agriculture has been relentlessly directed towards expanding the agricultural land base under an explicit policy of agriculture-initiated development. Successive governments have treated agriculture as the "propulsive sector" and expenditure on irrigation infrastructure forms the largest single investment since Independence. During the pre-Mahaweli period (1950-69) investment in the irrigation subsector amounted to Rs 9.7 billion and in the post-Mahaweli period (1970-87) the total outlay was Rs 54.4 billion (PSRP 1990). The role of Mahaweli as an irrigation and hydropower project has been dominant since 1970. Investment in irrigation inclusive of the "lead project," Mahaweli, rose to a third of the total development expenditure of the government and at its peak in 1982 amounted to 7 percent of the GDP (World Bank 1988). By the end of 1988, Rs 46.5 billion had been spent in the Accelerated Mahaweli Development Programme and with the projected expenditure in 1989, the total costs would reach Rs 50 billion (PSRP 1990).

The most predominant type of irrigated agriculture in Sri Lanka is through gravity irrigation from impounded subsurface and surface storage in state-sponsored schemes. The gravity irrigation schemes are classified into three main categories based on the size of the command area.

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[11] Director of Planning, and Director of Settlement Planning and Management Division, Ministry of Lands, Irrigation and Mahaweli Development.

Minor or Village Irrigation

Minor or village irrigation consists of irrigation schemes with a command area up to 200 acres. A single canal or two canals serve the fields and the schemes are designed for one season (maha) cultivation. These schemes have been managed by the Agrarian Services Department and with the administrative changes consequent to the devolution of power to the Provincial Councils, the management now rests with the provincial irrigation authority. The total area under the minor irrigation schemes is estimated around 433,584 acres consisting of 25 percent of asweddumized area.

Medium Irrigation Schemes

Medium irrigation schemes have a command area ranging from 200 to 1,000 acres and are designed for a maha and part yala cultivation. A distributary system with field channels is often found in these schemes. Although these schemes were previously managed by the Irrigation Department, the present management is entrusted to the Provincial Irrigation Departments. A working arrangement has been made for the management of medium irrigation schemes fed by interprovincial rivers to be handled by the provincial irrigation authority even though this is the function of the central government under the devolution scheme.

Major Irrigation Schemes

Major irrigation schemes have a command area of more than 1,000 acres and are designed for maha and substantial yala cultivation. These schemes possess a distribution system complete with branch canals and field channels. The units of agricultural land cultivated under these schemes are of uniform size and very often the farm families have transmigrated under state sponsorship, thereby necessitating the provision of social infrastructure facilities such as health, education etc. According to the Department of Census and Statistics rice cultivation is practiced in about 690,700 acres under major irrigation schemes covering 29 percent of the total rice cultivated area of 1.75 million acres.

The major irrigation settlements are concentrated in the agro-ecological zone designated "dry," extending over 70 percent of the land surface, which contrasts climatically with the "wet zone" in the southwest quadrant. The pronounced dry season in the dry zone is from May to September (during the southwest monsoon) and the rainfall is received from November to January (during the northeast monsoon). The vagaries of rainfall due to fluctuation around the critical level required to keep the soil moisture above wilting point make the dry zone a difficult region for nonirrigated crops (Farmer 1957). The Sinhala civilization had its origins in the Rajarata, the north central plains located in the dry zone, and it was nurtured by irrigated agriculture which developed from independent small village reservoirs to more elaborate networks connecting a

"cascade" of small reservoirs to each other within micro-catchments in the dry zone culminating in trans-basin diversions to augment major reservoirs. This was a landmark in the technological advance of the "hydraulic civilization" which enabled the enhancement of reliability of irrigation water through the importation of water from rivers originating in the wet zone.

THE EVOLUTION OF IRRIGATION AND SETTLEMENT POLICY

The Early Period

Land development in Sri Lanka has been closely associated with the development of its water resources. The ancient settlements in the dry zone were based on irrigated agriculture. The modern phase of irrigation development had its origins in the sporadic restoration of ancient irrigation works during the period 1850-1900, which was undertaken through the individual initiative of the colonial governors. Due to the efforts of high officials like Governor Henry Ward (1855-60) the government was persuaded to deviate from its laissez-faire approach and to take positive action for resource development. The Irrigation Ordinance was promulgated in 1856 to assist the process of restoration and land development; and to supervise the activity, Provincial Irrigation Boards were constituted in 1885, the Central Irrigation Board in 1888, and finally, the Irrigation Department in 1900. To further facilitate the restoration Sir William Gregory (1872-77) ruled that public works should not be judged by their capacity to earn revenue, which marked the beginning of a policy swing towards peasant welfare.

An Experimentation Period

During the period 1900-1927 experimentation in irrigation restoration and the establishment of irrigation-based settlements was witnessed. These experiments helped the moulding of most of the subsequent policies. Valuable lessons were learnt in the restoration and development of schemes such as Kalawewa, Yodhawewa, Minneriya, and Nachchaduwa. A government committee on self-sufficiency in food recommended in 1920 that the Irrigation Department should not be regarded as a revenue earner, making it a service organization catering to the people. An attempt was made to use the high scarcity prices to induce the private sector to participate in the development of dry-zone-irrigated agriculture but the investments in Kalawewa (1920), Kirindi Oya (1921), and Minneriya failed due to malaria and other harsh living conditions (Farmer 1957). At the end of the experimentation period it became clear that the only alternative for dry-zone development was through small cultivators under planned colonization schemes under direct official control. Land redistribution in the dry zone under irrigated settlement schemes was

chosen mainly as a strategy to relieve the mounting population pressure in the wet zone by assisting migration. State-aided colonization[12] was recommended as a remedial measure by the first Land Commission (1927). Further, the need to enhance food production during the two World Wars and the intervening period of low foreign-exchange earnings resulting from the depression in the plantation industries focused attention on the only available "resource frontier," the dry zone (Farmer 1957).

The Period of Achievement

Farmer (1957) identified the 24 years between 1931 and 1955 as the period of achievement. Considering the momentum generated in the creation of irrigation infrastructure which reached a climax through the Accelerated Mahaweli Development Project it would be convenient to extend the "period of achievements" up to about 1985 and to discuss the evolution of policy during a period of more than 50 years of intense activity.

Accelerated development of irrigation infrastructure and settlements during this period saw the creation of most of the major irrigation schemes based on large reservoirs (e.g., Minneriya, 1936; and Parakrama Samudra, 1947) which later progressed into multipurpose irrigation schemes (e.g., Galoya, 1949). Since 1950, irrigation development has been pursued with much vigor.

The second Land Commission (1955), while emphasizing the maximization of production reinforced the view that state-aided irrigation settlement should continue as insurance against failure of improved methods of food production and other lines of economic development. The Commission stressed that these settlements should be continued under state sponsorship as no other organization could provide irrigation facilities, essential land use, planning services, and the necessary administrative and financial support (Land Commission Report 1958). Hence, major irrigation schemes continued to be the key development strategy and the resulting rapid pace of development is evidenced by the creation of more than 70 major irrigation schemes (excluding extensions to existing schemes) during this period (LCD 1981). The irrigation development strategy was broadened to encompass river-basin development (e.g., Walawe, 1965) and reached its peak in the trans-basin diversions under the Accelerated Mahaweli Development Programme, the lead-project of the government since 1977.

While the construction of irrigation infrastructure shifted into high gear in Mahaweli areas, a dual policy was evident in areas outside Mahaweli. On the one hand, major schemes such as Mutukandiya, Mahadivulwewa, Inginimitiya, and Kirindioya were undertaken adding about 30,000 acres of newly irrigated land and providing settlement facilities to about 12,000 farm families. On

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[12] "Colonization," according to the Land Commission Report, 1929, is the settlement of peasants upon land outside their native villages. Farmer (1957) defines it as government-sponsored settlement in an area away from the settler's home, as distinct from spontaneous settlement either near or away from the settler's home.

the other hand, rehabilitation of existing schemes, both minor and major, received priority attention from the policymakers.

The early indications of a transformation of irrigation policy from a "construction dominated phase" into a "management phase" appeared in the late 1960s. Once the major irrigation systems became fully operational it became apparent that the full production potential was not being realized despite the heavy investment. Criticisms were leveled against the irrigation infrastructure program contending that it was unable to generate commensurate returns, implying a misallocation of scarce resources (Alwis 1986). The capital-intensive nature of the investments that yielded low returns was highlighted in the short-term implementation program of the government (1962), which made reference to the benefit/cost ratio of Mahakanadarawa (0.56) and Rajangana (0.67), with project benefits calculated over a 50-year period. Low yields of irrigated rice in the major irrigation schemes prompted the Galoya Evaluation Committee (1970) to base its cost/benefit calculation on a maximum yield of 50 bushels per acre, which revealed discouraging results. The highlighting of operational deficiencies triggered a process of review.

A review of far-reaching consequences was the FAO/IBRD Cooperative Programme's 1968 review of the Irrigation Sector. It recommended the rehabilitation of irrigation infrastructure, coordination of input supply, and continued construction of medium-scale and village irrigation, lift irrigation, drainage, and reclamation (FAO/IBRD 1968). Emphasis on greater output through better-coordinated inputs prompted the government to launch the "Special Projects" program for the major irrigation schemes: a management intervention aimed at insuring delivery of inputs and services with a committed back-up at all levels. This strategy coincided with the global expansion of Green Revolution Technology. Twenty-four major irrigation schemes were brought under this management exercise (Wijetunga 1986), but although encouraging results were obtained, the program was unable to sustain its initial momentum due to lack of institutional development and failure to involve farmers in management decision making (MLLD 1984A).

The FAO/IBRD review is considered as a watershed in the policy evolution of the irrigation subsector. It led to a revision of the strategic approaches to irrigation and caused a shift in policy in favor of improving existing irrigation infrastructure (Alwis 1986) and ushered in a rehabilitation and redevelopment phase with bilateral and multilateral assistance. Up to that time, the irrigation and settlement strategy was carried out as a "home grown, egalitarian, rural development model" funded exclusively through domestic resources. The only exception was the TVA-type Galoya irrigation scheme which utilized American expertise for designs and specifications and for the construction of headworks and hydropower plant.

The reorientation of policy took effect around 1975, prompted by the above-referred developments and necessitated by the deteriorated irrigation infrastructure caused by the neglect of maintenance, especially during the period of serious economic setbacks induced by the lack of resources that prevailed in the 1960s. The shift in policy was characterized by its emphasis on the improvement and betterment directed towards intensifying resource utilization and management (Alwis 1988). The International Development Association (IDA)-funded Tank Irrigation Modernization Project, 1976, signaled the beginning of the era of rehabilitation of physical systems which was followed by the USAID-funded Galoya Left Branch Rehabilitation Project (Galoya Water Management Project-1979) which contributed to developing cost-effective rehabilitation in order to restore irrigation systems to operational levels and to demonstrate the ability to form farmers' organizations as a corollary to achieve improved water management and beneficial agronomic practices.

The Major Irrigation Rehabilitation Project (IDA), Irrigation Systems Management Project (USAID), Minipe-Nagadeepa Rehabilitation Project (Japanese OECF), and Moneragala Agriculture Resources Development Project (CIDA) are in operation at present supporting the rehabilitation and redevelopment efforts. Rehabilitation of the minor irrigation works also has been pursued through the Village Irrigation Rehabilitation Project (IDA) which will be continued through a follow-up project for National Irrigation Rehabilitation funded by the IDA. The Integrated Rural Development Projects (IRDP) funded through foreign assistance have provided substantial assistance for minor irrigation rehabilitation. According to Central Bank figures, Rs 390 million (22.8 percent of total IRDP expenditure) has been invested between 1981 and 1985.

A strategy for increasing productivity in irrigated farming requires a well-coordinated supply of improved seed varieties, fertilizer, and agrochemicals, credit facilities, and the provision of support services such as extension and marketing. The success of a crop depends on the adequacy and timeliness of the supply of the most critical input, irrigation water. Improvement in unit productivity of water in major irrigation schemes has become necessary not only because water is a "high value" and "low priced" input subject to wasteful use by the farmer, but because it is "land augmenting" (Chambers 1978) and if used sparingly, can enhance the cropping intensity. Effective water management requires beneficiary participation and involvement in the management process of the irrigation schemes. With these objectives in mind a national program for the Integrated Management of Major Irrigation Schemes (INMAS) was launched in 1984, after the completion of a pilot project for water management conducted in 25 schemes. The policy parameters of this program were consistent with macro-economic development priorities of the 1980s which favored low-cost, production-oriented, quick-yielding projects. Effective formulation and adoption of principles of water management both at the system level and the farm level required training and changes of attitudinal and behavioral patterns of both farmers and interfacing irrigation bureaucracies. In order to strengthen the training and management capacity required by the integrated management effort, UNDP assistance has been obtained under two projects completed in the eighties.

PRESENT POLICY AND FUTURE DIRECTIONS

The policy of state-provided irrigation infrastructure which matured during the 50 years of activity related to the establishment and management of major irrigation schemes appears to be reaching a watershed. The dictates of the economic and social environment of the present period will influence a further reorientation of current policies and strategies.

The evolution of irrigation policy shows that the objectives have changed over time in order to adapt to the changing economic and social environment. The traditional objective of irrigation was considered to be the increase of reliability of the supply of water requirements for plant life. This was perceived at a time when the emphasis was on the cultivation of new land in the resource-frontier region of the dry zone, which was constrained by lack of irrigation water. The economic and social realities of the 1970s made it imperative that not only the increase in the supply but the improvement in unit productivity of water should be the objective.

The main determinants of future policy can be ascertained from the indicators of performance of the economy and its projection. The severely strained economy has long been overburdened by unsustainably large macro-economic imbalances. A deteriorating economy registered a low growth rate less than 2 percent in 1987. The current account deficit of the balance of payments was equivalent to 8 percent of the GDP and the debt service ratio reached a record high level of 29.9 percent in that year (World Bank 1988). The economic decline exacerbated by political and ethnic unrest in the northeast and the south highlighted the need to undertake economic reforms in the short- and medium-term. The civil strife that prevailed since the latter part of 1987 has resulted in depressed revenue collection and export earnings. The reforms agreed upon by the government are bound to constrict further the public investment potential. Damage caused to the productive assets of the economy will necessitate the available resources to be diverted to investments for "reconstruction."

Structural reform of the economy recommended by the World Bank bears a strong emphasis on "breaking with the past." A comprehensive stabilization and adjustment program has been formalized with the Bank which is stated in the "Policy Framework Paper 1988-89." This program includes, inter alia, the restructuring of public expenditures in order to increase economic returns and to improve cost-effectiveness and to remove the constraints on sustainable development. On a request made by the government in 1988, the World Bank has financed a "public sector restructuring project" with the objectives of a) preparing an implementation program of administrative and management reform, b) implementing a technical assistance program to support the establishment of Provincial Councils, and c) preparing a program to restructure selected public expenditure. The task of rationalization of public expenditure specifically includes the examination of expenditure in areas such as Mahaweli and other irrigation and land-settlement schemes. A study commissioned by the Project has made an in-depth analysis in a report called "Future Directions for Irrigation Investment in Sri Lanka"[13] (PSRP 1990). It is expected that the project could make its final recommendations on future irrigation policy strategies shortly.

Based on the signals generated by economic conditions and recent official pronouncements of policy this paper will attempt to discuss the present policy and future directions in the irrigation subsector under three headings.

a) The irrigation subsector and the development strategy;
b) Issues relating to the sustainable management of physical infrastructure in major irrigation schemes; and
c) The production environment and economic sustainability of major irrigation schemes.

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[13] The writer acknowledges that most recent data and analytical material contained in this report have rendered valuable assistance to the preparation of this paper.

The Irrigation Subsector and the Development Strategy

The National Agriculture, Food and Nutrition Strategy (NAFNS) formulated in 1984 recognized the vital role of irrigation in the development of the dry zone and reiterated its importance for future extension of agricultural development and settlement activity. Making an assessment of agriculture and the food situation, NAFNS proposed a change in perspective in determining future priorities. A shift from "construction" to "rehabilitation," with greater emphasis on water management and recovery of operation and maintenance costs was recommended. It also emphasized the need to formulate sound plans for system maintenance and rehabilitation and a coordinated watershed management. Rehabilitation was favored due to physical deterioration evident in irrigation systems through the neglect of O&M and inefficient water control and management that have resulted in waste of water (MFP 1984).

The relatively uneconomic nature of major irrigation construction and the absence of economically viable new major irrigation projects coupled with the chronic shortage of investment funds discouraged the continued emphasis on the creation of new major irrigation schemes. The irrigation investment strategy prepared by the MLLD tried to maintain flexibility in terms of choice of schemes, but indicated that "the construction of any new major schemes should be taken up only after a period of review and research (including Environmental Impact Assessment)." It preferred the construction and rehabilitation of small and medium tanks, taking into consideration the nation's financial limitations (MLLD 1984 B).

The Public Investment Programme (PIP)[14] has consistently emphasized the importance of agriculture and irrigation and has directed investments in accordance with the guidelines given in the NAFNS.

A World Bank study in 1986 further strengthened the policy direction and ranked rehabilitation as the first priority in irrigation after an analysis of cost and benefits of the Mahaweli and the rehabilitation schemes. The study revealed the economic rate of return of rehabilitation to range between 16 percent - 23 percent (against 12 - 21 percent of Mahaweli) and the cost per hectare to range between US$530-1,930 (as against US$3,800-6,200 of Mahaweli). Assuming the need for reduction in investment allocation for irrigation beyond 1985 the other rankings of investment priorities for the medium term included improved water management, and system operation and maintenance. With regard to new irrigation developments (i.e., southeast dry zone and northwest dry zone) the report recommended shelving of the proposal (World Bank 1986).

The emphasis on a policy of rehabilitation and efficiency improvement, improved operation and maintenance of existing schemes, better water management practices, encouragement of participatory management, etc., have been the salient features of current policy. The action plan of the government prepared in April 1989 has elaborated these activities which will be translated

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[14] An indicative rolling plan prepared each year since 1979 which incorporates a detailed investment plan for the ensuing year, indicates major sectoral investment targets for a longer-time horizon of five years, and is closely integrated into the annual government budget. Financial provisions are made only for investments that merit inclusion in the PIP. It is flexible and reflects changes in government policies and priorities from year to year.

into a development plan by the office of the Minister of State for Irrigation. The Development Policy Letter (October 1989) sent to the Asian Development Bank by the Minister of State for Finance and which forms an integral part of the Agriculture Programme Loan, setting out the focus and objectives of this government's development program re-states the above policies and mentions the new policy initiative for participatory management in the irrigation sector.

The study commissioned by the PSRP has recommended a "continued investment across the spectrum of project sizes and types" as a future strategy. This is based on the assumption that great potential exists for raising economic and financial returns from both rehabilitation and new projects. While advocating new approaches to be adopted for the design of new irrigation schemes and for the modernization and rehabilitation of existing major irrigation schemes it recommends that the domestic agricultural sector should take precedence over other sectors in the allocation of public investment funds. In view of the urgent need for new investments with high and rapid returns, it argues that irrigation is the subsector most capable of absorbing substantial investments in the short-run. This study has concluded that commonly held views about economic returns have shown a tendency to overestimate returns from rehabilitation projects and to underestimate returns from investments in major irrigation schemes such as the Mahaweli.

The final recommendations of the PSRP are yet to be seen and it is very likely that under the structural adjustment program, resource constraints are going to affect future investments in the irrigation sector. Under the circumstances new major irrigation projects with long gestation periods and high costs compounded by the need to provide economic and social infrastructure which make heavy demands on resources will not be favored. It is assumed that public investments will not grow more than 2 percent per annum. Hence, any increase in investments for new major irrigation projects will depend on the success in achieving diversification goals in irrigated areas, insuring an increase in its contribution, and the availability of outside investments (e.g., World Bank or ADB) to other subsectors of agriculture (such as tree crops, fisheries, livestock, and forestry) which compete for investment funds while contributing more than 80 percent of the value added in the agriculture sector (PSRP 1990).

Issues Relating to the Sustainable Management of Physical Infrastructure in Major Irrigation Schemes

Consequent to the policy shifts from construction to rehabilitation, much attention has been focused on the sustainable management of physical systems. The concept of rehabilitation first commenced under the Tank Irrigation Modernization Project (1976) and has progressed over the years, gaining momentum and attracting not only foreign funding but also inputs of foreign expertise. Different approaches have been tested out, enhancing the local capabilities.

A technical exercise to improve the physical condition of an irrigation system may be necessitated by the aging of the system, changing demand pattern, excessive operational losses, and mismatches between demand and delivery due to the run-down condition of the distribution system. At the inception of the "rehabilitation phase" the activities were centered on the physical systems, i.e., the engineering components and the provision of machinery and equipment for O&M. Before long it became clear that an irrigation system is comprised of physical, biological,

socioeconomic, and organizational activities related to the major economic activity of production of food crops. This led to the realization that physical improvements should be coupled with appropriate cultural practices and strengthening of farmer' organizations and consultation with them. The bias toward the rehabilitation of physical systems and machinery and equipment was removed in the Gal Oya rehabilitation, and the socioeconomic research component of strengthening farmer' organizations was given more emphasis.

Recent experiences have shown that a comprehensive rehabilitation is required after about 20 years of operation owing to poor regular maintenance of the systems, a consequence of lack of funds. Based on this, NAFNS suggested a cyclical rehabilitation of 15 years for small tanks, 20 years for medium-size tanks and 25 years for large tanks, necessitating, on the average, rehabilitation of 25,000 acres under major schemes, 5,500 acres under medium size and 15,000 acres under village irrigation, requiring about Rs 450 million annual outlay at 1984 prices. At the time of the formulation of the USAID- assisted Irrigation Systems Management Project it was evident that such allocation on an annual basis cannot be found and an attempt was made to establish through the project a workable methodology of regular O&M through the mobilization of farmer' organizations, and an alternative system of ongoing maintenance that would eliminate the need for cyclical comprehensive rehabilitation which can only be undertaken through the infusion of foreign assistance.

Due to the default of regular O&M most of the irrigation infrastructure rehabilitation in Sri Lanka has been directed towards the restoration of physical structures to original design specifications which can be viewed as an "extended" maintenance activity (Wijeratne 1988). "Rehabilitation" differs from "maintenance" in that it usually involves system-wide modifications of physical and organizational characteristics involving adjustments to capture the benefit of technological advance. Successful systems are those which adapt to the change of their external environment. It is this adaptation that permits the system to remain reasonably efficient with respect to the relative scarcities of available water, land, and management resources associated with the system. Systems which have opportunities to change at reasonably frequent intervals are likely to be more successful than those in which rigidities inhibit change (Levine 1986 quoted by Wijeratne 1988).

The objectives of an irrigation project after a period of 20-25 years of operation can change with agricultural and management practices which respond to the changes in the external environment. To reap the benefits of technological advances, what is needed is upgrading, betterment, or modernization of the physical systems through rehabilitation. In the formulation of rehabilitation strategy under the Irrigation Systems Management Project the technique of "Diagnostic Analysis" was used to achieve better definitions of problems, establish project objectives, inventorize resources, and develop strategies acceptable to the beneficiaries as well as to the technical management.

The different approaches to sustainable management of physical systems have so far helped to mould a policy of improving system efficiency through rehabilitation and upgrading of the physical infrastructure (the hardware) and to entrust farmer participation in water distribution at secondary and tertiary levels and create an associated organizational structure and management process (the software). Much headway has been made in this direction through a series of rehabilitation projects which strived to establish an effective system management methodology. Computer modeling of canal operation and irrigation scheduling, systematic O&M of infrastruc-

ture, on-farm development works to improve application efficiency, development of water users' associations to insure equitable distribution, and training of farmers in water management and modern agricultural practices are among the activities diligently pursued.

The economic indicators are clear that the entire responsibility of financing of O&M in major irrigation schemes cannot be borne by the government alone. A policy of O&M cost recovery through a fee levied on the users was implemented by the government as a means of reducing the recurrent burden on its scarce resources and to instigate a sense of "belongingness" in the minds of the users on the assumption that it will help eliminate wasteful water-use practices. It also became a condition of loan disbursement of major donors such as the World Bank and the ADB. The PSRP study observes that the need to collect O&M fees from the farmers is compounded by other factors. The ability of rice farmers whose operating margins are progressively reduced due to high costs of production militates against such a move. The fact that irrigation water within gravity-fed projects serving a large number of subsistence farmers exhibits many characteristics of a "Public Good," makes it unfeasible to enforce volumetric pricing. A recent study (April 1989) financed under the IDA-assisted Major Irrigation Rehabilitation Project has found that irrigation service fee recovery is a very narrow concept because it represents only one aspect of management of irrigation schemes (TEAMS 1989).

It has been pointed out that the recovery of O&M charges from the farmers as done in advanced economies is untenable in Sri Lanka because by design water delivery is not controlled and individuals cannot be served equally. The action of other users determines the water received and the water supply to the farm lots is not on demand. The supplier cannot be held responsible for the deficiencies in the delivery. Due to this complex situation, the future policy has to be contended with the proposition that irrigation water is best managed when it is treated as a social good and managed through social action. Hence, sustainable management of irrigation infrastructure in future has to find a solution through a "user-managed" system leading eventually to a "user-owned" system. This would require the enhancement of internal management capacity within the schemes. Much spade work will be needed to reach that goal.

The recent government decision (January 1989) is based on a joint-Cabinet paper submitted by the two ministers in charge of the subjects of irrigation and agriculture for the enhancement of participatory management, with the objective of improving overall management and performance and to encourage farmers to manage O&M of the distributary systems by contributing their labor and other resources. The decision provides for the continued supply of funds to maintain headworks and main canals (estimated at 50 percent of the total maintenance cost) and the framing of legal provisions for the handing over of ownership of irrigation works below distributary channel level to farmer' organizations. No doubt that the policy instruments are capable of establishing a regular O&M machinery in the long run. The achievement of such a goal under prevailing field conditions, which have been affected by the recent administrative changes taking place under the devolution of functions to the Provincial Councils etc., requires adroit steering of a well-coordinated program in the irrigation subsector.

The long-term sustainability of major irrigation schemes closely depends upon the management of the catchment areas. Observing that there is minimal planning on watershed management despite large investments devoted to the utilization of the water yield, NAFNS recommended a coordinated watershed management in order to protect the investments and to insure rational utilization of land and water resources. The Land Commission Report (1987) proposed a

"Watershed Management Authority." Except for the Upper Mahaweli Catchment Development Project (which includes the Upper Mahaweli Watershed Management Project, the Victoria Land Use and Conservation Project, and the Upper Mahaweli Forestry Project) watershed management has not received adequate attention yet. To insure sustainable irrigation systems the formulation and implementation of a coordinated watershed management program has become long overdue.

The Production Environment and Economic Sustainability of Major Irrigation Schemes

Agriculture production in major irrigation schemes is confined to the monoculture of rice. From the inception, irrigation has been planned and designed for wet rice cultivation over the whole command area in maha and in a limited extent in yala. The national preoccupation with rice self-sufficiency extended even to the Mahaweli period and a "unidirectional approach to production" is evident even at present times.

The irrigated monoculture in major irrigation schemes is confronted with a severe economic problem because rice-farming is becoming less profitable due to increasing real factor costs and input prices in the face of declining real price of rice, causing net returns to fall sharply. Productivity has increased but not sufficiently to outpace cost escalation. The guaranteed minimum price which usually is above world-market prices has caused market distortions, creating divergence between private and social profitability. The resulting allocative inefficiency has encouraged rice production at high opportunity cost. The quest for rice self-sufficiency irrespective of costs has made farmers high-cost producers of low-quality rice with no possibility of export (Abeyratne 1987). As a result of these constraints, the state-aided inducement package for irrigated agricultural settlement seems to degenerate into a near-subsistence mode of production that satisfies only the immediate food and income needs of the farmers (ARTI 1987). Even if there is surplus production in an individual unit, it is likely to be fractionated by subdivisions of holdings minimizing disposable income. On empirical evidence researchers contend that even double cropping of 2.5-acre units will not advance the large majority of households in major irrigation schemes beyond subsistence level, disposable income being insufficient to raise them above the poverty line (Scudder and Wimaladharma 1985).

If the prevailing macro-economic environment continues and the international market trends remain unchanged, the present trend of declining real profits from rice farming may persist (PSRP 1990). Declining producer margins can be offset only through technological changes to increase productivity and by increasing on-farm economic efficiency. Prospects of such a recovery seem to be bleak especially in the context of lack of resources for investment and the decisions the government has to make under the program of rationalization of the economy. The recent government decision to remove a 40-year old fertilizer subsidy is going to dampen any effort towards productivity increase. The low volume of lending, high rate of default, and the reluctance of rural banks to engage in the credit market beyond a minimum level, etc., necessitate a policy revision on subsidized agricultural credit. The subsidy element may be gradually phased out to allow the operation of commercial interest rates to give sufficient incentive for the commercial banks to engage in the agricultural credit market.

It is well-known that farmers in major irrigation schemes pioneered in the application of improved agricultural practices such as the adoption of high yielding varieties and the use of agricultural input package. With an agricultural production system exclusively oriented towards rice farming, these farmers will be the worst affected. Any prospect of economic sustainability of irrigated farming will depend on diversification into high value crops.

Diversification of agricultural activities in the irrigation sector becomes a high priority, first, because in terms of investment, irrigation water can be identified as the most expensive, state-provided input requiring optimum utilization. Second, there are no economically promising sources of irrigation left for future development after the Mahaweli Programme is completed (Land Commission Report 1987), making it imperative that existing sources be more intensively used. Diversification by incorporating a stable system of rain-fed upland farming does not offer much hope as it involves high risk and inhibits significant inputs of capital and technology. Hence, rain-fed agriculture under small farms cannot be expected to develop into a dynamic and commercially oriented production system (PSRP 1990). Theoretically, irrigation settlements which offer assured water to planned production units operated by farmers with high receptivity to technological change, backed by relatively intensive extension and management structures, provide a veritable field laboratory for experimentation and adoption of crop diversification.

The Uda Walawe project which was planned more than thirty years ago was the first major irrigation scheme in which crop diversification on irrigated land was planned on a major scale (rice 34 percent, cotton 25 percent, sugarcane 25 percent, subsidiary crops 13 percent and citrus 3 percent). Lack of research support to insure suitability of crops to local conditions and low profitability were the main reasons for the lack of success. Attempts to diversify the cropping of irrigation land under major irrigation schemes in the dry zone in the late sixties by growing non-rice or other field crops during yala did not succeed due to a lack of clear understanding of the constraints to diversified cropping and the inadequate knowledge of system management for non-rice cropping (Panabokke 1989).

The rationale for crop diversification in irrigated agriculture is well-supported. Well-drained reddish-brown earths(RBEs) have no limitation for growing of any kind of other field crops during the dry season and the physical attributes of the soils readily lend them to use alternated between wet-season rice and dry-season non-rice crops (ibid). The main problem is posed by the irrigation infrastructure designed for the monoculture of rice. Addressing the question of crop diversification in irrigation schemes, the PSRP study recommends a modernization program that gives top priority for investment in "on-demand" delivery systems conveying irrigation water up to the farm through hydraulic control systems and on-farm through micro-irrigation systems. It is further recommended that the on-demand delivery systems introduced into the existing schemes, be used in rehabilitation plans, and extended to be used in the design of new schemes to facilitate diversified cropping.

The IIMI study on crop diversification (ibid) conducted in two research sites (Kalankuttiya in Mahaweli System H and Dewahuwa Irrigation Scheme) has identified unreliability of irrigation water supply at farm level and the lack of flexibility to decide upon the time to irrigate (frequency), the quantity to use, and the duration of irrigation as major limiting factors. Without these facilities farmers will not be motivated to grow non-rice crops which are high-risk ventures requiring three to four times larger cash and labor inputs than rice. Unreliability and inequity of supply at turnout level arise from inadequate control and regulation. Systems that could solve

these inadequacies are identified as "on-demand supply systems." The technical opinion is that it is technically possible to automate free-level canals by the introduction of hydraulically controlled gates so that the canal system can behave in a manner similar to pressurized pipe conveyance. Hydraulic regulation offers automation without depending on an external source of energy and requires a minimal staff. These types of control technologies are reported to be extensively used in the Mediterranean countries, especially in Morocco, although its application in the Asian region is rare (PSRP 1990).

With the production environment of rice-based irrigated agriculture thrust under the most severe test since its inception, the future sustainability of major irrigation schemes will depend much on the success of crop diversification. The potential for diversification, in turn, rests with the system modernization that could accommodate "on-demand" supply. Hence, modernization of water delivery and diversification have to be introduced simultaneously. As pointed out by the PSRP study, a major research and development program for irrigation modernization and crop/agricultural activity diversification has to be launched immediately. Although the prospects of crops with proven agronomic capabilities and export potential are encouragingly large, the difficult areas such as organized farming, effective farmer participation, adequate dissemination of economic information, provision of processing and marketing facilities etc., need to be improved. All these factors point towards the possibility that the decade of 1990s is going to be a very crucial period for the long-term sustainability of irrigated agriculture in Sri Lanka.

CONCLUSIONS

Major irrigation schemes consisting of about 590,700 acres of rice cultivated area (29 percent of the total area cultivated to rice) contribute about 55 percent of the national rice output. An estimated population of about 1.6 million (10 percent of the total population) live in these settlements.

Constraints on domestic and foreign resources for investment, exacerbated by defence expenditure due to unsettled conditions in the country, have more recently compelled national-development policies to recoil from further investments in irrigation. Ex-post evaluations prove that investments in major irrigation and settlement schemes yield economic returns higher than what has been originally conceived. Economic Internal Rates of Return of 7 percent for rice-dominated irrigation schemes have the potential to increase to about 10 percent with diversification of cropping. Recent studies such as the PSRP study have shown the possibility of introducing new irrigation technologies, and the potential for diversification.

As these studies indicate, the irrigation subsector will continue to receive the priority attention it has commanded since independence and will be on the agenda of future investment policy as it forms the most productive asset of domestic agriculture sector, which possess the capability of absorbing substantial investments in the short run. Attracting higher investments will depend on the success in achieving diversification goals, insuring an increase in the contribution to the value added in the agriculture sector.

The major policy issue affecting the future sustainability of major irrigation schemes is whether the present system of irrigation including system design, O&M, and management structures formulated largely on the base-model developed for a subsistence type, monoculture of rice, will face the demands and challenges of the changing environment. Modernization of existing schemes or the rehabilitation or betterment, capturing the benefits of technological advances in order to adapt to the changes of the external environment, will be the primary task of this decade. Technologies for controlled and economical use will have to be introduced to facilitate crop diversification incorporating on-demand water delivery utilizing hydraulic control systems and on-farm water uses based on micro-irrigation methods. The irrigation policy would therefore reach a watershed from where new thinking, new designs and concepts, and new management methods will have to be evolved through research and development with the full backing and involvement of the state agencies as well as of the farmer population.

Investment priorities within the irrigation subsector will move towards modernization and transformation making it necessary for cost sharing in O&M. The government's recent decision to accept farmers' contributions to O&M in the form of labor and other inputs has to be translated into viable action soon. O&M cost sharing with the farmers and the promotion of a joint-management system that would eventually lead to "user-managed/user-owned" systems are parts of the same process and should be encouraged as complementary activities rather than conflicting activities.

The potential for diversification on the basis of modernized systems would require the elevation of present-day subsistence farmers "overdependant" on the government services to the status of commercial farmers with the skills and abilities of risk-bearing, quick decision making, and managing higher capital and labor inputs. Such a situation would be a long way from the near-subsistence mode of production prevailing in most of the major irrigation schemes. Building of an entrepreneurial class of commercial farmers would require agricultural holdings large enough for such farming ventures. In most of the major irrigation schemes where subdivision of present holdings is taking place due to fractionation under the generational pressure, horizontal expansion of farm size by way of consolidation will be difficult. The effective farm size for commercial production therefore can be achieved only through some form of group farming. The new strategies for agricultural development promulgated by the Ministry of Agriculture, Food and Cooperatives (July 1989) to encourage market-oriented commercial farming and to demonstrate the strategy through selected "centers of excellence" known as Agricultural Productivity Villages (APV) may help to develop possible alternatives. Yet it cannot be ruled out that a program of commercial farming based on diversification strategies described above may necessitate a rethinking on the viability of maintaining further the subsistence type of production unit in major irrigation schemes and to allow the consolidation of holdings.

The management challenge offered by the process of transformation taking effect in the present decade would be enormous. The task of managing the modernization and transformation will place very high demands on the capacity of the institutions serving the irrigation subsector. The Irrigation Department which was primarily organized to restore and develop as many irrigation reservoirs as possible through investigation, design, and construction during the turn of this century has inherited a historical bias towards construction activities and would need a radical reorientation. The research and development of new methods for system modernization for crop diversification, dissemination of better practices of management of water, consultative mecha-

nisms to enhance farmer participation, development of O&M methodology to accept farmer contributions, etc., will place this government agency against a massive challenge in adapting itself to the changed environment during the closing decade of the century.

The institutional capacity of the Irrigation Management Division is bound to get overstretched and the methodologies developed so far for the exercise in integrated management will be field-tested in the process of transformation. The devolution of powers to the Provincial Councils under the 13th Amendment to the Constitution and administrative changes currently underway in the provinces will also affect the efforts towards sustainable management.

In terms of the constitutional amendment, the interprovincial irrigation and land-development projects become the responsibility of the Government of Sri Lanka and will be administered by it. Most of the major irrigation schemes fall within this definition and will be managed by the government while the services relating to rural development, health, education, vocational training, cooperatives, and other facilities within the schemes will be provided by the Provincial Councils.

This raises the issue that there should be a single authority to handle the management of major irrigation settlements as there now exists a vacuum, especially due to the reduction of staff and funding of the line departments such as Agriculture, Irrigation, and Land Commissioner's. The Mahaweli Programme falls within the definition of interprovincial project and assuming that it is now in transition from the "construction phase" into the "management phase," it would be pertinent to visualize a new management structure in the lines of the "National Irrigation Administration" (NIA) of the Philippines to implement a common irrigation management strategy to insure sustainable management of all interprovincial irrigation and land-development projects.

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Legal Support Required for Effective Resource Mobilization under the New Participatory Management Policies

Joe Alwis[15]

POLICY PERSPECTIVE ANALYSIS

THE POLICY MANAGEMENT in respect of Sri Lanka's efforts in planned irrigation developing in the modern period commencing from the second half of the 19th century provides a wide spectrum of issues which could be analyzed in relation to six development phases, namely:

a) Emphasis by the central government to *facilitate* a process through experimentation and legislation to resuscitate customary and traditional practices associated with irrigated agriculture in farmer-managed irrigation systems.
b) *State intervention* to develop a system of management which asserted the state ownership of the scheme with a design to share management responsibilities with farmers.
c) *State control* through a system of management implemented by government agencies to assure equitable distribution of resources and administration of welfare measures provided by the state to farmers.
d) *Transform and reorder* state control of the management to increase food production through a multi-agency control of management, inputs supply, extension work, and other services.
e) Emphasize *water management* as an entry point to organizational and institutional reforms.
f) Adopt *integrated management* to synthesize management inputs and formulate an institutional approach to evolve a system of joint management by farmers and officials while the ownership of the physical systems remained with the state.

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[15] Secretary, Ministry of Coconut Industries and Crop Diversification. This paper draws heavily on Alwis (1986)

The last phase is designed to develop enhanced capacity and capability among the farmer community to take over management responsibility in an incremental approach.

In every one of these stages the respective governments played an important role, which they will be required to repeat for many more years to come. It is noteworthy however, that strategies and approaches adopted during each of these phases of irrigation development were largely determined by the availability or otherwise of resources to sponsor programs in a manner perceived by the government as serving the best interest of the sector. The facilitation process evolved by the British administrators in the 2nd half of the 19th century was in large measure a result of a conscious effort to avoid the burden of carrying a large retinue of village-level functionaries paid by the government. Instead, it was found that a continuation of the customary practices whereby farmers themselves will appoint their own representatives would receive wide acceptance. In a subsequent stage, facilitation was supplemented with reciprocity where villagers who were able to contribute their share by way of payment or services were assisted with government grants to improve irrigation systems. In the nineteen forties and thereafter when the local political leaders asserted more decision-making power, the need to develop the rural sector and assist the peasantry through large-scale irrigation and agricultural development figured as a high priority area of government investments. The principal strategy that came to be adopted towards this end was the improvement of social and physical infrastructure in rural areas. There was no doubt that such a step was prompted by the negative impact of the Waste Lands Ordinance on the rural peasantry which was lurking in the minds of the national leaders. The implementation of the Land Development Ordinance to distribute irrigated land allotments to landless people was therefore seen as a measure to rectify a historical injustice and compensate for the loss of lands by the rural people. The overwhelming social-welfare measures associated with this program continued until the late sixties when the government had to mobilize funds from international donors to sustain the level of investment in the irrigation sector.

Within this broad framework of providing social and physical infrastructure to contain the rural population, the next stage for government action was in the form of introducing central planning systems which were gaining wide acceptance in the fifties and sixties to ameliorate Third World problems. Government planning documents prepared in the late fifties and in the early sixties reverberated these sentiments and insisted on addressing issues concerning the return on instruments made for irrigation development and the need to look for alternative strategies.

The fourth stage during which efforts in policy management were directed towards transforming the sector and reordering the institutional character through emphasis on production thinking was an alternative provided by the multilateral donor agencies. Their assistance was sought for the first time by the government to obtain funds for the purpose of continuing the implementation of irrigation development programs. Organizational and institutional issues which surfaced during the production phase underscored the need to conserve resources by eliminating the waste of water. The fourth stage of development can therefore be described as the beginning of the *modernization process* commencing in the year 1965. Significantly this period coincides with the advent of the Green Revolution Technology which resulted in the large-scale introduction of high-yielding varieties, modern inputs, agricultural credit, marketing and above all an organized attempt by the State to increase production in major irrigation systems. The Special Project Programme (SPP) which was implemented during this period in selected major irrigation systems was a precursor to the current program for Integrated Management of Agricultural Settlement (INMAS).

Production thinking devoid of effective strategies to sustain productivity through organizational and institutional reforms was destined to make only a limited impact in the sector. It was also evident that strengthening of organizational capacity in the sector was restricted to strengthening the hand of the bureaucracies to intervene effectively with the subsistence-oriented production process. The economic situation necessitated short-term measures to increase production and contain the flow of valuable foreign exchange used for the import of food and such measures were perceived best in relation to objectives enunciated by the government. To assure quick results, the SPP was made the lead program for the government and a new political leadership was given by the government for its implementation. In the process the SPP became a program envisioned by the government and implemented by government agencies to achieve objectives perceived by the government as serving the best interest to overcome a difficult period of economic stagnation.

The decade of the sixties during which all these new measures for a modernization phase started evolving was in fact a watershed in the modern irrigation development in Sri Lanka. The use of foreign funds for irrigation development in the country was perhaps a very important change which made it necessary to add a new dimension to the thrust in policy changes in irrigation development programs. The irrigation agencies and the agricultural agencies which mobilized a large amount of budgetary funds adopted divergent approaches for the utilization of funds, but the planning documents put out by the line Ministry in the agricultural sector provided new insights and directions for revised strategies in the irrigation sector. In these new approaches organizational and institutional reforms appeared to have been given added emphases. This was understandable in the background of a series of events which led to the enactment of the Paddy Lands Act of 1958 ushering in radical changes in both agricultural and irrigation sectors.

In this context it is necessary to point out that in Sri Lanka the agricultural and irrigation sectors acted as distinct policy-management areas in the administrative divisions of line Ministries. Since Independence in 1948, the investment decisions made in favor of irrigation and rural agricultural development far outweighed investments in other sectors. As such, economic policies of the respective governments were dependant on the performance in these sectors. Self-sufficiency in rice production (and later in other food products as well) was therefore an important political objective in investment decisions. Even as organizational and institutional issues received more attention, the need for integrated approaches emerged as a key consideration in the implementation of programs. Previously, the need for integration was veiled in a covert catchword called "Coordination" which was more indicative of the reluctance of the bureaucracy to change on its own free well. Therefore, the organizational changes had to be initiated as an expression of political will than an organic development in a changing environment in policy management.

INSTITUTIONAL CHANGE AS A RESPONSE TO LEGAL MEASURES

Sri Lanka presents an interesting mix of incremental changes combined with radical reforms in the rural agrarian sectors. The Land Development Ordinance of 1935, however radical it may

have been for a developing country in the thirties, catalyzed a process of redistributing land among farmers improving their lot through agricultural development. But the entire process had been in the making for over a decade and the Land Development Ordinance only instituted the legal framework necessary to provide the legal cover and the machinery to implement programs formulated for the sector. At the same time, the Irrigation Ordinance had reached a high degree of maturity in its outlook in the thirties and its provisions were not affected by the institution of the Land Development Ordinance which in large measure was implemented in irrigation schemes.

In contrast, the Paddy Lands Act of 1958 was indeed a radical piece of legislation by any standard. It sought to introduce measures to provide legal security to the tenant cultivator who had not attracted the eye of the legislator until the late fifties. The introduction of such a piece of radical legislation did not come as a surprise in the background against which the new government was elected to office in 1956 with a new policy agenda identifying the small farmer community as a special area of policy concern. The political upheavals surfaced by the Paddy Lands Act within the party ranks of the government resulting in a breakup of the pro-radical elements, and followed by the political assassination of the Prime Minister himself, bear ample testimony to the controversial character of the new legislation.

Besides these political changes, the Paddy Lands Act did away with the important institution of the *Vel Vidanes* (Irrigation Headman) that evolved and survived through the years as a very important institution in sustaining maintenance and to a large degree in resolving conflicts in the distribution and allocation of water. It was claimed that the Vel Vidane in the 1950s behaved more like a village autocrat in certain provinces and he had outlived his useful role. Therefore, the removal of the Vel Vidane was viewed more as an act of political reprisal than a structured approach to reorder the institutions in the rural sector. The Vel Vidane was replaced with the Secretary to the Cultivation Committee who in his diluted role as an elected officer of the committee was unable to assert his authority and mobilize the village-based resources for irrigation maintenance. It is interesting to note that nearly one hundred years before, the British administration in their wisdom thought it fit to provide an opportunity to the farmer community to select between an elected official such as the Vel Vidane accountable to the farmer community or an elected body in the form of a committee representing farmers or both to undertake the operation and maintenance work in irrigation schemes.

These radical reforms launched in the late fifties were motivated more by political ideology and less by a correct perception of the need to change the rural institutional order. However, the element of policy bias towards the welfare of the tenant was eloquently expressed in the Paddy Land Act. But the security of the tenure provided by the Land Development Ordinance of 1935 did not envisage such tenancy arrangements in the lands distributed under the provisions of the Land Ordinance. Therefore, the application of the provisions in the Paddy Lands Act was more relevant to lands outside those alienated under the Land Development Ordinance. Since the office of the Vel Vidane was common to both categories of lands its removal did not appear to be a well-thought-out action in the long term. In fact, the decision to retain the Village Headman under a modified recruitment procedure and designate him as Grama Sevaka -- servant of the village -- clearly shows that in the thinking of the government, the usefulness of the officer was acknowledged and total abolition of that role was considered detrimental to the village-level administration of law and order at the village level.

In sharp contrast to the Irrigation Ordinance, provisions embodied in the Paddy Lands Act incorporated clearly spelt out functions which reached out to the village-level organizations. The Secretary to the Cultivation Committee who took over functions performed by the Vel Vidane also figured prominently in the management framework. This strategy added a new dimension to the role and functions expected of state-sponsored rural organizations by devolving specific activities on them. This practice has been sustained even in the Agricultural Productivity Law, Agricultural Lands Law, and the Agrarian Services Act. But the Irrigation Ordinance relied more on the District Organizations which consisted of a majority of officials from line organizations associated with irrigated agriculture. The fact that the District Agriculture Committee which monitors and coordinates the work in the agriculture sector in the respective districts was a creation of the Irrigation Ordinance clearly shows the importance attached to the strengthening of District Organizations for irrigation development. There is no doubt that the coordinating role of the District Agricultural Committee contributed substantially to consolidate initial phases of irrigation development when land alienation, land development, and land settlement activities were of prime importance in development activities of the district. Subsequently, in the production phase when the Special Projects Programme was implemented, the Government Agent as Chairman of the District Agricultural Committee played a pivotal role in providing excellent coordinating facilities to line agencies to implement the program.

Until the Paddy Lands Act was enacted, the accepted method favored by policy planners was to adopt an incremental approach instead of radical legislation. In a majority of instances the legislation followed a period of experimentations and close monitoring of the impact of the new measures in the agrarian situation of the country. It is of interest to note that the first Irrigation Ordinance which was called the Paddy Lands Irrigation Ordinance (No. 9 of 1856) was initially made operational for a limited period of 5 years which presupposed the concern of the administration to monitor its application and examine the necessary revisions and modifications to the implementation strategy after the lapse of the appointed period.

Although the Irrigation Ordinance was to a large extent insulated from hasty and radical changes through revisions and amendments, the agrarian sector was subject to a series of reforms which were dictated more by political changes and less by a rationalization of the institutional order which was already in search of an identity. The Paddy Lands Act was amended in the sixties by removing its "teeth" as it were. Later, it was substituted by the Agricultural Productivity Law and the Agricultural Land Law. There was hardly any doubt that the desire for introducing agency-controlled management systems was prompted by short-run objectives which emphasized centrally planned approaches to modernize the domestic agriculture sector.

The contents of the Agricultural Productivity Law and the Agriculture Lands Law did not appear to be too radical. The approaches embodied in the legislation shared the same sympathy to the cause of the small farmer in the way that the Paddy Lands Act envisaged in 1958. This clearly indicates that even radical changes in the institutional and organizational spheres get accepted through a process of adaptation. However, there was disappointment among institutional planners that the provisions which enabled the Minister to nominate members to the Agricultural Productivity Committees and the phasing out of the Cultivation Committee by making way for the Productivity Committee at the higher level of operation were inadvisable and destined to fail. The Minister of Agriculture and Lands who was responsible for bringing the legislation responded that the principle of nomination was resorted to insure that the new

institutional order which he set up would not be jeopardized or endangered by the appointment of antigovernment elements who could fend their way through the democratic process.

With the change of the government in 1977 both the Agricultural Productivity Law and the Agricultural Lands Law were repealed. Instead, the Agrarian Services Act which embodied many of the provisions in the two Laws was promulgated. There were three important changes that were incorporated into the new Act. First, the authority of the Agrarian Services Committee which succeeded the Agricultural Productivity Committee was extended to major irrigation schemes. Second, the Act empowered the Department of Agrarian Services to assert its legal authority as the state agency responsible for minor irrigation schemes in the country. The new Act even went to the extent of defining minor irrigation schemes in relation to the culturable command under each of them. Third, the principle of electing representatives to committees was restored, but they were included in the committee along with nominated persons from among elected personnel.

The emergence of the agricultural and agrarian line agencies as decisive organizations in the agricultural sector can be attributed to the shift in emphasis from construction-oriented physical infrastructure development and related work programs which dominated the scene for nearly three decades to a planned approach to agricultural production. The difficult economic environment made it imperative for the government to think in terms of increasing production and the production orientation made it necessary for the sector to evaluate the economic returns and understand the significance of organizational and institutional issues in the production process. The emphasis on management as the key issue to sustainable development should therefore be understood in this perspective.

An attempt was made through an amendment to the Irrigation Ordinance in 1968 to institute the Commissioner of Agrarian Services as a Line Agency Head to exercise general supervision and control over the Government Agents in the enforcement of provisions in the Irrigation Ordinance. This was an unprecedented step and the Minister who introduced the particular amendment before the parliament stated that "Government Agents under the Irrigation Ordinance were more or less independent institutions. We find that there should be more control of the functions of the Government Agents and closer coordination among them on the paddy cultivation side." This provision however remained a dead letter due to noncompliance, but the independence of the Government Agent in district administration was subsequently circumscribed by a series of other measures.

It would thus be seen that although the Irrigation Ordinance held sway over irrigation matters in animating a management process, the impact of other legislation in the total sector cannot be discounted. The segregation of line agency work according to departments and the administrative limits set by different agencies designated to carry out various functions at the field level caused problems in implementation for want of integrated approaches. For many years, the need to integrate the irrigation and agricultural sector has remained a mere pious hope and much of the time spent by line organizations in the field had to be allocated to bring about coordination. The INMAS program envisages the coordination of line agency functions into program objectives as one of its prime functions. Despite all these measures, the problem of coordination continues to be a vulnerable area and the situation is further compounded by the fact that even legislative provisions without fail portray the grooves in the way they were adopted in implementation processes.

The foregoing analysis of the macro-policy environment in relation to changes which have been either consolidated, legitimized, or introduced through legislative measures shows that the

legal process has not seriously hindered or impeded the implementation to the same extent that the present situation has shown in the O&M cost recovery program. This can be analyzed in several ways. To start with the collection of O&M fees as a service contribution affects the individual interests of the farmer who has been placated for many decades with innumerable social-welfare measures poured in by government agencies. An inevitable "dependency syndrome" has affected farmers to such an extent that many of them have failed to benefit from the modernization process in irrigated agriculture that took place during the last two decades by linking major irrigation systems to a market-oriented economy. This has even given rise to a feeling that the perpetration of the present system of administration in major irrigation systems can only perpetuate poverty. Large-scale increase in concealed fragmentation of landholdings has compelled farmers to live on an uneconomic farming system for their livelihood.

In another sense this situation brings about an interesting aspect relating to property rights which has an overwhelming impact on the organizational pattern. Until water was made the entry point to participatory management and the development of an organizational model such as water users' associations, the government agencies handling major irrigation systems perceived irrigation systems in relation to land units and therefore all organizational patterns were developed on units of land administration. This perception shared among officials and even among farmers seriously interferes in projecting an integrated view of the systems as an interdependent system which aims at increasing productivity through improved equity.

The Irrigation Ordinance is also modeled on the same basis and represents a typical top-down approach which was conceived with the main system consisting of the reservoir and the distribution of water to main and distributary canals. The tertiary level was considered the domain of the farmer and therefore central agencies showed little concern on the facilities necessary in that area to improve equity and productivity. It was only a few decades ago that the need for proper design of the tertiary system was recognized as an important component of the government contribution to provide improved irrigation facilities.

LEGAL PROCESS IN OPERATION

It has been argued that the law as it is practiced in Sri Lanka is overly concerned with rights of the individual and has failed to come to terms with specific issues where the rights of a group of individuals have an overbearing impact on social harmony and productivity. The issue is basically related to the rules in the irrigation democracy (as against social democracy) where individual aspirations are reconciled in decisions arrived at by the community thus according a preeminent position to the rights of the community over those of the individual concerned. In point of fact, local institutions in the form of Village Councils existed in the past with representation from the community to adjudicate upon matters that arise out of conflicts in irrigation matters. When fundamental rights of the individual were made the pillar of the social democratic system, the relevance of community rights was badly undermined. Thus, the legal protection afforded to the individual under common law interpretations of fundamental rights becomes a refuge to individuals who wish to overawe community rights through legal courts.

Another important feature in laws dealing with the irrigation sector is the lack of an ideological commitment in the conceptual content of the Irrigation Ordinance, while most other enactments such as the Land Development Ordinance, Paddy Lands Act, Agricultural Productivity Law, Agriculture Lands Law, the Land Reforms Law and the Agrarian Services Act exhibit a bias towards the small farmer and the tenant. Perhaps, this position can be explained in relation to political commitment which supported the law in its final form whereas, the Irrigation Ordinance has over the years remained insulated from such influence. A distinct advantage in such ideological commitment residing in the law is that it provides a sound basis for the law to give clear directions for implementors in keeping to the objective of the program.

The lack of an ideological commitment in the irrigation laws has given rise to a wise skepticism and lukewarm support from among field-level officials responsible for implementing programs about the usefulness of the irrigation laws to deal with day-to-day problems in water allocation, distribution, and maintenance of irrigation systems. The disappointment with the efficacy in legal enforcement measures often manifests itself as lethargy on the part of officials. In other instances lethargy is also described as a result of "soft laws" enacted for implementation without a commitment for enforcement. In effect, the law has not proved to be an integral component of the implementation packages. Instead, it is kept aside for use either in an "emergency" situation or in defence of action by officials. This does not however mean that official actions have invalidated the force of law. It has only failed to gain acceptance as a living force in the day-to-day irrigation activities.

Indeed a law found in statute in abeyance can also solicit uncharitable decisions at the instance of unscrupulous hands that can mobilize resources to move law into action. When the O&M program was initiated and farmers were asked to contribute a share of the service fee, political groups who were opposed to the collection of fees started a campaign through the courts by mobilizing the support of lawyers. This movement proved to be successful in many areas and the dismissal of plaints filed by field-level officials against defaulters was in many cases on a point of law which exposed the weakness in the law itself.

In a sense, many of these laws have overlapped with other enactments in the agrarian sector such that they are unable to measure up to strict legal scrutiny in a judicial forum. Judicial reforms per se have been numerous and jurisdictional authority designated in one law is often invalidated either by the abolition of that institution or in the alternative by the revision of the judicial authority. Amendments to the Irrigation Ordinance after the 1968 revision contain piecemeal revisions which were necessitated largely to realign the legal provisions to the changes in the legal system.

One glaring instance which has caused immense problems in litigation is the shifting of judicial authority between Primary Courts and Magistrate Courts on the one hand and District Courts and Magistrate Courts on the other. Judicature Act No. 2 of 1978 sought to set up first the Civil Courts as the Primary Courts and it was necessary to move an amendment to the Irrigation Ordinance to substitute the First Civil Courts for the Magistrate's Courts to recover default payments of O&M fees. In another instance, it was argued in the Courts that the Magistrate's Courts cannot recover a debt as stipulated in the Irrigation Ordinance for the default of payment and that such cases should be instituted in the District Courts. Hence, it was considered necessary to amend the relevant provisions in the Irrigation Ordinance to reflect the "debt" as a "fine" for the purpose of recovery. According to the legal system, the Magistrate's Courts has the power to recover a fine.

Apparently the issue has gone even further in that section 78(A)3 of the Irrigation Ordinance does not specify the course of action to be taken when a defaulter is unable to respond to a Magistrate's Courts order to pay. Therefore, it was considered necessary that existing legal provisions should be further elaborated to specify the action that has to be taken when the farmer fails to pay the fees after he is ordered by the Magistrate.

Amendments to enactments usually sometimes take unimaginable periods of time because constitutional, legal, and administrative procedures have to be rigidly observed. When such measures embodied in amendments are penal measures against farmers as in the case of amendments to the Irrigation Ordinance which were prompted by field-level implementation problems affecting the recovery of O&M fees, policy makers themselves are reluctant to permit undelayed passage of amendments which often invite harsh criticisms by members in the legislative forum.

In many of these instances the implementers themselves are not guided by good legal advisers and problems encountered are not always anticipated until an order is made in response to a strict scrutiny of legal provisions. Recently it has come to light that the Additional Government Agent of an administrative district is not empowered by the Irrigation Ordinance to take decisions to enforce legal provisions for the simple reason that the officer mentioned in the law is the Assistant Government Agent (of a junior rank) and not the Additional Government Agent.

It is not surprising to find instances where the policy objectives fail to convey the spirit of the law in the course of framing the law and it often gets submerged in common law interpretation which results in being reversed in the course of implementation. In effect, the way that the law was framed, and then interpreted and enforced, gave the impression that the legal process favored maintaining the status quo in the existing social order. In this manner, if the legal process is considered unrealistic and unpredictable, implementators like to support rigid laws to be used only as a last resort. Such laws can prove to be an effective instrument in the hands of the more affluent to jettison programs which exhibit a bias towards the weaker sector in the society. A stalemate reached in the implementation of the Paddy Lands Act was the result of a decision made by a Magistrate in 1963 to the effect that the Assistant Commissioners of Agrarian Services or any officer of the Department of the Agrarian Services or the Board of Review had no jurisdiction under the provisions of the Constitution to make a judicial determination because such officers were not appointed by the Judicial Service Commission. This judgement favored the landlords against whom nearly 14,500 complaints of eviction were made in 1959 (Gold et al. 1977). The administrative procedure adopted by the Department of Agrarian Services in conformity with the Paddy Lands Act was found to be ultra vires the provisions of the constitution. A test case in the Supreme Court supported this view and inquiries instituted by the Department of Agrarian Services against landlords for the eviction of tenants were successfully stalled. It was not until the mid-eighties that the Judicial Services Commission appointed under its authority officers in the Agrarian Services Department to inquire into the eviction cases and clear a backlog created by the previous decisions of judicial courts. This was a unique instance where the judiciary on its volition agreed to overcome procedural problems in a way that it cannot be questioned in a Court of Law. The rights of judicial review on administrative decisions have been jealously guarded by the judiciary and it is rarely that judicial powers have been used in a very pragmatic manner to avoid delays in law.

CONCLUSION

The present concern for amendments to the Irrigation Ordinance has arisen out of two issues, the need to obtain legal status for the water users' organizations or farmers' organizations to gain recognition as a legal body, and the need to deal with problems encountered in the legal process in successfully prosecuting errant farmers who default in the payment of O&M fees for the recovery of money.

An examination of the issues concerning legal status for farmers' organizations indicates that the need for such recognition in law is necessary to overcome procedural problems associated with the taking over of contracts by farmers' organizations for maintenance work. The Irrigation Department which gives out these contracts insists on signing contracts with a legally constituted body which will be recognized by judicial courts in the event of a default in carrying out work agreed upon between the two parties. Officials have suggested that the Farmers' Organizations should take cover under an existing society to overcome the constraint posed by procedures. Farmers have rejected these solutions on the grounds that such societies have their images tarnished by unscrupulous people who have resorted to making money by obtaining contracts for covert operations behind these rural organizations. It is difficult to understand why an amendment to the Irrigation Ordinance should be identified as a solution without persuading the authorities concerned (be they in the Treasury or in another agency) to take a more pragmatic view of the solutions available without being subverted by regulations which have not helped very much in implementation. Interpreting these regulations to absurd limits has compelled farmers to suspect the integrity of officials whom they suspect to be deliberately using a ploy to deny farmers of their right to undertake work on contract.

The Irrigation Ordinance does not have provisions for a farmers' organization in the manner that its constitution has been perceived today. The need to include the bare framework of a farmers' organization based on hydrologic boundaries has been recognized but it will have to be accomplished by endorsing an amendment which will allow pragmatic operation within flexible objectives. This issue has been delayed for many years but the delay is not lamented because the form of the organizations and its implications are perceived in a better perspective today than before. At the same time one cannot rule out the possibility of setting up "paper" organizations under cover of law once it is enacted.

Experience with institution-building strongly suggests that in the initial stages of organizing farmers, judgments on organizational forms, and the processes of forming farmers' organizations are far more important than the law. In fact, it is possible that un unimaginative legal framework can even obstruct and endanger the process adopted to form farmers' organizations by creating a permissive environment for other organizations to surface as countervailing forces. During certain stages in the formative phase of promoting farmers' organizations it would therefore be necessary to provide some kind of protective cover for the new organizations to stand on their feet.

Institutional strengthening is the key to success in farmers' organizations. A stage will be reached when farmers' organizations will have to transcend legal backing and start adopting their own modes of conducting business to deal with their membership. In this case the subject of conflict resolution is indeed an area which has not received adequate attention. In the present context disputes could be resolved either by the intervention of field-level officials for damages

to structures while the Government Agent is expected to deal with institutional issues. But a grey area exists in conflict resolution where the community can on its own intervene for remedial action.

In the past, the appointment of quasi-judicial officials under the Village Council to dispense justice has had a great deal of acceptance within communities because these courts looked at the root of the matter under consideration. This system could be modified to suit the present needs. Since senior officials working at close range with the rural level are available in large numbers, the training of such officials to adjudicate on these matters for speedy disposal and dispensation of justice may prove to be an effective solution. The only obstruction to the adoption of such a system for project-level conflict resolution is the need to appoint these officials by the Judicial Service Commission and allow these courts to function as specialized bodies for irrigation specific disputes. The court will visit the schemes regularly to attend to any matter awaiting disposal and speedy administration of justice will have a salutary effect in resolving the present impasse.

Legislative provisions embodied in the Irrigation Ordinance sometimes deal too exhaustively with processes to be adopted. Thus complications arise out of legal interpretations which render the solutions counter-productive. It is therefore desirable that such details are left to enabling legislation which could then be commuted to regulations published in the Government Gazette. This practice has been in use in the past as a convenient method of bringing specific issues under legislative authority. For instance, it has been the practice to publish in the Gazette all the rules relating to the operation of a specific irrigation system without recommending uniform systems for application in all irrigation schemes. The use of such enabling legislation in irrigation matters has been far too little in the recent past. Similar methods should be adopted in prescribing jurisdictional authority without having the main frame of legislative authority to spell out the specific courts to be utilized in each offence or situation.

At present, legislation is examined by judicial bodies to determine whether they conform to requirements. No such examination is adopted to evaluate the impact of agrarian legislation in changing the institutional environment. Currently, procedural arrangements have been finalized to insure a mandatory evaluation of the impact of development projects on environment. Similar practices should be adopted to obtain impact evaluation of new legislation on the institutional character of the existing agrarian situation.

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A Strategy for the Irrigation Department to Implement the New Government Policy

D.W.R. Weerakoon[16]

INTRODUCTION

THE ESTABLISHMENT OF large-scale commercial plantations appropriating the available lands in the wet zone during the early period of British rule created landlessness in this part of the island while near-famine conditions and abject rural poverty existed in the dry zone which was sparsely populated. The solution to the land pressure in the wet zone had to be found by shifting the excess population in the wet zone to the less crowded dry zone. The rural population that had an agricultural farming background could easily adapt to the translocated new areas if a source of water could be provided to cultivate their new lands. Reservoirs for storing the runoff from northeast monsoon rains to support the cultivation by making water releases during the periods of low rainfall appeared to provide the means of insuring the water in demand. Thus, irrigation development in the dry zone turned out to be the principle strategy in the effort of transferring people from the wet to the dry zone for permanent settlement. The dry-zone irrigation schemes which were originally intended to facilitate population migration later became the springboard for launching a campaign of self-sufficiency in food production, when the significance of an effort in the latter direction too was brought into focus due to a gradual depletion of external resources to import the required food.

The Irrigation Department was established in 1900 to take over the functions associated with irrigation development in the island which were until then handled by the Public Works Department. Even though the ancient major irrigation systems in the dry zone had been abandoned and were in ruins for many centuries, the miniature village-irrigation systems

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[16] Senior Deputy Director, Irrigation Department.

continued to be operated by a small but cohesive farmer community managing the tank by themselves. In the application of then current engineering techniques during the earlier designs of major irrigation systems, the Irrigation Department had to draw lessons from only the village-irrigation systems that existed.

The farmers under the village tanks successfully operate the system due to the cohesion that exists among the farmer community which is very much different from the state of disunity, competition, and at times even conflict amongst the smaller groups within the overall settler community under the major irrigation schemes. A major irrigation settlement has a mixture of farmer groups with origins in different parts of the country, with different social traditions, behaviors, and even agricultural practices that are compelled to find a harmonious coexistence by being placed in groups as part of a larger settler community. An irrigation system that could successfully be operated by a cohesive group will fail to bring forth similar success in a situation of disunity and rivalry. An outsider, the Irrigation Department or any other agency, attempting to manage the system cannot aspire to successful management without a strategy to overcome the differences that exist amongst the different groups. The desire to achieve self-sufficiency in food through rice cultivation to which irrigated settlement schemes make the major contribution, later led to the demand for increased cropping intensities and increased yields per unit area. While the cropping intensities depended on the optimum use of the natural resources of land and water, higher yields depended primarily on high yielding varieties. The success of achieving higher cropping intensities was recognized to be dependent primarily on the coordination of the use of water with many other agricultural inputs, agronomic practices, credit, marketing etc. The Irrigation Department and the settlement agencies were thus required to meet the challenge of increasing gross productivity in a situation different from the original demand for providing a means of sustenance to assist the migrant population. The attempts to coordinate activities of the farmers and the agencies responsible for various inputs through various coordinating bodies like the District Agricultural Committees, Agricultural Productivity Committees, Agrarian Services Committees, and Cultivation Meetings backed by a number of statutes have failed to yield the desired degree of results. On the other hand, the experience in Minipe and Gal Oya without any legal backing demonstrated the possibility of achieving better results by a genuine attempt by the officials to involve the beneficiaries in decision making and involving them in managing the irrigation system.

The efforts in Minipe have shown how unity and cohesion could be achieved by the proper guidance of the officials as well as the beneficiaries in a scheme where a chaotic situation existed previously. The farmers' organizations proved their strength and the ability to bring about the closeness and joint participation amongst the diverse groups of farmers and officials within a major irrigation settlement to a satisfactory level resembling the situation of joint participation in the village-tank system. The capacity of farmers' organizations to manage their systems and also to participate in decision making can be used to advantage in operation and maintenance of the distribution system.

OPERATION AND MAINTENANCE

Returns from an irrigation scheme depend largely on how well the system is operated and maintained to assist the farmer with his on-farm water requirements. The Irrigation Department operates and maintains the main and branch canals, distributary channels and the structures in the field channels while the farmers maintain the earthwork in the field channels. Many shortcomings are observed in the maintenance of the canals the responsibility for which lies with both the Irrigation Department and the farmers.

Operational problems also exist in the systems arising partly from inadequate maintenance and partly due to other reasons. The damaged canals, silt and weeds in the canals, malfunctioning control structures, and water losses make it very difficult or impossible to achieve reliability and equity of water distribution in a large network of canals. This difficulty in proper operation is further aggravated by uncoordinated farming activities and lack of resources like farm power for land preparation, seed for planting, and credit facilities which are required for timely farming activity. The coordination of the resources and farmer activities are being improved through integrated management efforts made in the irrigation schemes under the INMAS and MANIS, and by dedicated individual officers.

In a state of lack of coordination and collective activity, the value of participatory action of the irrigation agency and the users is well-demonstrated in schemes like Kimbulwana and Nagadeepa. The motivated leadership of an individual officer in Kimbulwana has enabled good maintenance of the canal system and to operate it at low cost compared with the other irrigation schemes in the neighborhood within the same range under the Range Deputy Director of Irrigation. The individual motivated leadership coupled with a nongovernmental organization's facilitation in Nagadeepa has been able to enlist a very high degree of participatory action in the operation and maintenance of the distributary-and field-channel system. In spite of nonpreferential allocations of O&M funds to either of these schemes the strength of farmers' organizations has made it possible to achieve a greater degree of user confidence, ability to manage a canal system even with certain defects, operate the canal system with collective and timely farming activity, and above all to the greater satisfaction of the user with less burdens and irritation to the agency.

NEW GOVERNMENT POLICY

In the past, participatory management in the major irrigation schemes has been minimal. A faint reflection of a participatory involvement was introduced in the major schemes where field channel maintenance was assigned as a responsibility of the farmers. Kanna meetings (cultivation meetings) provided legal facility for participatory decision making regarding only the operation of a season. But, the participation at these meetings does not bear the qualities of participatory decisions owing to the nonattendance by the majority of beneficiaries and a lack of dialogue among the beneficiaries and the line-agency officials.

Participatory decision making in the design for rehabilitation in Gal Oya and in operation and maintenance of the irrigation system in Minipe and Kimbulwana while being the earliest efforts at creating a stage for participatory action through closer harmony of farmers and officials, succeeded also in creating an awareness of the possibility and usefulness of such harmonious action. The integrated management approach under the INMAS introduced by the Irrigation Management Division (IMD) as an organized attempt to exercise a formal method of initiating and developing participation in selected major irrigation schemes has generated greater awareness in the irrigation sector. The INMAS project of the IMD could not include all the irrigation schemes that are under the responsibility of the Irrigation Department. Therefore, the Irrigation Department launched the MANIS program in 1988 to promote similar action in the schemes left out of INMAS. The major thrust in these projects has been in the direction of improving the harmonious and coordinated behavior in the operation and maintenance of the irrigation schemes.

The former Minister of Lands, Land Development and Mahaweli Development and the Minister of Agricultural Development and Research obtained Cabinet approval in principle for the policy of participatory management in irrigation schemes and to provide a legal framework to recognize the rights and obligations of the farmers' organizations. The ever-worsening problem of the lack of funds for the operation and maintenance is also expected to be solved by encouraging the farmers to manage the operation and maintenance of the distributary systems by contributing their labor and other resources. Such a development is expected to enable the exemption of farmers from payment of O&M fees. The Secretary, Ministry of Lands, Irrigation and Mahaweli Development while referring to the cabinet decision to the Committee of Secretaries made certain recommendations, extracts of which are given below.

1. Policy Commitment on Participatory Management

It is recommended that participatory management be accepted as a policy and systems based on these principles be developed and experimented with, with the objective of improving overall management and performance.

2. Organizational Form

It is recommended that the management principle of village tanks be adopted in larger systems with the turnout area, the field channel and the distributary channel, respectively, being treated as the respective management units in the ascending order.

3. Institution-Building

Farmer participation has to be developed through institutions in the irrigation sector, such as turnout groups, the subproject committee, the project committee, the kanna meeting, District Agricultural Committee (DAC) subcommittee etc. It is recommended that these institutions be strengthened providing for active farmer involvement.

4. Cost-Sharing

It is recommended that farmers be encouraged to manage an O&M system in which they contribute their labor and other resources rather than just paying O&M charges to a central authority.

5. Main System Management

Government funds should continue to be available to the irrigation agencies for main system management with appropriate provision for consultation with farmers' organizations in the execution of such work.

6. Legal Framework

The present programs of participatory management in some schemes have been developed on an informal and voluntary basis. It is necessary at some stage to provide a legal framework to speed up this process and also recognize the right and obligation of the parties, namely of government and of farmer. An amendment to the Irrigation Ordinance, which recognizes water users' organizations and also modifies the present kanna meeting procedure, would be necessary.

7. Transfer of Ownership

There has been a suggestion that in respect of village tanks and medium-scale works and in respect of the distributary system of the major schemes, ownership of irrigation networks be legally turned over to the farmers. While this is desirable in an ultimate sense it can remain as a long-term objective towards which future thinking could be directed.

It would be useful, however, to enact enabling legislation for such transfer over a period of time. Regulations can be so framed that in respect of each irrigation scheme the performance of the water users' organizations could be evaluated and strict criteria laid down to determine the stage at which such ownership should be transferred.

Out of these recommendations fulfillment of the first five needs much preparatory action by the agencies as well as by the users. The necessity for providing the legal framework for the farmers' organizations is being attended to by a committee headed by the Secretary to the State Minister for Irrigation, currently studying the changes that are required in the Irrigation Ordinance. The enabling legislation for the transfer of ownership also could find a place among the changes that are being proposed in the Irrigation Ordinance.

THE PROPOSED STRATEGY

The irrigation agencies and the farmers have to synchronize their activities and bond themselves into a cohesive body for the above recommendations to be made a practical reality. The level of performance of the agency and the use in the exercise of implementation efforts will depend on their attitudes, skills, resources, and the organization available. The level of performance will be higher or lower according to whether these supporting conditions are strong or weak. Any strategy adopted should therefore be directed towards the improvement of them. Having participated in discussions among the agencies and the users at various opportunities provided by the ongoing rehabilitation projects, farmers-organization building, and with some individual agency officials, the author feels that the future strategy of the Irrigation Department in operation and maintenance should be directed to include the following activities:

* Strengthen the operation and maintenance arm of the Irrigation Department.
* Create greater widespread awareness among the Irrigation Department staff on the benefits of participatory management as a means of improving the overall irrigation management efficiency.
* Reorient the staff to provide their ready involvement in operation and maintenance breaking away from the traditional professional preference for new construction. Provide training facilities and incentives for staff involved in the O&M activities.
* Be active in the removal of confused state of misunderstanding that exists within the irrigation agencies and the farmers' organizations regarding the concepts and approach for participatory management in the distribution system.
* Actively participate in the formation of the farmers' organizations and in participatory decision making.
* Educate the farmers in the operation and maintenance practices.
* Identify and prepare a plan for the rehabilitation of all the irrigation schemes that require it, on a low keynote to avoid over-complexity in implementation, within limited resources and determine the resource requirement.
* Adopt improved techniques to enable faster response to operational demands.
* Cause a change in the procedure of allocation of funds for operation and maintenance at national level by justification of the costs.
* Avoid overstaffing.
* Provide legal support for the farmers' organizations.

The above have not been placed in a strict order of sequence of importance of succession. Many of them need to be followed up concurrently.

STRENGTHENING THE IRRIGATION DEPARTMENT

The importance of the operation and maintenance of irrigation systems has been recognized in the past by successive Directors of Irrigation. The manual for operation and maintenance has laid down many important and useful procedures especially on maintenance (Arumugam 1957). This recognition and the procedures have not found popularity in the implementation process and very little change has occurred within the organization over the years to meet the operation and maintenance responsibilities. The emphasis on the role of the Irrigation Department has changed from providing designs and construction to facilitate irrigated settlement schemes to one of effecting efficient operation and maintenance to achieve the optimum level of productivity from the available resources of water, land, and the water users. It needs organizational strengthening to fulfill this requirement while its ability to design, construct, and set standards is maintained to serve the new construction projects, rehabilitation work involved in projects like VIRP, IRDP, MIRP, and ISMP, and maintaining uniformly high standards in the work under Provincial Councils. The existing organization will not be able to promote participatory management involving the Irrigation Department effectively without suitable changes to meet the demands of the day in irrigation management.

A number of branches within the Irrigation Department are involved closely in the performance of operation and maintenance activities, allocating funds among the various schemes and monitoring their use, identifying schemes for rehabilitation and planning the implementation of rehabilitation work, and training staff and users. It would be necessary to coordinate all of them into an arm of the department with the status of a subdepartment that provides for coordination under an Additional Director who will be able to devote 100 percent of his time on the operation and maintenance functions without being involved in other responsibilities of the Department such as investigation, designs, and construction of new irrigation systems. Exposure to disciplines other than irrigation engineering is required to insure the infusion of changes required by the participatory management and such disciplines should be brought into the subdepartment for successful irrigation management. This will be the operation subdepartment which includes all O&M activities and management of the irrigation schemes while the investigations, research, designs, and construction activities are grouped together under a construction subdepartment. The importance of having a more organized arm of the Irrigation Department for operation and maintenance increases at the Range and Divisional levels. These offices should also be reorganized to include a strong section for O&M in each Range Office and divisional office with adequate power and authority delegated to them.

The O&M subdepartment should develop links and close ties with other agencies and research organizations involved or interested in the irrigation sector. This relationship too should be promoted and forged at the Range and Divisional levels also.

At the Range level, a Chief Engineer under the supervision of the Range Deputy Director should have the responsibility of supervisory coordination of all Divisional O&M activities which will include the costing and monitoring of maintenance work, involvement in farmers' organizations and participatory management, monitoring operational decisions made in the schemes and their implementation, assisting the Divisional Engineers to communicate with other line agencies at district level, and organizing local training for staff and farmers, and he should be instrumental

in formulating proposals for rehabilitation of irrigation systems and for seeking additional financial support. Range offices with a heavy load of work due to major construction projects should group such work under a separate Chief Engineer so that the operation work and the major engineering construction work will both be performed without operation and maintenance losing due recognition. In Ranges without major construction programs there would be no necessity for a separate Chief Engineer for engineering work. Such work can be managed by an experienced senior engineer with direct involvement of the Range Deputy Director.

At the Divisional level, an additional engineer under the supervision of the Divisional Engineer should have the responsibility of directing the Technical Assistants, the Work Supervisors, and the other staff on the inspection of the system, participatory programing and estimating maintenance work that has to be done, participation in the development, strengthening, and activities of farmers' organizations; participation in making decisions, in operational activities, and their implementation; setting out and providing technical advice to the farmers' organizations in the maintenance work done by them, establishing healthy relationships with other line agencies; participation in the training of farmers and the operation and also maintenance of the head works. The Irrigation Engineer in charge of a Division with heavy construction responsibilities should be assisted by another Additional Engineer to perform the construction responsibilities.

AWARENESS OF PARTICIPATORY MANAGEMENT

The drive for integrated management with the recent emphasis on participatory management commenced in the decade of the eighties and the awareness of the usefulness of a participatory management and of the correct approach is still lacking among the staff of the irrigation agencies. This is evident from the experience discussed under the removal of confusions in a subsequent section. While the policy of participatory management can be given official recognition by way of circulars and official instructions, the awareness cannot be infused without greater flow of ideas, two-way transfer of experiences and of progress of performance between all levels of the agencies, and continuing efforts to evaluate and correct the procedures and approaches.

Training courses and seminars are essential to spark off the initial awareness. The existing facilities and opportunities within the irrigation agencies and research organizations should be made use of. The Department should get adequate funds and facilities to enable the staff to be given the orientation needed and expose them to other disciplines to develop the skills of communication, teaming up for providing better services, and for recognizing and reacting favorably to socioeconomic problems of the user. They should also be made aware of the drawbacks arising from a purely technological approach and be trained in methods of developing harmony of technology with the multifaceted environment that exists so as to achieve long-lasting solutions.

Regular discussions under the program to discuss its implementation, at the Range and Divisional levels should include not only the officers involved in the O&M but also others as a means of propagating the awareness to all the Engineers, the Technical Assistants, and the Work Supervisors. A newsletter would be useful in the sharing of experience among all the schemes.

BREAKING AWAY FROM THE PREFERENCE FOR CONSTRUCTION

There is a preference for construction activity over operations by the technical staff within the Irrigation Department. In competing for staff between the construction projects and maintenance divisions the former gets the more competent persons. This recognition is established by the decision makers at higher levels within and outside the Department. They would easily approve the payment of extra remuneration to those in construction projects but not approve similar payments when the construction is over and the maintenance phase commences. Opportunities such as overseas training have been used more often to reward those engaged in construction.

Engineers and technical officers generally derive a greater sense of job satisfaction out of construction work. Their preference for construction responsibilities is further strengthened by actions similar to those mentioned above. Revised thinking in the official recognition of competency and award of fringe benefits could induce an initial phase of realization that there is equal recognition for both construction and maintenance from both within and outside the Irrigation Department. If this induction is promoted it would gradually encourage larger numbers to be attracted towards performing the maintenance responsibilities.

REMOVAL OF CONFUSION REGARDING PARTICIPATORY MANAGEMENT

The steering committee for the INMAS program decided in 1987 that a few distributary channels in selected projects be handed over to the farmers' organizations for operation and maintenance. This handing over on a pilot basis has surfaced a number of examples of confused thinking, the removal of which would be beneficial in the implementation of the new government policy. The feeling that exists among some Irrigation Department and IMD staff that the Irrigation Department will completely withdraw from the channels handed over has to be removed. The term 'handing over' that has been used from the beginning needs to be changed to 'share responsibilities' for participatory management. There is a need for the Irrigation Department staff to continue to be present in the distribution system to assess the maintenance work that has to be done, prepare proposals, provide technical advise in the work, set out work, assist in quality control, prepare irrigation schedules in consideration of the water available in the main system, help the farmers' organizations to manage the water issues until they become competent to do so on their own, and to monitor the O&M activities to insure satisfactory performance. They should be able to intervene and rectify when the operation or maintenance does not take place as desired.

In certain INMAS projects there had been complaints that the Irrigation Department staff is reluctant to 'handover.' Under pressure influenced by the Project Managers through District Administration, the Irrigation Engineer 'handed over' the entire distribution system in two irrigation schemes with command areas of 14,000 acres and 2,000 acres, within a few days, in November

1989, to the farmers' organizations. In management by sharing responsibility, the farmers' organizations should be strong and be able to operate the system, effect the irrigation issues, command the confidence of and recognition by the farmers, be able to deal with errant farmers, have demonstrated ability to operate and maintain the field channels, and develop a firm bond among the farmers and the irrigation agencies. If the last-mentioned state of a bond has not been achieved, any deficiencies already existing in the O&M of the system will continue to exist even after the 'handing over.' The farmers in the above two schemes have missed three consecutive cultivation seasons due to shortage of water and the prospects of a maha 89/90 cultivation do not exist even in early February 90. The forced handing over does not reflect well on the conceptual understanding of those who forced it. Participatory management is possible only with strong and stable farmers' organizations and the sharing of responsibilities should be phased out in step with the growth of the individual farmers' organizations. In a number of schemes, project committees have been established while the distributary channel committees are not yet formed or are being reconstituted. The responsibility can be shared only after the latter are formed and have grown in strength. A set of criteria should be evolved to decide on the strength of the farmers' organization and its stability. The sharing of responsibility in the distribution system should be phased out in step with the development of the individual farmers' organizations.

A strong farmers' organization is characterized by its regular meetings which are well-attended and where collective decisions are taken in the overall interest of the farmers. The farmer leaders will be respected by the farmers for the sincerity with which they arrive at decisions and implement them. The farmer leaders would be sensitive to the needs of the farmers served by them and respond quickly and effectively winning the confidence and the respect for their active leadership. An organization with such farmer leaders will also be able to handle effectively noncooperating farmers and the consensus for their decisions and actions would freely come forth from the rest of the farmers.

The maintenance work in the canals, irrespective of whether they are shared or not, should be entrusted on contract to the farmers' organizations where they are prepared to undertake the work. However, this should not be permitted to emerge as the only activity or the most important activity of the farmers' organizations as currently envisaged by some farmers' organizations and project managers. The farmers' organizations should not be developed into a set of contractors to replace a set of genuine or 'ghost' contractors, even though undertaking contracts by them is a most desirable method of doing the work.

The channel system should be in a good state of repair and operability for convenient operation. But the rehabilitation of all irrigation systems in the country within a few years does not appear to be practicable due to the lack of funds. A strong farmers' organization can operate a canal system, better than the Irrigation Department, with the cooperation it gets from all the users. Rehabilitation of the canal system should not be treated as a precondition for participatory management. That would require a long time for completion and delay the participatory sharing of responsibilities. This does not imply that the efforts to improve the distribution system can be given up after that. Efforts to rehabilitate should be pursued to bring the distribution system to a standard that can be conveniently sustained through farmer participation.

A joint declaration by the farmers' organizations and the Irrigation Department that they have entered into a phase of sharing responsibilities is appropriate in promoting a sense of commitment on both sides. It should not be an agreement with legal status binding the two parties to a rigid

set of conditions and responsibilities. The staff of the agencies involved in the formation of farmers' organizations should enter into open discussions to dispel many confusions that exist. They should avoid the division of farmers in a bid for leadership or using them as instruments for gathering force against other agencies. The dsire to achieve official leadership of the farmers can lower the farmers' organizations to the status of a trade union where the needs of the farmers are exploited by the Project Managers as a set of demands with which they can reach the limelight rather than perform a role of official coordination of the resources available within and outside each irrigation agency to satisfy the farmer needs. Farmers' organizations are not meant to be a stage for achieving personal gains of ambitious officials.

FORMATION OF FARMERS' ORGANIZATIONS

The Irrigation Department being the agency responsible for the most important input of the farmer, cannot remain passive in the efforts to form farmers' organizations. A farmers' organization without active participation of the Irrigation Department cannot develop the confidence in its members about the possibility of successful management of the irrigation system.

The Irrigation Department has to work out, with other agencies instrumental in forming the farmers' organizations, an approach for the full involvement of the Works Supervisors, the Technical Assistants and the Irrigation Engineer in the activities of the farmers' organizations at the relevant levels.

One hundred and ninety irrigation schemes with a total area of 174,000 acres that are excluded from the INMAS were considered by the Irrigation Department as grounds for launching an integrated management program. The MANIS project with no extra input support of funds or personnel was commenced by the Irrigation Department with 121 selected Technical Assistants and Engineers as Project Managers. They were required to perform the onerous task of developing the farmers' organizations and establishing an environment for participatory management, merely through sheer dedication. They did not get any support in the form of more time by relieving them from other official responsibilities, with transport facilities for the extensive traveling required in organizing, subsistence allowance to reimburse personal expenses incurred during the increased number of days spent out in the field away from their residential areas, or a source of funds to meet the expenses in conducting the meetings with farmers and line-agency officials. The lack of official support from above experienced by those who wanted the Irrigation Department to await the proposed devolution to the Provincial Councils had an adverse impact on the program as was to be expected.

The circulation of an official introduction of the program to the District officials at the District Agricultural Committee was incomprehensibly delayed until the safety of a few Project Managers who were involved in facilitating farmers to organize, turned out to be endangered under the prevailing security situation in the country. As a result, the farmers' organizations formed by that time found it difficult to proceed with positive action beyond taking decisions. The line-agency

support waned. Project Mangers were demoralized when they began to feel that the authorities were not supporting their efforts. In spite of the general demoralization, dedicated leadership by the Technical Assistants who acted as the Project Managers have shown a promising trend in a number of schemes like Kaltota, Mediyawa, Maha Andara wewa, Vijaya Katupotha, Kande Ela, and Handapangala.

An opportunity to lay the foundation for participatory management in the schemes devolved upon the Provincial Councils was lost due to the lack of official support. The Provincial Councils could find it easier to continue developing farmers' organizations that had been started than to realize their usefulness and form them by themselves. The Provincial Councils should be extended support to evolve methods of implementing the government's new policy of participatory management in those schemes. The Irrigation Department should also continue to seek ways of successful implementation of the MANIS program in the few schemes that will not be devolved. The effort with a low cost of investment should be continued in establishing the farmers' organizations, getting the services of facilitators for institutional development, farmer training, and promoting the participatory management while the search continues for funds to meet the overheads and implementation costs.

Farmer Education

Successful participatory management will also depend on the ability of the farmers to understand the functioning of the canal system and its operation. The farmers' organizations will have to be given this training by the Irrigation Department for them to be able to understand the reasons for decisions taken in operation and maintenance.

Proposals for Rehabilitation

As stated earlier, rehabilitation should not be a precondition for commencing participatory management. But, it is necessary for improving the distribution system to a level that can sustain participatory operation and maintenance.

Finding sufficient funds to rehabilitate all the irrigation schemes is a major problem and it needs to be properly planned out. A low-capital investment rehabilitation should be planned out which involves local engineering resources for design and construction supervision, farmers' organizations and local contractors within the schemes for earthwork and construction of structures while adopting successful experiences of participatory decision making and action from other schemes in the country. Precautions should be taken to avoid heavy capital investment that would be required if expensive consultancy designs, large-scale contractors, and heavy machinery and equipment are involved in the rehabilitation.

Proposals for low-cost rehabilitation of individual irrigation schemes based on sample surveys of canals, embankments, and structure should be prepared and presented on a priority order for local and foreign financing. The proposals should also include provisions for improvements for regulation and measurement of the water issues.

IMPROVED OPERATION

The farmers' organizations will be entrusted with the operation of the distribution system while the Irrigation Department will operate the main system. The operation of the main system and the distribution system will have mutual effects on each other. Greater complexity occurs within the distribution system where a large number of farm outlets, field-channel turnouts, and regulators in distributary channels have to be operated. The Irrigation Department should continue to assist the farmers' organizations in carrying out this responsibility with its advice on regulation and control of issues at various parts of the distribution system. Turnout attendants of the Department can continue to serve in the canals under the supervision of the farmers' organizations in operating the issues according to the Department's advice. The farmers' organizations will thus be able to apply technical advice under their supervision through the Departmental employees.

The participation of the farmers' organizations is expected to generate greater interest in the water issues among the farmers which will require and also assist improved operation. The Department will initially prepare a water-issues plan for the season with the farmers' organization. During the season, review of water issues already made and decisions on water issues to be made can be taken at regular meetings of the Irrigation Department and the farmers' organization. This will enable reservoir storage to be saved by optimum use of rainfall and provide better supply to the farmers who need special attention due to problems that may arise in the operation.

Installation of measuring devices, measurement of discharges, monitoring and measuring rainfall, and regular review of operations can further improve the operations by communication of information to the Irrigation Engineer's office. The feedback information can be used on computer to quickly predict the changes that may be needed in the operation.

ALLOCATION OF O&M FUNDS

The practice of releasing allocations to suit the O&M activities that are required to be performed, has reversed with the reduction of annual budgetary allocations, to a state of adjusting the O&M activities to suit the available funds. It is expected that the participatory decisions on prioritizing of maintenance work to be performed, farmers' organizations undertaking the contracts for repair works, and their ability and willingness to perform more work than contracted due to the self-interest in the benefits after repairs, would reduce the gap between the availability of and demand for O&M funds. Yet, it is necessary to urge the policymakers at national level to annually release increased funds to sustain the irrigation systems at an acceptable level of maintenance that would delay the need for heavy investment for rehabilitation. A request for increased funds appears to be contradictory to the government policy to withdraw from the O&M of distribution system with a reduction in the government spending. The share of cost borne by the government out of the total cost of O&M to be performed is gradually falling. The attention of policymakers needs to

be drawn to the relative level of commitment of the government funds rather than to the absolute total amounts.

OVERSTAFFING

Any overstaffing and the resultant involvement that consume the meager O&M allocations should be avoided in order to optimize the use of funds. The recent decision of the government to grant permanent status to casual employees with more than six months' service will result in a further increase of monthly salary bills which have to be met from O&M allocations in the Irrigation Divisions which have only maintenance responsibilities.

Further recruitment of staff that will burden the O&M funds should be avoided by the Department as far as possible and there should be no replacement of such employees who retire or resign from service.

LEGAL RECOGNITION OF FARMERS' ORGANIZATIONS

The necessity for legal recognition of farmers' organizations has been identified for many reasons. In participatory management of O&M activities where the farmers' organizations are required to assume control of irrigation structures and perform operations, there should be legal provision for them to take necessary action against errant farmers who act in violation of the common interest of the other farmers. While the farmers' organization should attempt to manage through a sense of group cohesion, it should also be able to deal effectively with the dissidents violating decisions on water issues, farming activities, cultivation calendar, causing damages to irrigation infrastructure, and failure to participate in O&M activities. Provision should also be available for the recovery of costs of damages -- preferably not in the form of fines -- by the farmers' organizations in dealing with such instances.

CONCLUSION

The author feels that the above strategy would be necessary to implement the decision of the government regarding participatory management of irrigation systems. This strategy is oriented around water which is the most important irrigation input. The author expects the strategy

suggested would help the Irrigation Department to perform its role successfully in this exercise. However, the total success will also depend on how well strategies are implemented towards settlement of other problems involved with the other inputs. It is also essential that problems caused by illicit water tapping, land fragmentation, and encroachments are settled to complement the success desired to be achieved through improvements in the irrigation system management discussed above.

The ideas expressed and suggestions made in this paper are solely those of the author and not necessarily the official view of the Irrigation Department.

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Future Strategy of the Irrigation Management Division

D. M. Ariyaratne[17]

HISTORICAL BACKGROUND TO THE NEW POLICIES

IN JANUARY 1989, the Government of Sri Lanka approved certain policy changes in relation to the operation and maintenance of the Major Irrigation Agricultural Settlement Schemes. This paper attempts to put these policy changes into an operational perspective, and to propose new arrangements that would insure and facilitate their smooth and speedy implementation to achieve a sustainable and continuous process of management of the Major Irrigation Agricultural Settlement Schemes.

From about the mid-sixties the government has been paying attention to the fact that the major irrigation schemes were gradually becoming unable to deliver the desired results. However, the immediate and most compelling reason for this concern was the intervention by the donor agencies who insisted on a system of continuous and sustainable operation and maintenance of these schemes through sharing of costs with the beneficiaries. The historical reasons that stimulated the new thinking and policy changes are interesting and important, but they can be cited here only briefly.

In the past, approximately up to the mid-nineteenth century the management of the operation and maintenance (O&M) of the irrigation schemes had always been an institutionalized, collective effort by the beneficiaries. The important collective practices and customs that were prevailing until then were codified and incorporated into the Irrigation Ordinance of 1856. These customs and practices helped to maintain a continuous and a sustainable system of O&M, and were able to look after the professional and physical aspects of rice cultivation in all respects.

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[17] Director, Irrigation Management Division.

From the early decades of the present century, the interest in the construction and the restoration of major schemes and the complex and sophisticated technology utilized in this task created a tendency for the technocrats to assume that the O&M of these massive schemes were beyond the comprehension and capacity of the small farmers. As a result, the 'technocracy' took over the responsibilities of O&M of the major irrigation schemes as a direct function of the state. But these schemes did not pose serious problems during the fifties and the early part of the sixties as they were comparatively new after restoration. But since the mid-1960s as the balance of payments position of the country became aggravated and the prices of imports of food items rose, there was an urgent need to look at these agricultural settlement schemes more critically.

The spurt of thinking and experimentation beginning with special projects in the sixties; farmer committees aimed at self-participatory management in the new Mahaweli settlements planned in the 1970s; the disruption to the Irrigation Department's long-evolved system of procedures for O&M during the Territorial Civil Engineering Organization (TCEO) years; the Gal Oya experiment searching for new management mechanisms using catalysts, farmers' organization and farmer-officer linkages; the coordinated water management, agricultural production and farmers' organizations through a separate project manager under the Lands Ministry's Water Management Programme in the early eighties; and consolidation of the previous experiences in the current INMAS program, are salient land marks in the search for an acceptable and sustainable O&M management system.

Along with the implementation of INMAS in 1984, the government introduced an irrigation service fee collection scheme as a means of recovering O&M costs. Under this scheme the farmers were required to pay half (50 per cent) of the O&M costs and this rate was to increase gradually to recover the full cost after five years. At the same time although the Territorial Civil Engineering Organization was dismantled and O&M of major irrigation schemes restored to the Irrigation Department, the government was compelled to reduce its allocations for O&M due to a new policy thrust in the Irrigation Sector. During the eighties the government was more bent on a new strategy of improving irrigation facilities through modernization, institutional building, coordination, and integrated management. This strategy made the government preoccupied with problems of coordination and refurbishing the schemes but O&M did not figure prominently.

As counterpart local funds for modernization programs were needed to match the foreign aid and loan funds, the government continuously kept on reducing its allocation on O&M. But the donor agencies vehemently insisted that O&M of the schemes rehabilitated or modernized should receive greater and concerted effort. Although the Treasury approved an increase in O&M up to Rs 84 which was only Rs 64 at the time, inadequate O&M figured prominently in the criticism by the farmers and was often cited as a factor for lack of farmer participation and cooperation in the new management systems. With less and less allocation for O&M, a situation arose under which O&M allocations became negligible. Sometimes it became apparent that most of the funds allocated were used to maintain personnel instead of schemes. There was a kind of permissiveness in the utilization of O&M funds in the sense that they were used to cover up the shortfalls of allocations in the other areas such as overtime, fuel supplies, payment to casual laborers etc.. This permissiveness very often led to allegations of misuse and/or abuse of these allocations and became a common area of criticism by farmers collectively and individually. In the absence of a clearly laid down policy the O&M programs very often suffered from inconsistences and dissatisfaction of farmers. Due to these reasons continuation of O&M activities and the sustainability of the Irrigation Systems appeared to be in danger by the end of 1988.

THE NEW POLICIES AND THEIR OPERATIONAL IMPLICATIONS

The new policies referred to in this workshop are those approved in principle by the Cabinet in January 1989 related to the following aspects of participatory management in regard to the O&M of the major irrigation schemes.

i. Adoption of management principles of the village tanks in larger systems in the turnout areas and the distributary channels respectively;

ii. Development of village-level institutions to provide for active farmer participation and involvement;

iii. Encouraging of farmers to manage the operation and maintenance of the distributary system by contributing their labor and other resources. This development is expected to enable the exemption of farmers from payment of O&M fees;

iv. Continuation of government allocations to maintain and manage the Main System (Head Works and Main Canals) - approximately 50 per cent of the total cost of operation and maintenance;

v. Provision of a legal framework to recognize the rights and obligations of farmers' organizations through amendments the Irrigation Ordinance and the Agrarian Services Act as required;

vi. Enactment of legislation to transfer, over a period of time, the ownership of the irrigation network below the D-Channel level to farmers 'organizations, when they are found to be ready to take on that responsibility.

These policies taken together would mean a 'sharing' of the responsibility for O&M of these schemes between the state and the farmers. Presently these schemes are managed by the Irrigation Department on behalf of the state through contractors and departmental labor. The Department controls all resources and authority and the entire system is regarded as a property of the state. In terms of these policies this management pattern has to be converted into a participatory type under which the state will manage the schemes through and with the farmers. In this sense, it would mean a partnership or a contract. There is, on the one hand, an element of contractual economics in such a partnership relating to sharing of resources either collected from farmers or allocated by the state, and on the other, an element of contractual social-politics in the partnership relating to sharing of power and authority. It is therefore both contractualeconomy and contractualpolity, the achievement of which can be accomplished only through a joint effort by the farmers and the government. This joint effort must lead to a gradual emergence of a system of integrated/participatory/self-management of the O&M of these schemes which entails a change from an over-subsidized to a self-sustaining and self-financing O&M program and ultimately to a self-management system as implied in the policy decision number vi listed above.

The first and foremost operational implication would therefore be for the IMD/INMAS, one of the implementing agencies of these new policies, to change its emphasis to one of promotion and development of the required management system. With this end in view the IMD/INMAS should be able to change its structure from time to time to facilitate the effective implementation of the required processes, interventions, and programs until the farmers are organized to develop skills and capabilities to manage the operation and maintenance of these schemes on their own. However, at the beginning and during the formative stage, these policies collectively imply that since water is recognized as the critical input and the provision of irrigation facilities is identified as the entry-point for these processes and interventions the programs of water management and essential structural rehabilitation and improvement, should naturally and obviously continue to receive priority consideration. Here again it must be emphasized that the joint or the partnership/ participatory nature of these processes and interventions should be clearly borne and understood equally by both partners.

The two partners in this jointeffort are the farmers and the state. Contractual economy/polity would therefore mean that efforts of the state must be directed towards the achievement of the aspirations and programs designed by the farmers and conversely farmers must be aware of their reciprocal responsibilities to the state and realize that even a 'welfare' state does not have unlimited resources. If they require state assistance they must know that such assistance entails obligations. The state must realize that farmers must be helped to help themselves. When service is given to the farmers it must be given with respect and dignity and with a clear understanding that the farmers rightfully deserve such service.

It is obvious that the promotion and development of such partnership-contractual economy/ polity has to be planned on a long-term basis. Suitable mechanisms have to be evolved and tested to achieve an appropriate equilibrium between the reciprocal commitments of each partner. Setting-up of these mechanisms have to be undertaken in stages. The first stage would be the strengthening of the organization and autonomy of the farmers to bestow on them an increasing bargainingpower and to make them aware of this power. In most schemes under the IMD/INMAS this has already been accomplished (some studies have called this mobilization instead of organization). At the next stage it would be possible to launch annual or seasonal agreements regarding O&M between farmers and the state. A further step would be for individual farmers to sign personal contracts with the farmers' organization in regard to their share in the O&M and the farmers' organizations to sign a composite contract with the state (Irrigation Department) stating the reciprocal rights and duties of each partner and the provisions made to insure their enforcement. The final stage would be for the state to enact enabling legislation for the farmers'organization to take over the ownership of the system and for the state to remain as a watchdog.

However, it has to be accepted, and experience has shown that numerous difficulties do arise in the proper implementation of this partnership principle. As the two partners are not of equal strength -- the farmers and their organizations on the one hand without any power, other than their numbers, cohesiveness, and recognition by the state and the 'all-powerful' state on the other with rigid hierarchical bureaucratic mechanisms -- the contracts and agreements between them may not always prove operative and workable. This type of partnershipbuilding has therefore necessarily to be induced and strengthened by means of certain other programs which would support/ supplement/complement the attempt to achieve the main goal of participatory management. The more important of such supportive programs identified are as follows:

i. Institutional Development;
ii. Promotion and Development of farmers' organizations;
iii. Restructuring of State Organizations for Co-ordination/Facilitation;
iv. Establishment of linkages between farmers' organization and State Agencies;
v. Production Planning and Implementation;
vi. Training and Awareness Programs.

SUPPORTIVE/SUPPLEMENTARY/COMPLEMENTARY PROGRAMS

Institutional Development

The new policies require the involvement of farmers in an effective manner on a participatory basis in the new management system. The first and foremost ingredient in this regard therefore is the realization and recognition that these farmers are both the means (resources) for management and the final beneficiaries of and the reason for such management. This means that they cannot be mechanically deployed like physical and financial resources with good results except during brief, major, and mutually recognized crises. Farmers function most effectively when they clearly understand how they fit into the effort and see that it is of benefit to them. Farmers can adequately respond to governmental requirements in management terms only through their own local organizations over which they can exert some meaningful degree of control. (This is why some farmers' organizations are reluctant to take over D-Channels with the existing turn-out attendants.) It is only through such linkages that agents and services of government can effectively contact and influence rural people. It is through such linkages that farmers can adapt and adopt generalized and uniform government assistance and programs in a way that meets their particular (specific) needs and situations. It is in their own organizations that the farmers develop the sureness and security to respond to government initiatives. In such organizations joint responsibility is learnt, good citizenship practiced, and village leadership developed.

Experience in several developing countries has shown that development projects and management systems which develop and strengthen institutional capabilities for beneficiary participation have most often produced sustained benefits. In such projects, farmers are treated not as beneficiaries but as participants in a jointendeavor to improve their productivity and well-being. The projects and management systems which have been 'doing things for the farmers or to the farmers rather than with them' have not been able to sustain (e.g., Special Projects in 1967). Therefore, with a new strategy of farmer-organization building, the IMD/IMMAS would make a determined effort to avoid paternalistic fallacies as well as the populist fallacies and resort to a mutual endeavor emerging from above and from below. It will also avoid the adoption of uniformity and the standard of perfection (100 percent success and 100 percent efficiency). The farmers would be allowed to build organizational structures to suit their own areas and locations based on indigenous traditions and technology.

What should be the strategy of the IMD/INMAS to promote and develop farmers' organizations as stipulated above? It is obvious that it cannot be undertaken in a vacuum. The resources in these schemes as well as those coming from outside have to be allocated and absorbed into different programs required to achieve this objective.

Promotion and Development of Farmers' Organizations

Beginning with 1984 up to July 1989, as much as 5,334 Field Channel Groups, 396 D-Channels Organizations, and 34 Project Management Committees have been formed. The functioning and the effectiveness of these organizations have varied from scheme to scheme. Of the 396 D-Channel Organizations, so far only about 40 have been identified as capable of taking over the management of O&M of these schemes. In such a context the need is to consolidate and strengthen the existing ones and to form new organizations where there is none and where they exist only in name.

It is true that the type of stirring and the awakening effort required to help the farmers to get organized cannot be successfully undertaken by a hierarchically tightened bureaucracy. Nevertheless, it is the author's personal experience and convinced opinion that in a human exercise such as organizing of farmers, top-down efforts are very often required to initiate, induce, and even sustain bottom-up capacities. The promotion of participatory modes of management among farmers and officers requires a strategy that transcends the two extreme approaches of top-down and bottom-up. It has to be an admixture of both these approaches, the two extremes moving towards each other and meeting at a certain equilibrium of the scale and sharing the responsibilities mutually in a framework of assisted self-reliance. In this process the resources that should come from outside are the services such as advice, extension, training, health, and education and inputs such as seeds, fertilizer, chemicals, and other material assistance. These external resources should not attempt to produce direct results but should encourage and strengthen local capacities to initiate, manage, modify, and sustain activities that produce benefits for which the farmers would feel they are responsible. It must also be remembered that this sort of assistance should be a continuing process.

Mobilizing and utilizing local resources and talents involve multiple means. The IMD/INMAS in this regard would not constitute or adopt a fixed design but rather analyze a few components to be combined in appropriate sequences and amounts. The mechanisms of existing powerstructures of these schemes as well as the service organizations would be utilized or incorporated into the new organizations.

The IMD/INMAS has identified three types of 'implementors' to undertake the above task.

* First, there would be the Institutional Organizers (IO), the Institutional Development Officers (IDO) and the Farmer Trainers who would be directly dealing with the farmers as catalysts or change agents. The program of recruitment and training of IOs and IDOs and Farmer Trainees would be strengthened. The first two batches of these categories have already been recruited and are being trained.

* Second, it is proposed to enlist the effective cooperation and participation of all the governmental officials working in these schemes at the moment. However, reorientation of their attitudes and approaches would be required for them to deliver assistance in ways and on terms that are 'positive-sum' which neither substitute for nor discourage peoples' contributions. If the assistance is formulated according to agreements reached with the farmers' organizations, these external resources can 'PRIME THE PUMP'' to sustain and even encourage the flows of local inputs.
* Third, the Irrigation Management Division hopes to use 'para-professionals' to bring the different services closer to the people. Invitees or selectees from the local farmers' organizations would be trained in technical subjects and skills which they can put to use for the benefits of friends and neighbors. This has become even more important with the new structural changes in the extension services of certain departments such as Agriculture and Agrarian Services and the need to do away with a number of turn-out attendants presently employed by the Irrigation Department.
* All these three categories of 'catalysis' would be required to adopt a learning-process approach in order to restructure or reorganize periodically the organizations, plans, and programs in the light of the experiences gained in action. Experience in the Irrigation Systems Management Project (ISMP) in Polonnaruwa has already demonstrated the value of such an approach.

State Organizations for Coordination/Facilitation

Presently, the more important of the line departments and agencies that are concerned with the major irrigation schemes, are the Irrigation Department the Land Commissioner's Department, the Department of Agriculture, the Agricultural Development Authority, the Paddy Marketing Board, the Agricultural Insurance Board, the People's Bank, the Bank of Ceylon and the Irrigation Management Division. Throughout the history of these schemes it is noted that the government has been attempting to get its departments and agencies to adopt a coordinated approach towards implementation of its program in these schemes.

The government has not been able to achieve anything much of this coordination. With the establishment of the Project Management System under the Irrigation Management Division, arrangements such as a degree of administrative control to the Project Manager over line-department staff, reallocation of duties, making it compulsory for line-department staff to attend project committee meetings etc., were made to remedy the situation. These were very good intentions indeed, but unfortunately they have not worked out all that good. The situation has become so unsatisfactory that these line-department and agency officers have to be paid an extra allowance to attend the meetings of the Project Committee. Even so, some of the officers do not attend them regularly. The attempt to achieve coordination and formulation and implementation of a mutually agreed program has so far not been successful.

The administrative arrangements made to ease the Project Managers' responsibility do not seem to have been institutionalized as expected. This is due to the absence of a program approach and the insistence on the existing mechanism of working through Departments and the connected inherent weaknesses in the administrative system itself. The inability to change the procedure of

preparing the District Annual Agricultural Programme to suit the new 'project management system' adversely affected the working of the schemes as 'projects.'

Observed in an overall perspective, 'excessive departmentalism, tendency to refer matters up the ladder and 'an admixture of reluctant consent' and 'an apathetic resignation' seem to be prevailing over the entire management situation of these projects. These attitudes have often led to considerable informal resistance beneath agreement on the surface. This has become vividly visible in regard to the attempt to hand over D-channel operation and maintenance to the farmers' organizations.

The above is a generalization of the situation with regard to the 'Project Management System' taken as a whole program. Nonetheless, there are very many instances where it has gone a long way past this stage and achieved some very valuable experiences. This is particularly so in regard to all the Irrigation Systems Management Project in Polonnaruwa and a few projects in Anuradhapura which received the patronage and support of the district authorities. This leads us to the area of authority which is required to operate the linkages between the farmers' organizations and the state officers.

Linkages Between Farmers' Organizations and State Agencies

Theoretically, the organizational arrangements discussed in the two previous sections may seem to be more than adequate to implement any development program in the rural sector of the country. But experience has shown that these organizations do not function or are unable to function in the required effective and regular manner. This may be due to various reasons very often beyond the control of these individual organizations. But the more unsatisfactory feature in the working of these organizations is their inability to develop a mechanism of effective linkages both horizontally and vertically. The proper implementation of the new policies of participatory management is directly dependent on this vital requirement of an effective linkage between these two types of organizations individually and collectively. The first and foremost requirement for such a strong linkage is the need for these individual organizations to be strengthened and restructured to improve their skills and capabilities so that they become strong enough to enter into a useful dialogue with each partner in the participatory process.

The linkages of coordination between the farmers and the officers appear to have worked effectively where a little bit of authority has been wielded. In this regard, it is proposed to look at only the positive aspects of such linkages as providing guidelines for future improvements. One of the formal institutional arrangements of linkages between the farmers and the state is the cultivation meeting held seasonally with the Government Agent of the district or the Additional Government Agent presiding personally. All district heads of the relevant departments and agencies are expected to attend these meetings and after a friendly deliberation between the technical departments and the farmers a cultivation calendar is decided upon with mutual agreement. The adherence of this agreement with the implementation of the cultivation calendar gains statutory authority or legal sanction from the Irrigation Ordinance and the regulations framed thereunder. In the Irrigation Systems Management Project of Polonnaruwa and the few projects in Anuradhapura where these meetings were held systematically a tremendous improve-

ment in the adherence to the cultivation calendar and an exemplary attempt of economic use of water and a change from long-term varieties of seed to short-term varieties, and also the readiness to grow less-water consuming crops particularly during yala were clearly visible. The farmers and the state officers were able to reach agreement with regard to many controversial areas. The effort of the cultivation meeting was made easier and simpler by an informal 'pre-kanna meeting' held by the project management committee which meets to work out a tentative cultivation calendar to be ratified by the cultivation meeting. The reversal of this is the possibility for outsiders or vested interests who are allergic to farmers' organizations to make use of the cultivation meeting to change the decisions in their favor. Instances of this nature were reported from districts such as Hambantota.

In order to avoid such confusion and disruptions it is proposed to make certain recommendations as amendments to the existing law on cultivation meetings. In addition to recognizing the farmers' organizations instead of the cultivation committees the Irrigation Ordinance would provide provisions to legalize the pre-kanna meetings as well as the Project Management Committees as a consultative mechanism for the Government Agent to ratify the cultivation calendar instead of holding a separate cultivation meeting. Part II of the Irrigation Ordinance has the District Agricultural Committees and Advisory Committees in respect of major irrigation schemes. While allowing the District Agricultural Committee to continue it is recommended that the Project Management Committee which decides on the cultivation calendar should be presided over by the Government Agent. The tentative cultivation calendar submitted by the pre-kanna meeting committee to the Project Management Committee and ratified by a meeting of the committee presided over by the Government Agent becomes legally binding and implementable. There would be no need for a separate cultivation meeting. Under a four-tiered structure of farmers' organizations the subproject committee/area council too can be legally recognized as a coordinating mechanism in addition to the above.

At the district level the INMAS Programme is directed, guided, and monitored by the subcommittee of the District Agricultural Committee. Due to many reasons these committees have not been meeting regularly as required except in the case of Polonnaruwa and Anuradhapura as mentioned earlier. The Irrigation Management Division would make every endeavor to persuade the authorities concerned to have regular meetings of these committees and insure a proper monitoring of the Irrigation Management Division Programs. It is also proposed that in view of the decision to hand over the distributary systems to farmers for operation and maintenance, the project management committee be incorporated into the subcommittee of the District Agricultural Committee legally, as it could serve as the Advisory Committee already existing under the Irrigation Ordinance. In order to strengthen the hand of the farmers' organizations representatives of the D-channel groups or one or two farmer representatives of the project management committee have been nominated to the District Agricultural Committee in Polonnaruwa and Ampara districts. This proposal has been submitted to Government Agents of Anuradhapura and Kurunegala. The Irrigation Management Division intends to follow up on this to see whether this arrangement could be legally provided for or be effected by an administration order.

All these and many other aspects that need to be incorporated into legislation are now being considered by a Committee appointed to recommend amendments to the Irrigation Ordinance and the Agrarian Services Act as stipulated in the new policy No. v listed under 'The New Policies and Their Operational Implications.'

Among the informal linkages of coordination and monitoring of the INMAS Programme are the Central Coordinating Committee of the Ministry and the two Steering Committees under the two Special Projects, the Major Irrigation Rehabilitation Project and the Irrigation Systems Management Project (MIRP and ISMP). The implementation of the new policies would be recognized by all these committees as an integral component of their terms of reference. In addition, a separate Steering Committee under the chairmanship of the Secretary to the State Minister for Irrigation has already been set up to guide, direct, and monitor the implementation of the handing over of distributary systems to farmers and other connected aspects. This committee would be meeting once a month. The institutional arrangements under the two special projects (Major Irrigation Rehabilitation Project and Irrigation Systems Management Project) would be utilized to intensify the participatory management processes in the projects coming under their purview. Already, a Review and Monitoring Committee has been set up under the Irrigation Systems Management Project at Polonnaruwa to review this program monthly. A similar committee would be set-up in Anuradhapura for the review of MIRP Projects. When and where possible, the resources available under these two projects would be extended to the other projects under INMAS as well. As would be seen later the two special projects would be organizationally incorporated into the Irrigation Management Division structure (section on restructuring of the Irrigation Management Division).

Production, Planning and Implementation

Presently, the Annual District Agricultural Programme is prepared in terms of the Assistant Government Agent (AGA) Divisions and not in terms of these schemes. Almost everyone of these schemes falls into more than one AGA Division and sometimes into separate districts as well. The officers responsible for collection of data for the program, do so in terms of these divisions and therefore do not identify these schemes as separate production entities but only as small areas in the AGA Divisions. With the establishment of the Special Projects under the Irrigation Management Division these schemes should have been very conveniently taken as separate components of the Annual Agricultural Program by a simple decision of the District Agricultural Committee (DAC). In the absence of such institutionalization, the project manager's program for the project does not matter or mean anything to the other line departments and agency officers. Their concern is only with the statistics of the Annual District Agricultural Program which does not matter or mean much to the Project Manager. There is no encouragement or inducement under this setup for the two parties to come together in terms of a common program.

Another striking feature in the existing arrangement is the fact that the production inputs and services which obviously constitute an interdependent package have been parcelled out into compartments and made the responsibility of the different government departments and agencies. Any successful attempt at coordination or facilitation which sought to provide effective assistance for the program had to insure that the compartmentalization did not affect the smooth delivery of this interdependent package. In most projects, certain achievements have taken place due to the sole effort of the project managers who have even used Institutional Organizers to transport and distribute unmilled rice seed etc.

The IMD/INMAS proposes to change this system of production planning into a strategy of assisted self-reliance. Under this strategy of assisted self-reliance the farmers would be mobilized into a mutually agreed production program that would help improve their income levels. Such a program would afford opportunities to realize the advantages of economics of scale, specialization, crop-diversification, crop-rotation and even off-farm economic activities. It would also insure the timely supply of appropriate inputs including irrigation water as well as marketing services. The preparation and the implementation of a common production program have to be undertaken as a joint effort by farmers' organizations and state officials.

The basic unit of production planning would be the field-channel group. The 15 - 20 farmers in the group would discuss among themselves and prepare a production program for the extent under the field channel. These field- channel plans would be submitted to the D-channel farmers' organization through the field-channel representatives and a total program for the entire D-channel area would be prepared. This total program would be submitted to the Project Management Committee which will scrutinize it in terms of the overall perspective of availability of water and other resources and approve with amendments, modifications, or additions and would be submitted to the DAC/subcommittee. Once the DAC/subcommittee ratifies the program it becomes binding on all parties concerned and becomes the mutually agreed common program for the project. It has already been proposed that legal sanction for such a program should be provided by making the necessary amendments to the Irrigation Ordinance for the Project Management Committee to sit as the Advisory Committee advising the Government Agent on all matters connected with irrigation and cultivation.

Training and Awareness Programs

Implementation of such programs as those discussed above have very often been failures due to many reasons. It is very easy to construct an irrigation channel or to provide a better variety of seed materials, but it is nearly impossible to change the attitudes and behavior of human beings. The achievement of mutual agreement which is essential for coordination at all levels implies a drastic change in the attitudes and behavior of both parties to the situation. The attitudes and behavior of human beings cannot be managed in the same manner as materials and machines. If material or a machine is wasted it costs only money to replace it. On the other hand, if a man's confidence is eroded it becomes nearly impossible to create a new confidence in him. Human beings are generally not so flexible as material factors. Action has therefore been taken to design and conduct a comprehensive training and awareness program for farmers and officers at all levels to induce the kind of attitudinal and behavioral change required.

The 'Catalyst' programs of these schemes would be reoriented to make farmers conscious that they represent a considerable amount of social forces and that these forces must be primarily focused on collective goals. Field-channel groups would be the units of action and the respective farmers' organizations the instruments of action. Outside assistance will come from the line department and agency officers who will be required to act as facilitators and helpers and no more the 'know-all' getting the 'ignorant, illiterate, lazy, and crafty' farmers to do a job of work. At the same time farmers would be made to realize that officials are neither their masters nor their

servants but copartners in the new management. Both officials and farmers therefore would have to be trained and prepared to assume their respective roles effectively.

Effective operationalization of the 'new policies' presupposes that the officials must possess both sound 'technical competence' and 'human relations' skills which will enable them to enter into a fruitful dialogue with the farmers and to resolve their problems with them. The officials must be trained to develop a creative frame of mind which integrates a sense of observation, critical analysis, and a sound knowledge of their own values and culture with a completely realistic approach in their day-to-day work. The officials will be trained to work in groups with a 'team spirit' and to speak an idiom easily understood by the farmers in their own terms. It is in such a harmonious context that a system of participatory management proposed for these schemes will operate effectively as a jointeffort by the farmers and the government.

Four workshops are being conducted for the purpose of assessing training needs on the following aspects.

i. Training as a Function of Management;
ii. Results-Centered Management;
iii. D-Channel Area Development;
iv. Distributary Channel Management.

During the preliminary round of the four workshops mentioned above, a few senior officers of the Irrigation Management Division Head Office, all Project Managers and Institutional Development Officers, some Institutional Organizers and Farmer Representatives of the D-channel organizations would be trained as multipliers who will undertake the training of farmers and other officers in the D-channel areas in terms of an ongoing training program. They will be required to validate the Training Manuals prepared during the preliminary workshops and test the training programs in terms of action plans by each person trained.

Despite this type of comprehensive and practical training the officers at the implementation level may not be able to approach their tasks effectively if they do not enjoy the encouragement, inspiration, guidance, and direction of the senior supervising officers. It is therefore extremely important that all senior officers of the relevant implementing agencies should demonstrate dedication, loyalty, and commitment to the new policies. The Training Program includes two or three seminars to remind senior officers of this vital requirement.

OPERATION AND MAINTENANCE PROFILE

The life span of Irrigation Projects considered as economic enterprises is calculated only in terms of economic considerations which are intimately connected to a relative depreciation of investment made for the project. But the irrigation schemes in Sri Lanka are both social and political systems and the social and political bearings of these schemes extend far beyond what the economic considerations can project. In that regard the life span of the irrigation schemes has to

be linked to ways and means of tendering them to exact a sustainable productivity; hence the need for O&M. The prevention and the arresting of decay and deterioration certainly result in better yields than many doses of investments on ad hoc reconstruction, structural improvements, and cyclical rehabilitation.

Operation means the allocation and delivery of water supplies including the management of storage facilities and handling of drainage runoff required to satisfy crop water requirements. Maintenance means the up-keeping of the physical system in conformity with the design capacity including the removal of silt and vegetation etc., to contain and arrest its decay and deterioration.

The fundamental requirement for the successful operation of an irrigation scheme is proper maintenance. This, not only means better irrigation facilities to farmers but will also extend the useful life of the system and in the long-run yield benefits through a properly planned production program. Properly organized maintenance activities will reduce the cost of maintenance in a scheme than an ad hoc maintenance program. Even the most sophisticated system with the best irrigation facilities will deteriorate rapidly if not maintained properly or if maintenance is neglected. Preventive maintenance is the key for continuous long life of an irrigation system. Such a program of maintenance should satisfy three important requirements.

i. Finances and Resources;
ii. Mechanism for Planning, Programing and Monitoring;
iii. Organization.

These three components are interdependent. In the past, a lack of a reliable supply of adequate funds contributed in a large measure to dislocate procedures adopted in implementing systematic O&M programs which the Irrigation Department had painstakingly developed and institutionalized over a long period. Inadequacy of funds also led to a lack of planning, monitoring, and evaluation of the O&M program. Lack of farmer participation in the O&M program resulted in heavy cost to the state and dissatisfaction of and agitation by farmers. The new policies require the taking over of the distributary system by farmers which cannot obviously be accomplished by administrative fiat or by enforcement of any legal authority. It should be complemented by and backstopped with measures which will emphasize the development of capacity and capability of farmers' groups and organizations to shoulder such responsibility. Please see "Institutional Development" and "Promotion and Development of Farmers' Organization" above.

Finances and Resources

Under the strategy of modernization of the irrigation sector a large volume of resources are now directed for investment in the major irrigation schemes under different programs of reconstruction, rehabilitation, essential structural improvements, and operation and maintenance. The programs channeled through the IMD/INMAS are as follows:

i. Rehabilitation and Improvement to Capital Assets for Operation and Maintenance (Approximately Rs 65 M)

ii. Construction of and Improvements to Gravity Irrigation Works (approximately Rs 15)
iii. Major Irrigation Rehabilitation Works (Rs 162 M)
iv. Irrigation Systems Management Project (Rs 75 M)
v. Small Items of Works on Request by Farmers - (O&M Fees).

In addition to the above it is known that certain other resources too are directed to these schemes through sources such as the Integrated Rural Development Projects, the Decentralized Budget etc.

Planning, Programing, and Monitoring

These investments taken together would mean a substantial amount of resources. If these resources are utilized in a rationally planned manner in terms of specific programs approved in consultation with farmers' organizations it is felt that most of the structural and other problems connected with operation and maintenance of these schemes can be taken care of. There has to be a system of proper planning, programing, and monitoring to achieve higher results from these investments.

Theoretically, the different construction programs under the above allocations should be prepared on the basis of a priority list submitted by the farmers' organizations and thereafter, scrutinized and investigated by the Irrigation Department and other executing agencies and finally discussed and approved by the Project Management Committee. But, there is a vast difference between this theory per se and its actual implementation in the field. Experience has shown that state officials with no commitment to the respective program objectives can directly or indirectly hamper implementation of the respective programs towards attaining the desired results. In any event a halfway situation without clear direction for field-level operation can bring more harm than good in terms of policy goals. New institutional and organizational arrangements have to be designed to remedy this situation.

In the past, there was an institutional arrangement under the District Agricultural Committee System to approve all irrigation construction programs by the District Agricultural Committee. It would be useful to revive this procedure through amendments to the Irrigation Ordinance enabling the Project Management Committee to sit as the Advisory Committee and approve the different construction programs. Once the programs are approved by the Advisory Committee, copies of the programs should be made available to the farmers'organizations and the Project Managers of the Irrigation Management Division.

The progress on all these programs should be discussed at the monthly Project Management Committee Meetings with the farmers' organizations. The execution of the programs should commence from the first quarter of the relevant financial year. The duties, responsibilities, and obligations of the two partners in all these programs should be clearly defined and agreements signed where necessary. There should be a regular sharing of information with regard to the allocation and disbursement of all resources. The allocation of resources in terms of separate rehabilitation, repair or maintenance items should be clearly understood by both partners. There should be a healthy dialogue and a continuous evaluation to dispel all doubts, suspicion and apprehensions that are bound to arise in an attempt of sharing resources, power and responsibility.

More than everything such an evaluation should insure that there is no duplication or overlapping between the different programs.

In regard to the execution of works under these programs, attempts should be made as far as possible to involve the farmers especially on the works in the distributary systems. If farmers' organizations are prepared and are capable of handling such works even on the main system, they should be provided with all facilities and advice to undertake such work. As an incentive to farmers' organizations and to encourage them for regular participation, it has been already decided to hand over small-scale constructions in these schemes to the farmers' organizations. For this purpose, the farmers' organizations are required to be registered with the Irrigation Department on the recommendation of the Project Manager. The value of each contract work was originally limited to Rs 5,000 and later increased to Rs 25,000. A special request has been made to the Treasury in this regard in respect of the work in implementation areas under the Irrigation Systems Management Project to increase the limit to Rs 250,000. It is also suggested that the farmers' organizations be registered as labor societies under the Co-operative Ordinance to enable each of them to undertake work up to Rs 750,000.

Such an institutional arrangement would have the following advantages.

i. Construction, Operation and Maintenance Programs are made the collective effort of all participants concerned;
ii. The need for accurate planning, programing and monitoring is recognized and accountability clearly identified;
iii. Farmers would be made to feel that they are in partnership with government officials who are directly dealing with the management of these schemes;
iv. Opportunities are afforded through the farmers' organizations to contribute voluntary labor and enhance the total value of the work undertaken;
v. Farmers are able to get back the fees contributed by them in the form of labor wages;
vi. Regular involvement and participation by farmers would promote a feeling of ownership of these schemes among farmers;
vii. Reduction or sharing of costs of management of the schemes by the government and the farmers.

Organization

The government decided to collect an operation and maintenance fee in lieu of the service provided by it to the farmers by way of irrigation facilities. Although the collection was fairly satisfactory during the first year (1985), it fell to very low levels during the following years and came to more or less a standstill by 1988. When the fee was proposed in 1984, there were a number of conditions attached to it that the government has failed to adhere to. One of the conditions was that operation & maintenance fees collected in any one scheme will stay in that scheme and be used there so that the farmers would know their money will not be taken away and used elsewhere or sent to the government coffers. Another condition was that the farmers would be given an opportunity to determine the priorities for operation and maintenance so that they

would feel that the money is being used for essential things. The third condition was that the operation and maintenance programs would be approved by the farmers so that the money is not wasted on questionable contracts. The fourth condition was that the farmers' organizations were also to be given the responsibility of collecting the operation and maintenance fee and obtain a commission for doing so.

From the very beginning the Treasury maintained that any financial contributions from the farmers in irrigation schemes should be credited to the government revenue. Even up to now the Treasury has not revised its policy and recognized the need to have a separate fund for each scheme, by which the farmers would be persuaded to take a more active interest in the decision making and implementation process involved in operation and maintenance programs. Even with regard to the other conditions, the government has been very slow or reluctant to put them in to place. The consultation with farmers in the preparation and approval of operation and maintenance programs is there only in name in most schemes. The farmers' organizations have still not been given legal recognition to entrust them with the collection of O&M fees.

Despite the above difficulties, certain important achievements have been made in regard to O&M collections and disbursements. The money collected from the farmers is being credited to an Advance Account operated in the Central Bank and allocations are being channeled back to the schemes through the Irrigation Management Division for items approved by the Project Management Committee on request by farmers' organizations. Under this arrangement out of the total sum of Rs 36.9 million collected up to end of 1989, approximately Rs 23.3 million has been spent on small items of maintenance in the respective schemes. It has also been insured that the principle of utilizing the money in terms of individual schemes without transferring the money collected from one scheme to another is adhered to.

Experience in this program has shown that farmers' organizations are capable of handling operation and maintenance programs if they get advisory support and cooperation from government officials. Several farmers' organizations have also indicated that they would be able to collect the O&M fee in a more effective manner if they are given the responsibility for collection and disbursement. With the new policy decision to hand over the distributary systems for O&M by the farmers' organizations there is a possibility of entrusting this to the farmers' organizations. The decision whether to collect some contributions from farmers towards meeting the cost of O&M, the amount to be collected and how it should be collected, either in cash, kind or by contributory labor and how the funds should be disbursed should be left to farmers' organizations. the necessary legal provisions will be incorporated in the Irrigation Ordinance to give effect to such an arrangement. The various mechanisms of checks and balances in the operation of such a scheme have to be worked out in terms of responsibility and obligations spread over the entire organizational system of management from the field-channel groups upwards to the Project Management Committees and Advisory Committees and the District Agricultural Committees. The committee on amendments to the Agrarian Services Act and the Irrigation Ordinance would be considering all these aspects.

The details of the O&M activities to be handed over to the farmers' organizations have been prepared in consultation with the Irrigation Department. The costs on O&M could be reduced by entrusting the farmers' organizations in the water distribution and also involve them in maintenance activities whereby they will contribute their labor and their resources rather than just paying O&M charges to a central authority. According to a calculation done by the Irrigation

Management Division, it has been revealed that approximately Rs 385 per acre would be the cost of operation and maintenance. After handing over the distributary system to the farmers' organizations, it is roughly estimated that about 30 percent of the cost could be saved by this arrangement (Annexure 1).

A committee to monitor the program of handing over the distributary systems has been setup with the Secretary to the State Minister for Irrigation as Chairman. This committee would be responsible for the preparation and implementation of all programs and certain guidelines have already been laid down. The procedure for handing over is given in Annexure II. Handing over is essentially a matter between the Irrigation Department and the farmers' organizations. However, the handing over can be done only after fulfilling three essential preconditions.

i. The field-channel groups and D-channel organizations should be stable and reasonably efficient;
ii. The farmers' organizations should have full confidence in the officers of the Irrigation Department;
iii. The field- and D-channels should be at least up to a standard which enables water to be regulated and sent down all the canals.

Improvements and rehabilitation necessary could be subsequently continued by the Irrigation Department after handing over to farmers' organizations. A phased program of handing over is being prepared including a tentative time frame. Simple O&M manuals for field- and D-channels would be prepared and handed over to the farmers' organizations for guidance. Specifications of O&M to be met by farmers and farmers' organizations are given in Annexure III. Annexure IV explains how the existing O&M personnel should be realigned and how resources should be allocated and shared with the farmers' organizations. Even after handing over, the Irrigation Department would continue to hold overall responsibility for water management within the entire system. This is because the operation of the main canal is linked to and depends entirely upon the efficiency of the day-to-day operation in the field- and D-channels. The Irrigation network will therefore be jointly managed by the Irrigation Department and the farmers' organizations with mutual sharing of responsibilities.

RESTRUCTURING OF THE IRRIGATION MANAGEMENT DIVISION

Operationalization of the new policies would require restructuring of the IMD/INMAS organization to allow the necessary emphasis and concentration of effort towards organizing of farmer, production programs, planning monitoring and evaluation, training and, very importantly, operation and maintenance programs. It has very often been argued that there is no need for a separate 'Division' to attend to the implementation of these policies and that this could be done by the 'Irrigation Department' by attaching the present Irrigation Management Division to the Irrigation Department. Under such an arrangement the management aspects are like to be lost

sight of and relegated to the background. The construction aspects on modernization, rehabilitation, essential structural improvements etc. would definitely undermine the management aspects. Moreover, it would be difficult or almost impossible to maintain the multidisciplinary character of the present IMD-INMAS Programs, when they become assimilated into the Irrigation Department as a departmental program.

It has to be appreciated that the IMD/INMAS programs have been surviving up to now, despite various difficulties and obstacles, because of their 'multidisciplinary character' and the 'program approach' adopted in the preparation and implementation. Although theoretically the Project Manager belongs to the Irrigation Management Division he is not considered as an officer of a particular Department but only as a representative of the Ministry of Lands, Irrigation and Mahaweli Development. If the IMD/INMAS attempted to implement these programs through a departmental approach many more difficulties and disruptions would have been encountered.

It is therefore recommended that the IMD/INMAS should continue under the umbrella of the Ministry. It may be useful to consider the incorporation of all other aspects of management of Major Irrigation Agricultural Schemes such as tenurial and settlement aspects under the umbrella of INMAS. However, allowing such an arrangement to be considered as a long-term strategy the following structural changes are proposed for the IMD/INMAS for the purpose of facilitating the speedy and smooth implementation of the 'new policies.'

In terms of the new policies the mission of the Irrigation Management Division is considered as the promotion and development of a system of integrated/participatory/self-management of major irrigation agricultural settlements through the organizing of farmers based on a mutually agreed production program which would insure the proper coordination and facilitation of the supply of appropriate inputs and services to these schemes. In terms of this mission, it is apparent that the promotion and development of farmers' organizations should be the main emphasis of the Irrigation Management Division in order to achieve the mission successfully. The system of farmers' organizations so developed should ultimately be able to take over the O&M of these schemes and manage them on their own. With this end in view, the Irrigation Management Division will change its structure from time to time to facilitate the effective implementation of the required processes and interventions until the farmers' organizations develop skills and capabilities to manage these schemes on their own. At the beginning of these processes and interventions, since water is recognized as a critical input the provision of irrigation facilities is identified as the entry-point of these processes and interventions. Therefore, the following aspects of the Irrigation Management Division assignment are identified as areas needing greater emphasis and concentration of effort.

i. Maintain a multidisciplinary approach in all its programs;
ii. Strengthen and monitor the existing farmers' organizations and promote the development of new ones;
iii. Constant and regular monitoring and evaluation system;
iv. Incorporate the two special projects in the Irrigation Management Division organization;
v. Streamline and institutionalize Training and Awareness Program;
vi. Strengthen the capacity of Irrigation Management Division in Administration and Establishment matters;
vii. Proper and regular communication between the Irrigation Management Division head office and the field;
viii. More effective supervision by provincial and district authorities .

In order to equip the Irrigation Management Division with a multidisciplinary character, three posts of Additional Director were approved under INMAS in 1984. Under them, three divisions to deal with Institutional Development and Training; Coordination of O&M, and Production Planning & Implementation will be set up by reorganizing the present structure and functions of the Irrigation Management Division.

In the implementation of the new policies the field organization of the Irrigation Management Division has to be strengthened by way of support staff to the Project Managers and a more intensive and regular supervision and monitoring of the Irrigation Management Division Programs by the Provincial/District authorities. The Project Manager's office will be provided extra staff and facilities as needed.

In regard to regular and intensive supervision and monitoring in the districts,it has been agreed that Government Agents should be made Additional Directors of the Irrigation Management Division. In considering this alternative, in the light of the recent changes in the provincial/ district administration with the establishment of provincial councils, certain structural adjustments have to be made.

The focal point of administration of the Provincial Council would move down from the Kachcheri to the divisional level and of Divisional Secretaries of the Provincial Councils. Divisional Secretaries are expected to coordinate and facilitate the preparation and the implementation of all development programs in their divisions. From the point of view of the Irrigation Management Division, it is felt that this arrangement should be made use of in the case of not only the provincial projects but also in regard to the interprovincial projects. The Project Managers of the Irrigation Management Division as well as Irrigation Engineers in charge of the respective projects should necessarily be attached to the Divisional Secretaries of the Provincial Council as members of the Divisional Secretaries' Coordination Committee. It is therefore apparent that the coordinating, administrative and financial functions which were once handled at the Kachcheri by the Government Agents should pass on to the Divisional Secretary of the Provincial Council. Certain discussions have already been held with the Provincial Minister of Agriculture, his Secretary and the Chief Secretary of the North-Western Provincial Council in this regard. The indications are that such an arrangement would be the most practical solution.

The above proposals for restructuring of the Irrigation Management Division are being studied by the Ministry of Lands, Irrigation and Mahaweli Development and would be implemented as soon as a final decision is made on them.

Annexure I

Past O&M Costs and Estimated Reductions after Handing Over D-Channel to Farmers' Organizations.

	(1) 1982 cost	(2) %	(3) 1988 cost	(4) %	(5) Operation	(6) %	(7) Maintenance	(8) %	(9) Cost after handing over D-channels to Farmers Operation	(10) %	(11) Maintenance	(12) %	(13) Total Cost	(14) %	(15) %	(16) %
Maintenance labor	92.54	46.27	185.11	48.08	51.86	49.24	133.25	47.65	23.53	30.56	80.00	41.45	103.53	38.34	26.89	55.93
Supervision	5.04	2.52	11.45	2.97	3.47	3.29	7.98	2.85	3.47	4.51	3.96	2.05	7.43	2.75	1.93	64.89
Drivers and operators	5.55	2.78	8.23	2.14	2.54	2.41	5.69	2.03	2.54	3.30	2.80	1.45	5.34	1.98	1.39	64.88
Traveling and combined allowance	2.68	1.34	3.63	0.94	1.60	1.52	2.03	0.73	1.60	2.08	1.67	0.87	3.27	1.21	0.85	90.08
Fuel and repairs to vehicles	10.85	5.43	15.36	3.99	3.72	3.53	11.64	4.16	3.72	4.83	3.83	1.98	7.55	2.80	1.96	49.15
Purchase of materials and tools	32.98	16.49	37.07	9.63	3.70	3.51	33.37	11.93	3.70	4.81	32.00	16.58	35.70	13.22	9.27	96.30
Physical contingencies	7.48	3.74	24.15	6.27	5.94	5.74	20.21	7.23	5.94	7.72	5.24	1.68	7.18	2.66	1.86	29.73
Administration and overheads	18.50	9.25	40.00	10.39	13.50	12.82	26.50	9.48	13.50	17.53	26.50	13.73	40.00	14.81	10.39	100.00
Depreciation of vehicles and equipment	24.38	12.18	60.00	15.58	21.00	19.94	39.00	13.95	21.00	27.27	39.00	20.21	60.00	22.22	15.58	100.00
	200.00	100.00	385.00	100.00	105.33	100.00	279.67	100.00	77.00	100.00	193.00	100.00	270.00	100.00	70.13	70.13

Column 15 - Cost of each item after handing over expressed as a percentage of the total cost before handing over [(13)/(Total of (3)]. The total of this column indicates that after handing over only 70.13 percent has to be incurred by the government.

Column 16 - Percentage ratio of cost of each item before and after handing over [(13)/(3)]. This will give the percentage by which cost of each item is reduced due to the handing over.

Source: Irrigation Management Division.

Annexure II

Handing Over of Distributary and Field Channels for Operation and Maintenance to Farmers' Organizations - Procedure

i. A written request should be made to the Divisional Irrigation Engineer (IE), by the Project Committee through the Project Manager after a formal decision at a Project Committee meeting to hand over the O&M of the distributary channels. The request should cover an area which includes all the field channels under a distributary channel or a subdistributary channel in such a manner as to avoid the joint operation by both the departmental staff and the farmers' organizations on the turnouts in the same distributary channel.

ii. The Divisional IE, should forward the request to the Range Deputy Director (DD), with his recommendations about the request identifying the canals and the structures where the O&M is to be handed over. The recommendation should also indicate what should be done to the employees of the Irrigation Department after the handing over.

iii. The Range DD, will inform the Divisional IE, about his decision. The Range DD, should also keep the Director of Irrigation (DI) informed of all decisions to hand over the O&M of distributary channels and the action taken regarding the departmental employees.

iv. In making the recommendations by the IE, and in taking the decision by the Range DD, the capacity of the farmers' organization to operate and maintain the D - channels should be examined. Maintenance of D-channels should not be entrusted if the field channels which should be maintained by the farmers under the present procedure are not satisfactorily maintained by them.

v. The IE, should insure that gates and accessories in the structures are in working order in the areas where handing over is done. Any repairs required should be done before the handing over, meeting the expenses from the maintenance funds already available. However, in case where excessive repairs have to be done and where the cost cannot be accommodated within the available funds, additional requirements of funds should be sought from the Irrigation Management Division (IMD).

vi. An acknowledgement by the Project Committee witnessed by the Project Manager including the details of the channels thus taken over should be obtained by the IE, after the handing over of the operation and/or maintenance of the farmers' organizations. A copy should be forwarded to the Range DD, by the IE, keeping the Head Office also informed.

vii. The mode of payment to farmers' organizations for the operation of canals is being worked out jointly by the Department and the IMD. Further instruction will follow.

Source: The Director of Irrigation's Circular No.70-000404 of 23/05/1988.

Annexure III

Specification for Maintenance of Handed Over Irrigation Systems

The tasks identified under maintenance are: 1) Maintenance of Irrigation Canals (Both D-channels and field channels); Weeding & J/C, Desilting, EarthWork, and Minor repairs to structures, 2) Maintenance of Drainage Canals; and 3) Maintenance of Canal Roads and Tracks

Maintenance of Irrigation Canals

Weeding & J/C. Weeding and JC includes the extermination of weeds (weeds must not be cut but pulled out by the roots) and the cutting of grass in the reservations as well as in the canals; stumps remaining should be uprooted and all dead trees and branches burnt or disposed of otherwise. Salvinia, water hyacinth and similar plants should be removed from the water surface, dried, and burnt. The weeding and J/C operation should be done at least twice every season, once before water issues and once after two months of issue.

Desilting. Silt should be removed to the levels given by Irrigation Department. The removed silt should be deposited away from the canal so that it will not be brought back to the canal later by rain. Desilting should be done at least once before the commencement of a season.

Earthwork. Earthwork includes anthill removal, filling of scours, repairs to bunds, slopes, and top. Before any filling is done, all vegetation should be removed by uprooting. All loose earth should be removed and where appropriate scarifying or benching should be done and the prepared surface should be adequately moistened. Filling should be done using a selected material with an optimum amount of water and compacted properly. All such new fillings should be dressed with turfing.

Maintenance and minor repairs to structures. Any fallen pitching should be replaced. Scours near masonry structures should be patched up promptly and turfed, and leaks should be mended with earth, puddle clay, turf etc. Weeds in joints and cracks and other obstructions should be

pulled out immediately. Plants should be properly fitted and tarred. All steel parts contact-surfaces should be painted with anticorrosive paint and contact-surfaces of moving parts should be greased.

Maintenance to Drainage Canals

All construction in drainage canals should be promptly removed and they should be kept in good condition for proper functioning.

Maintenance of Canal Roads and Tracks

Every canal should have at least a road for O&M. Slight camber should be provided in each case so that rain water is able to run off rapidly. Lumps must be cut off and hollows filled up. Only gravel (not earth) should be used in surface-dressing the roads. Proper side drains should be provided where necessary.

SPECIFICATION FOR OPERATION OF HANDED OVER IRRIGATION SYSTEM

The following tasks are identified under operation
Equitable distribution within the system
Distribution according to a delivery schedule
Safety of the system

Equitable Distribution within the System

This includes the operation and controlling of all gates and gate arrangements in the system handed over in such a manner as to provide equitable distribution of water to all farmers in the system.

Distribution according to a Delivery Schedule

This means that operation should be done according to a delivery schedule prepared by the Irrigation Department with the consensus of the farmers. This is to insure that operation within the handed over system is synchronized with the operation of the rest of the system.

Safety of the System

This includes careful operation of gates to insure their safety to project them from damage and theft.

Source - Irrigation Department.

Annexure IV

Handing Over of Distributary and Field Channels for Operation & Maintenance to Farmers' Organizations

Procedure for Realignment of Staff and Mode of Payment to Farmers' Organizations

Operation

Turnout Attendants who are presently attending to the operation of gates in the selected canals which are handed over should be withdrawn.

Turnout Attendants should be reassigned within the rest of the canals not exceeding the norm of one Turnout Attendant per 500 acres. If they are in excess, they should be employed elsewhere on maintenance work and if such work is also not available their service should be terminated. However, if they belong to the permanent cadre where there is no authority in terminating the services such cases should be referred to the Director of Irrigation to be transferred to places where there are shortages of such employees. All the Irrigation Engineers should therefore inform the Director of Irrigation about the shortages of Turnout Attendants within the schemes as well.

Farmers' organizations should be paid an amount calculated on the following basis for operating the canals that are handed over to them. The amount to be paid per annum:

$$= \frac{A \times P \times F \times 8}{500}$$

where A = Area in acres operated by the farmers' organization

P = Monthly wage of a Turnout Attendant computed on the basis of the daily casual wage and allowances for 30 days.

F = 0.5(Factor to take into account the departmental overheads for supervision in the canals handed over and for the operation of the rest of the system which in turn will also affect the operation of the canals that are handed over).

An area of 500 acres is assumed to be the Departmental norm for a Turnout Attendant.

This total annual amount is to be paid in two installments to the farmers' organization for regular payment by them to the farmers engaged by them on operation of the canals. As far as possible each payment should be made to the farmers' organization a week prior to the first date of water issue for the ensuing season as decided at the kanna meeting. If the canals handed over to the farmers' organization are not required to be operated during a season due to non-cultivation arising from lack of water for the season, *bethma* cultivation, canal rehabilitation or any other reason, the IE should inform the DD of the Range and Director. The Irrigation Management Division and the saving of the funds for that season can be used by the IE for his normal work.

Maintenance

No maintenance other than major repairs to structures should be done by the department in the canals that are handed over to the farmer's organization. All other maintenance work will be the responsibilities of the farmer's organization.

However, any earth filling requiring more than one cube of earth in 100 of distributary canal should be costed as a separate work item and cost should be charged to improvements to Water Management. Such work can be given on contract to the farmers' organization on measurement basis. If the farmers' organization does not undertake the work, it can be awarded under the normal contract procedures to any other contractor. This arrangement of separate costing should be limited to the first two years since such large-scale earthwork is likely to be higher priority within a scheme.

On satisfactory completion of maintenance work, the farmers' organization should be paid an amount calculated on the following basis for maintaining the distributary canals that are handed over. The first step in working out the allocation to the farmers' organization involves the proportioning (A_p) of funds for the maintenance of the D-channels and field channels as follows:

$$A_p = \frac{\text{Total maintenance allocation for all canals}}{(L_f + 1.5\,L_d + 2.5\,L_m)} \times (L_f + 1.5\,L_d)$$

where

L_f = total length of field channels maintained by the LD prior to handing over

L_d = total length of branch canals and D-channels maintained by the I.D. prior to handing over.

L_m = total length of main channels.

1.5 and 2.5 are the wastage adopted in the distribution of allocation for canal maintenance.

Then the amount to be paid annually to the farmers' organization can be calculated by the following expressions:

$$\text{Amount to be paid annually} = \frac{L_h \times A_p \times C,}{(L_h + L_t)}$$

where

L_h = length of D-channels and field channels (current maintained by the ID) handed over to the farmers' organization

L_t = total length of Branch canals, D-channels and field channels (maintained by I.D) in the system maintained by the Department after handing over.

C = 0.8 (A factor to account for the retention of departmental overheads for supervision.)

A_p = Fraction as defined above

This payment may be made in installments to the farmers' organization. Agreement should be reached between the department and the farmers' organization at the Project Committee at the beginning of the year as to the work to be done on maintenance during each season and the installment of payment that should be made after the satisfactory completion of the seasons.

General

At the beginning of the year, IE should inform the farmers' organization of the amounts available for payments to the farmers' organization for both O&M of the canals handed over to them, computed as explained above.

The farmers' organization should be given technical advice and assistance regarding both the O&M and their work should be closely supervised.

Participation of Technical Assistants and Works Supervisors in the subproject committees should continue, to insure a constant and healthy dialogue for cooperation, advice, and supervision. The observations by the department on maintenance work done by the farmers' organization should be brought to the notice of the farmers' organization while the work is in progress for any rectification required, thus avoiding the possibility of a disagreement at the time of payment after the work has been completed.

The payments for completing the agreed maintenance program of work by the farmers' organization should be made as lump sum payments on the satisfactory completion and after a joint inspection by the IE and the farmers' organization. The funds available on computation as above out of the inadequate maintenance allocation received by the Department are likely to be much smaller than the value of work actually performed by the farmers' organization working on virtually a voluntary basis. The payments made will therefore be only a service payment for the maintenance of the canal rather than an adequate payment for the work done.

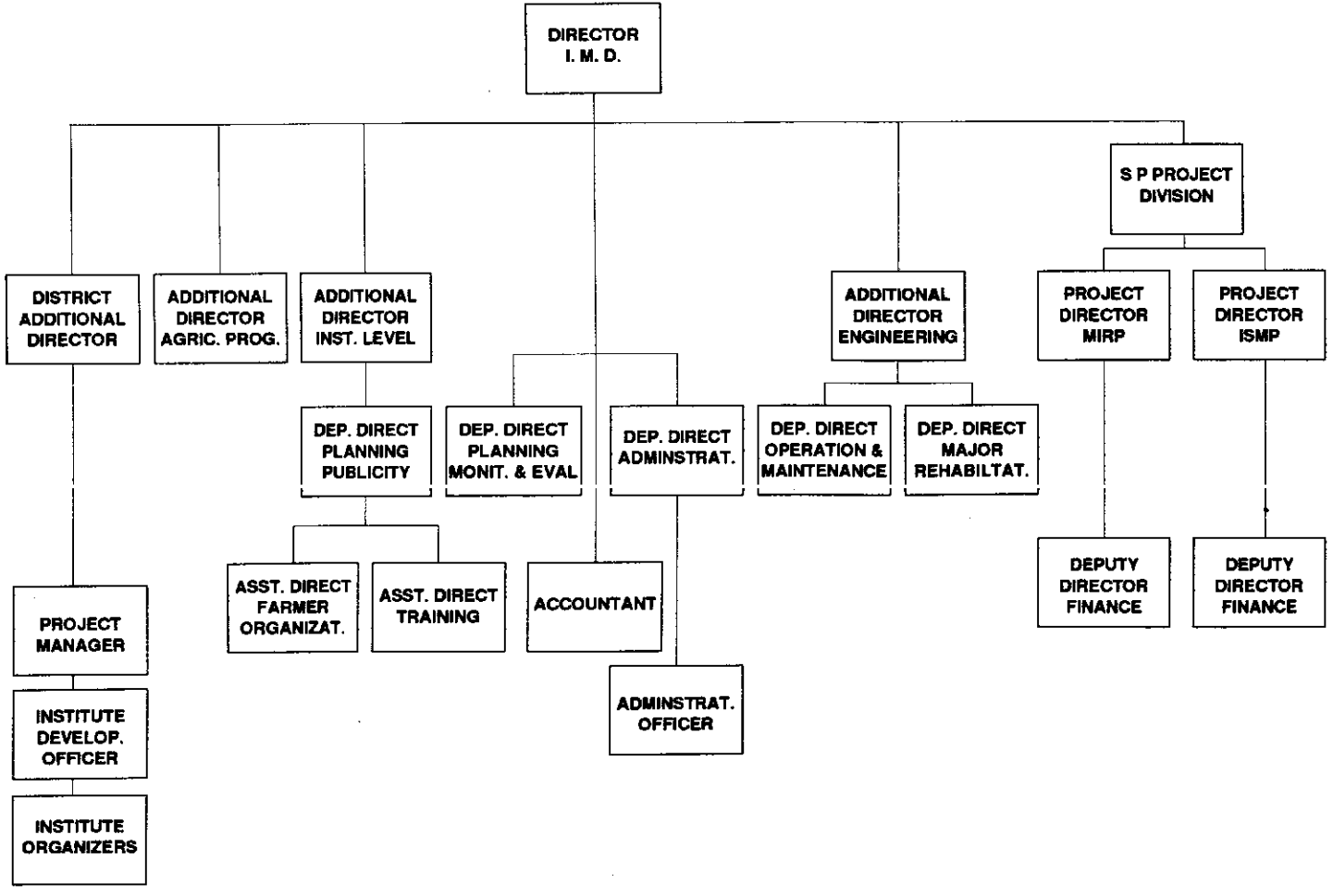
Any disputes regarding the work that cannot be settled at the field level should be resolved at the Irrigation Subcommittee of the District Agricultural Committee.

All payments should be made to the bank accounts of the farmers' organization. Normal financial regulations pertaining to payments should be followed in making the payments. In this regard the IE should enter into a service contract agreement with the farmers' organization signed on small-scale agreement forms for providing the above service on the guidelines stipulated in the I.D. Circulars No.26 and 33 of 1986.

Source: Director of Irrigation's Circular No.70-000404 of 13/01/1989.

Annexure V

Proposal Restructured IMD Organisation



Mahaweli's Implementation Strategy of the New Government Policy on Participatory and Joint Management of Irrigation Systems

Jayantha Jayewardene[18]

INTRODUCTION

By a cabinet Memorandum dated 1st December 1988, submitted jointly by the Minister of Agricultural Development and Research and the Minister of Lands, Land Development and Mahaweli Development, the new policy of the government on participatory and joint management of irrigation schemes was spelt out. Copies of this Cabinet Memorandum and the Proposal for Participatory Management in Irrigation Schemes are in Annexures I and II.

A study, and later a workshop on the possibilities of obtaining the participation of farmer groups in the management of irrigation systems, were initiated by the two ministries mentioned above and the International Irrigation Management Institute (IIMI). This was followed by detailed discussions with the Sri Lanka-IIMI Consultative Committee and the Secretaries of the Ministries concerned. The resultant proposal was placed before the two Ministers. Briefly, the recommendations in the proposal relate to the following:

i. to accept participatory management as a policy by the government with the objective of improving overall management and performance;
ii. to adopt the management principle of the village tanks in the turnout areas, field channels and the distributary channels in the larger irrigation systems;
iii. to develop village-level institutions to provide for active farmer participation and involvement;

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[18] Managing Director, Mahaweli Economic Agency.

iv. to encourage farmers to manage the operation and maintenance of the distributary systems by contributing their labor and other resources. It is expected that such a development would enable the exemption of farmers from payment of O&M fees;
v. to continue to make available government funds to maintain and manage the main system, namely the headworks and main canals; it is estimated that this would amount to approximately 50 percent of the total cost of maintenance;
vi. to provide a legal framework to recognize the rights and obligations of farmers' organizations through amendments to the Irrigation Ordinance and to the Agrarian Services Act, as required; and
vii. to enact legislation to transfer, over a period of time, the ownership of the irrigation network below the D-channel level to farmers' organizations, when they are found to be ready to take on that responsibility.

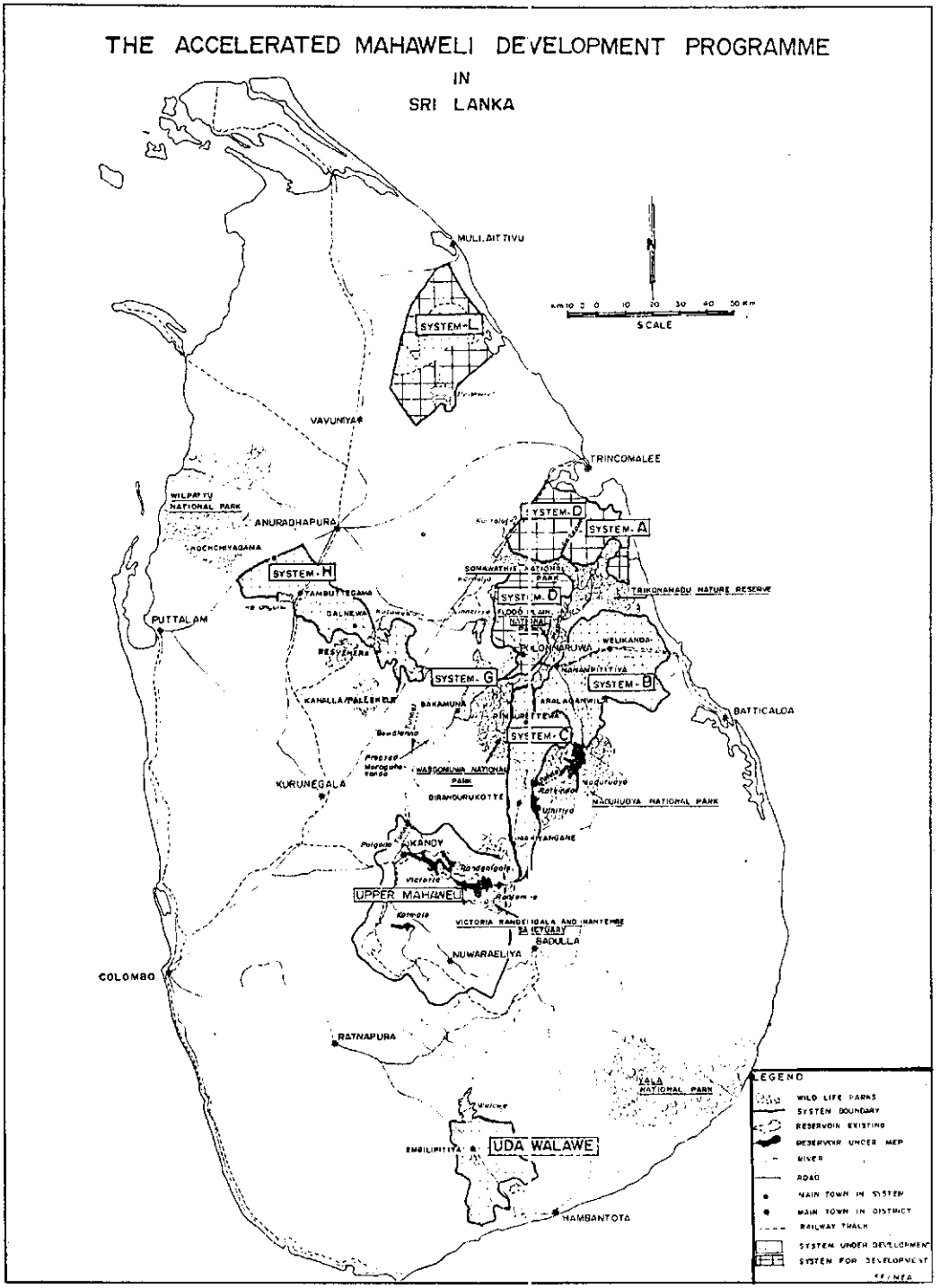
The Mahaweli Economic Agency (MEA) manages, at present, 75,676 ha of new land covered by irrigation systems in its various projects. The map shows all the project areas under the Accelerated Mahaweli Development Programme. With continued development and settlement this irrigated area increases annually. The MEA has managed these new irrigation systems since 1980. The MEA has also managed the Uda Walawe project, an old settlement scheme, since 1982. The experiences gathered in the management of these systems are recorded in a previous paper submitted at this workshop. The implementation strategy for the new policies of the government must necessarily be based on these experiences.

The experiences of the MEA in irrigation management over the last ten years have been characterized by the following shortcomings or drawbacks.

1. Due to the accelerated nature of the project there were many construction defects and shortcomings in the irrigation systems which proved a constraint to equitable water distribution. Some of these constraints were incomplete drainage canals and field roads, nonexcavation of rock in channel beds, minor deviation of field channels, completion and repairs to canal banks, modification to and repairs of structures, etc. These are technical factors that have caused inefficiencies in water use.
2. Another constraint was that there was a lack of effective farmer participation in water management. The farmers expected the agency to deliver water to each allotment and therefore felt that their participation in water management was not necessary. There was also a poor response by the farmers to the requests to pay operation and maintenance fees. Farmer participation, through their turnout groups, was evident only at times of organized training for the turnout groups and leaders and when they had problems of water distribution. These are social and institutional factors that have prevented the best possible use being made of the water available.

These constraints have resulted in below potential agricultural production and lower farmer incomes. The avowed policy of the Mahaweli Economic Agency is to increase the incomes of the farmers through more intensive and highly commercial agricultural production. With this another objective of the Mahaweli, i.e., increased agricultural production, is also met.

Farmers can participate in irrigation management either as individuals or as an organized group. Individual effort or in the form of loose groups, may be effective for small and specific


THE ACCELERATED MAHAWELI DEVELOPMENT PROGRAMME
IN
SRI LANKA
SCALE
MULLAITTIVU
SYSTEM-L
VAVUNIYA
TRINCOMALEE
WILPATTU NATIONAL PARK
ANURADHAPURA
SYSTEM-D
SYSTEM-A
SYSTEM-H
SOMAWATHIE NATIONAL PARK
TRIKONAMADU NATURE RESERVE
SYSTEM-D
PUTTALAM
GALNEWA
WELIKANDA
SYSTEM-G
SYSTEM-B
BATTICALOA
SYSTEM-C
KURUNEGALA
WASGOMUWA NATIONAL PARK
MADURUOYA NATIONAL PARK
UPPER MAHAWELI
VICTORIA RANDENIGALA AND RANTEMBE SANCTUARY
BADULLA
NUWARAELIYA
COLOMBO
RATNAPURA
YALA NATIONAL PARK
UDA WALAWE
HAMBANTOTA
LEGEND
WILD LIFE PARKS
SYSTEM BOUNDARY
RESERVOIR EXISTING
RESERVOIR UNDER MEP
RIVER
ROAD
MAIN TOWN IN SYSTEM
MAIN TOWN IN DISTRICT
RAILWAY TRACK
SYSTEM UNDER DEVELOPMENT
SYSTEM FOR DEVELOPMENT

jobs but if the sustained participation of a group of farmers in irrigation management, with their taking on increased responsibilities with time is the objective, formal organized groups of farmers are necessary. The MEA experience with farmers' organizations has shown that farmers will allocate and distribute water much more efficiently through organized groups than can be done through the MEA management system. This paper will therefore concentrate on farmer participation in irrigation management through farmers' organizations. This is also the most effective method of putting into practice the government policy of participatory and joint management of irrigation systems.

The participation of farmers in the development aspects of a project like the Mahaweli is possible through a number of organized forms, such as Field and Distributary Channel Organizations, Farmer Cooperatives, Cultivation Committees, etc. The important aspect of farmer participation is the mutual cooperation, based on trust and respect, that should exist between the farmers and officers. This cooperation is necessary if viable organizations, that can take on increased responsibility, are to be built.

PROPOSED STRATEGY

True farmer participation in the management of an irrigation system can only be achieved through strong farmers' organizations. These organizations can only be built if the dependency of the farmers on the agency staff to do the same work is reduced. In the Mahaweli project areas one Unit Manager and a Field Assistant initially work with 250 farmers. After four or five years the Unit Manager's area is extended to 500 families. In System H, which is now over 7 years since settlement, the Unit area has been extended to 1,000 families. The Field Assistant, who is solely responsible for agricultural extension work, will now have 500 farmers to work with. This is due to the importance that we have attached to agricultural extension, especially for new technologies that are constantly being developed.

With the formation of farmers' organizations it is necessary that the leadership of these organizations be given very early to the farmers themselves. The Unit Manager should function only in an advisory capacity and should not be an office bearer. If the Unit Manager is an office bearer as President or Secretary, the farmers' organization will then in effect become an extension of the bureaucracy. As a result, the farmers will not be interested in participating fully in the activities of the farmers' organization on the basis that it is their own organization. The Mahaweli officials should work alongside the farmers to assist in building and strengthening sustainability of farmers' organizations to take in more and more responsibility as time goes on.

It is also important that a farmers' organization should have only one or two interests. If an organization has a number of objectives, the interests of the membership will be divided with different priorities. The objectives of the organization must be those that interest the majority of the members. In the Mahaweli areas we have been able to build successful farmers' organizations around water management issues in a turnout area. We also have successful farmers' organizations for marketing their produce, but these organizations do not involve themselves in water

management. They have only one purpose -- marketing. It is also important to insure that these farmers' organizations should not be allowed to slip into a farmers' problem-solving forum as it could easily do. It must be made very clear to the farmers, that their organization has to be a much more responsible body, with specific objectives and tasks that have to be achieved.

Like any other effective organization, the farmers' organizations that are to be built up must become financially stable as soon as possible. In the Mahaweli projects we now give the farmers' organizations that have been formed, contracts to carry out the maintenance work on the distributary channels and the repairs to structures. Through the contracts done by the farmers' organizations, the members get an additional income and part of the profits go to the organization's funds. This system also insures that better quality work is done and no complaints are made by the farmers. Instructions have been given to all Block Managers and Unit Managers that each Unit Manager should display, in his office, details of maintenance work estimated to be done during the year.

Our present strategy should be to cover four seasons or two years. The more important season, in terms of getting the farmers to participate in water management, is the yala season. This is because, to start with, there is a limitation in water. Further, the policy of the Mahaweli Economic Agency is to, as far as possible, encourage the cultivation of crops other than rice during this season. This helps to make maximum use of the water in terms of land utilization and also gives the farmers a much better income. Therefore, group activity, centered on the distribution of water, can best be fostered during a yala season.

Our experience is that it is not too difficult to enlist the participation of farmers -- either as individuals or as groups -- during times of adversity, especially water shortages. When these problems have been overcome, especially those that affect them directly, the farmers lose interest and their involvement decreases. They are quite content to allow the managing agency to carry on the task of the management of their irrigation system. We must also, as a matter of policy, wean away the "official" involvement in the management of the irrigation system and hand over these responsibilities gradually to the farmers' organizations, which we must at the same time foster and build up.

Financial management problems will crop up regularly at the initial stages. For example, there will be complaints that some farmers who have participated in contract work taken by the farmers' organization, have not been paid in full or that some have not been paid at all. It will be noticed that the office bearers of the farmers' organization will spend a lot of money on 'official business.' The farmers will not be able, at the initial stages, to manage their finances properly and a lot of money will be spent on overheads. Training in financial management is an essential prerequisite to handing over the responsibility of managing the irrigation system to farmers' organizations.

The initial step of the MEA strategy is to form Turnout Group Organizations at the field-channel level, primarily to assist the farmers to distribute and manage the water that is issued to them at the head of the field channel. This has been done in most projects but only a small percentage of these organizations is functioning satisfactorily. With the varying lengths of the D-channels in the Mahaweli areas, the number of turnout organizations differs with each D-channel. The differences in the lengths of the D-channels in the Mahaweli areas are minimal compared to the variations in the D-channel lengths of pre-Mahaweli irrigation schemes.

The second step of the strategy is to federate the turnout or field-channel organizations at the D-channel level. The D-channel organizations would consist of representatives of each of the

turnout organizations along that particular channel. The main functions of the D-channel organization would be to manage and distribute the water issued along the D-channel according to the Seasonal Operational Plan (SOP) that has been drawn up. The SOP will be drawn up in consultation with the D-channel organizations and the staff of the Block Manager and the Resident Project Manager.

The next step is to have a Block Management Committee consisting of the Block Manager and his relevant staff together with representatives of the D-channel organizations in that Block. An administrative block in a Mahaweli Project, consists of approximately 2,500 farmer families. In the older settlement projects, a block area has been increased to 5,000 farmer families. The Block Management Committee would assist the project management to decide on policy, and formulate the cropping calendar and the SOP, which include the water issue calendar and the crops that are to be cultivated. They will also advise and decide on the maintenance of work etc., that has to be carried out in the irrigation system in that Block.

A similar Management Committee at project level with representation from each of the Blocks would be set up. The representatives on the Project Management Committee from each Block would necessarily be farmers themselves. The other members of the Project Management Committee will be from the Project staff.

For the farmers' representation on the block-level and project-level committees to be effective, their ideas and decisions should be listened to and respected. To this end, the training that we propose to give the Unit Managers would have to be extended to the project and block staff as well. More than training in organizing farmer groups, the training of these officers would be focused on dealing with farmer representatives on an equal level. If this is successful, much headway can be made in making these committees truly representative of the farmers.

The strategy described above is based on an initially successful project that has been started in Pimburettewa in System 'B.' Pimburettewa is an old colonization scheme which has now been incorporated into the System 'B' Left Bank irrigation system.

The MEA has two special projects where alternative approaches to developing farmers' organizations are being tried, or are proposed in the near future. An approach using the services of an experienced nongovernment organization is being proposed for Walawe; this is described in Annexure III. An alternative approach using institutional community organizers as "catalysts" in System B is described in Annexure IV. Through these efforts we hope to learn how to achieve our objectives most effectively.

ORGANIZATIONAL CHANGES NECESSARY

The Mahaweli Economic Agency has at present an Irrigation Engineer who has experience in working with farmers' organizations, monitoring the activities of the various farmers' organizations in the different projects. In fact, he has been a Special Awardee of IIMI, writing up his

experiences on working with farmers' organizations for water management in System 'H.'[19] He will head a Special Unit that will coordinate, assist, and monitor all farmers' organization activities in each of the MEA project areas.

Up to now, the Community Development Officers of the MEA have assisted the Unit Managers and Engineering Assistants to set up and monitor the activities of the various farmers' organizations as part of their general duties. It is now necessary to set up a special section within the MEA administrative structure, to assist and monitor all farmers' organization activities. This Unit should be under the community services division but manned by specially selected staff from the water management and agriculture disciplines who have experience in working with farmers' organizations. It must be understood that it is more difficult to maintain the continued and effective work of existing farmers' organizations than to start new organizations. A close check on the progress made by each of these organizations in the initial stages is very necessary. With the stabilization of the farmers' organizations over a period of time, especially with regard to finances, and when the members have developed a degree of responsibility, the intensity of the supervision can be reduced, allowing the organization to stand on its own.

It is hoped that with these changes in the MEA management structure the dependency of the farmers on the Unit Manager will decrease greatly and strong farmers' organizations will evolve. This will not happen automatically, but a concerted effort will have to be made by the MEA to organize and strengthen the farmers' organizations. To achieve this the MEA has, as mentioned earlier, made the necessary changes in the administrative structure to have a separate unit in the MEA head office working with farmers' organizations. At the project-level also, a special unit would be in charge of farmers' organizations. The role of the Unit Manager will change radically in that, he will now, rather than assist farmer families, direct inputs, help the farmers to stabilize their farmers' organizations which in turn will be of benefit to the farmers themselves. It is apparent therefore, that experienced persons would be necessary for this job. We are well aware that there are only a very few people with real experience in working with farmers' organizations. It is therefore necessary for intensive training to be given to the Unit Managers and the Block and Project level officers so that they could carry out their new roles and duties in respect of farmers' organizations effectively.

TRAINING

Reference is made elsewhere in this paper to the need for training farmers, especially farmer leaders, in financial management which is essential for the sustenance of farmers' organizations. Training is also necessary to bring about the necessary attitudinal changes amongst the farmers

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[19] P. Weerakkody. 1989. Farmer - Officer Coordination to Achieve Flexible Irrigation Scheduling: A Case Study from System H, Sri Lanka. IIMI Case Study No. 3. Colombo: IIMI.

and the Mahaweli officials if they are to form effective farmers' organizations. This training would be in addition to the normal training the Mahaweli Economic Agency provides to its officers and farmers in water management, agriculture, marketing etc. Further training will have greater emphasis on the training that is necessary for the formation and sustenance of effective and viable farmers' organizations.

RELATIONSHIP WITH OTHER AGENCIES

With the envisaged increase in their activities and the more responsible role that they would play in water management at the field-channel and distributary-channel level, the interaction of the farmers' organizations with the headworks administration will become increasingly important. Therefore, the farmers' organizations will need to have links with the Water Management Panel of the Mahaweli Authority of Sri Lanka. In the course of time, with their increasingly responsible role, it would be necessary for the farmers' organizations to have representation on the Water Management Panel. This would confirm our commitment to farmer participation in irrigation management and encourage the farmers' organizations to take on even greater responsibility.

CHANGES AMONGST THE FARMERS

At present, the farmers, even though they tend to complain regularly, are quite happy to go along with the present situation where water management is carried out by the managing agency. They see no reason why they should take on the added burden of operating the irrigation system when it is already being done for them. The farmers would prefer, of course, to have an improved service through the bureaucracy, rather than taking on the management of the irrigation systems themselves. This is the dependency syndrome. As we all know it is not very easy for the bureaucracy to improve in efficiency.

It is necessary therefore, for us to reconsider the role of the Agency and also the attitude with which we try to engage farmer participation in irrigation management. The farmers may feel, quite rightly, that our encouraging the participation of farmers in irrigation management is mainly due to a selfish motive in that we want to reduce the work load of the managing agency. We must create an atmosphere where the farmers firmly believe that the irrigation system is their own and is solely for their benefit and therefore it is incumbent on themselves to manage their own affairs. Once the farmers are convinced and start thinking on these lines a strong farmers' organization can be formed to take over, at least a part of the management of the irrigation system. In order to change the farmers' attitudes to be more positive, we have to show them the benefits that can accrue to them by their increasing involvement in the management of their irrigation system. This

is not only in terms of water management and agricultural production, but also in marketing. There are short-term benefits and long-term benefits that can accrue to the farmers and their organizations from the increased involvement of farmers' organizations in irrigation management. The short-term benefits include consolidation of funds to the organizations etc. The long-term benefits are greater involvement in their activities, for example, employment of their own extension staff etc., as in Taiwan.

CHANGES IN AGENCY

The management structure of the Mahaweli Economic Agency has, at field level, a water management division, an agriculture division and a community services division under the Resident Project Manager. There is a high degree of cooperation and coordination between these three divisions at present. This has contributed greatly to the accelerated rate of development that is evident in the Mahaweli areas. The MEA has not however given the full responsibility to any of these divisions for the fostering of farmers' organizations. The community-services divisions have been instrumental in the formation of farmers' organizations. They have, however, been helped to a great extent by the irrigation and agricultural staff in each project.

With the new emphasis that has been placed on farmer participation in irrigation management, it is necessary that a special unit, functioning both at project level and at the MEA head office, be set up to promote and monitor the activities of the farmers' organizations. This unit should be charged with only this work and should consist of engineering, agricultural, and community development staff who are well-experienced in farmer participation in irrigation activity and with farmers' organizations.

MONITORING SYSTEM

Monitoring the performance of farmers' organizations where the emphasis is on farmer participation in irrigation management is not an easy task. Just as it is necessary that the farmers' organizations be formed on a sound foundation or base, the continued monitoring of farmers' organizations in the initial stages is also very necessary if they are to be guided so that their activities could be continued effectively by the farmers themselves for a long time. The monitoring of their performance cannot be done by the mere collection of data, on attendance at meetings, regularity of these meetings, etc. The monitoring system must be able to gauge or sense the growth, the strength, the effectiveness of the organizations in irrigation management, the buildup of their funds etc. Most of these cannot be found in the raw data that are generally gathered. Monitoring the progress of farmers' organizations has to be done by persons who are

connected with and who understand farmer-group activities. They will, whilst monitoring the progress of farmers' organizations, be able to look at the effectiveness of a farmer-managed system in terms of the quality of the O&M, rate of problem solving, impact on yields, water duty etc., rather than in terms of the number of meetings, number attending these meetings, etc.

Progress in monitoring data to be collected should relate to the number of farmers in each organization, regularity of their meetings, but more importantly to the problems that have cropped up, the financial status of the organization, the work that the organization has engaged itself in, plans for the future, etc.

Monitoring the performance of farmers' organizations is necessary in that it helps not only to asses the status of these farmers' organizations but also to decide whether any changes are necessary in the policy and strategies that have been adopted to accelerate and increase the participation of farmers in the management of their irrigation systems.

It is also very necessary that the MEA be in constant touch and has a regular dialogue with the other irrigation management agencies on the subject of farmers' organizations. A regular sharing of experiences will assist to identify common problems and surface successful solutions that another agency has affected.

HORIZONS

The ultimate goal with regard to farmer participation in irrigation management should be for farmers' organizations to take over the management of their irrigation systems, starting with the field channels and going up, through the distributary channels to the main and branch canals. It is difficult at this stage, to foresee farmers' organizations taking over the management of the headworks. Even the management of the main and branch canals by farmers' organizations will take some time.

The initial step the MEA has to take is to help the existing farmers' organizations, most of which are at field-channel level, to strengthen and consolidate themselves. The next task is to federate all the field-channel level farmers' organizations in a distributary channel. This D-channel organization would consist of representatives of the field-channel organizations along that distributary. Since the tasks of a D-channel organization are somewhat different to those of a field-channel organization, setting up of these organizations is more difficult. The main reason for this is that as the farmers' organizations move up the irrigation systems through federation, the farmers are distanced more and more from their field-level situation. The scenario becomes bigger and the work done by the farmers, through these new farmers' organizations, is increasingly for the good of a large community of farmers and less for themselves individually. This needs an attitudinal change amongst the farmers. This is where the work of the specialized unit in the MEA becomes important.

Once the D-channel organizations are functioning satisfactorily an organization to manage the main and branch canals must be set up. The ideal situation would be, initially, for all the distributary channels served by the main and branch canals to have effective farmers' organizations at the

D-channel level. This will take some time, as our experience shows that it is not easy to set up a D-channel organization. Setting up such organizations in all distributary channels in an irrigation system would therefore be difficult. Without waiting for this ideal situation to come about, it would be expeditious to set up the Block-level and Project-level committees and get on with the program to build up the participation of farmers' organizations in the management of our irrigation systems. At the same time we could also work on organizing the balance D-channel organizations.

These are the main objectives and tasks of the Mahaweli Economic Agency in relation to the participatory and joint management of irrigation systems, now a policy of the government. Though the task ahead is certainly not easy, with the experience the MEA has gathered over the last ten years and the enthusiasm and dedication of its staff, much headway can be made in the effort to help the Mahaweli farmers to organize themselves to participate fully and to join the project management in operating and maintaining their irrigation systems with a view to taking over a large part of these systems for management by themselves in the future.

Finally, however, I must mention that the strategy I have detailed out above looks very effective on paper but it is not that easy to implement in the field. The problem initially is one of logistics. In the Mahaweli Projects we have over 5,000 turnout areas. The sustained interest and enthusiasm of all the officers at all levels, involved with farmers' organizations, are absolutely necessary to make a success of this exercise. They should, at all times, work very closely with the farmers.

Annexure I

Joint Cabinet Memorandum
Participatory Management in Irrigation Schemes

The Ministries of Lands and Land Development and Mahaweli Development and the Ministry of Agricultural Development & Research, in collaboration with the International Irrigation Management Institute (IIMI), have completed a study on the possibilities of obtaining the participation of farmer groups in the management of irrigation systems.

Following detailed discussion with the Sri Lanka - IIMI Consultative Committee and the Secretaries of the Ministries concerned, a proposal was placed before us to obtain approval to implement these recommendations. The recommendations are summarized in the annexed paper. They relate, in brief, to the following:

1. A need for participatory management to be accepted as a policy by Government with the objective of improving overall management and performance;
2. to adopt the management principle of the village tanks in larger systems in the turnout areas, field channels and the distributory channels respectively;
3. to develop village level institutions to provide for active farmer participation and involvement;
4. to encourage farmers to manage the operation and maintenance of the distributary systems by contributing their labor and other resources. It is expected that such a development would enable the exemption of farmers from payment of O&M fees;
5. that government funds continue to be made available to maintain and manage the Main System, namely the headworks and main canals; it is estimated that this would amount to approximately 50 percent of the total cost of maintenance;
6. to provide a legal framework to recognize the rights and obligations of farmers' organizations through amendments to the Irrigation Ordinance and to the Agrarian Services Act, as required;
7. to enact legislation to transfer, over a period of time, the ownership of the irrigation network below the D-channel level to farmers' organizations, when they are found to be ready to take on that responsibility.

We recommend that the above proposals be approved in principle and that authority and facilities be granted to the Ministries concerned to implement these proposals.

K.D.M.C. Bandara
Minister of Agricultural
Development & Research

Gamini Dissanayake
Minister of Lands and Land
Development & Mahaweli Development

Annexure III

Participatory Management in Irrigation Schemes

1. The International Irrigation Management Institute (IIMI), in collaboration with the Irrigation Management Division (IMD) of the Ministry of Lands and Land Development (MLLD) held a workshop in May 1986 on the subject "Participatory Management in Sri Lanka's Irrigation Schemes." Senior professional staff concerned with irrigation management in the Ministries of Lands and Land Development and Mahaweli Development and of Agricultural Development and Research presented papers and participated in the workshop.

2. The workshop compared the experiences of Sri Lanka as well as several countries in the Asian region. The proceedings of the workshop were published and were also taken up for detailed deliberation of the IIMI-Sri Lanka Consultative Committee comprised of senior staff of IIMI and the concerned agencies of the government. The Consultative Committee recommended that the major findings of the workshop should be discussed with the secretaries of the three Ministries concerned and the related Heads of Departments.

3. The meeting of Secretaries and Heads of Departments, having discussed in detail the proposals of the workshop, agreed that a set of propositions should be submitted to the Hon. Minister of Lands and Land Development and Mahaweli Development and to the Hon. Minister of Agricultural Development and Research with a view to obtaining their views and a firm commitment on this issue in order that approval of Cabinet could be obtained for the proposals thereafter.

   An expert consultation on this same subject was sponsored by the Food and Agricultural Organizational (FAO) in July 1984 in Indonesia, at which a set of recommendations had been drawn up for presentation to the governments in the Asian region. The recommendations, wherever feasible, have also been taken into account in formulating the present proposals.

4. The following proposals therefore are being made for the consideration of the Hon. Minister:

Policy Commitment on Participatory Management

The desirability of farmer participation in irrigation systems has been accepted by most professionals and policymakers concerned with improving the performance of irrigation systems.

Experiences during the past few years under different irrigation management programs also have borne out the fact that farmer participation is most essential for sustained performance improvement. A clear policy commitment is required from the government in order to develop effective participatory methods on a long-term basis.

Village Irrigation Systems have for a long time had most of the ingredients of participatory management with minimum government intervention. It is recommended that participatory management be accepted as a policy and systems based on these principles be developed and experimented with, with the objective of improving overall management and performance.

Organizational Form

The organizational form that farmer participation should take should clearly define the overall responsibility that farmers should be asked to shoulder. The relationship to be developed between farmers and the government, the specific tasks to be assigned to farmers, and incentives required for both farmers and the government agencies to change their respective roles and attitudes should receive adequate attention.

A possible classification of irrigation schemes for purposes of management is given in Figure I. This classification, among other things, indicates how the government interest and involvement in management increase with the size of the scheme. Farmers in practically all irrigation systems are made up of small holders; hence, the management system at the smallest unit is almost identical to that in a village-irrigation work. As the system gets larger, units build up in a hierarchical pattern. It is recommended that the management principle of village tanks is adopted in larger systems with the turnout area, the field channel, and the distributary channel, respectively, in ascending order, they being treated as the respective 'management units.' Figure II gives a possible structure for farmers' organizations, which would promote the sharing of rights, duties, and responsibilities between the government and the farmers.

Institution Building

Farmer participation has to be developed through institutions in the irrigation sector, such as the turnout group, the subproject committee, the project committee, the kanna meeting, the DAC subcommittee, etc., These institutions have been reviewed in recent years. They have to be strengthened by giving the farmers a progressively larger share of the responsibility for decision making. Current experience is that in many schemes, farmers are willing to take responsibility for management at the field channel/turnout level while in some places they have shown the

ability to manage even at the D-channel level. The extent to which they effectively participate would depend on the extent to which they could participate in the decision-making process in system management. It is recommended that these institutions be strengthened, providing for active farmer involvement.

Cost-Sharing

At present, farmers in major irrigation schemes are expected to contribute 50 percent to 60 percent of maintenance costs. Although it is proposed to increase this contribution to 100 percent it is highly unlikely, considering the low efficiencies of most irrigation systems and the low income levels of the farmers, that this would be realized in the short term. On the contrary, handing over responsibility to farmers for O&M and management would in the long term considerably reduce government commitments for O&M. This would be a much more meaningful way of sharing costs and responsibility than trying to recover costs. It is recommended that farmers be encouraged to manage an O&M system in which they contribute their labor and other resources rather than just paying O&M charges to a central authority.

Main System Management

It is likely that for some time to come the maintenance of all headworks and of main canals (i.e. main system) of major schemes will have to remain the responsibility of agencies of the government although it is most desirable that this cost should eventually be borne by the farmer. Hence, the government funds should continue to be available to the irrigation agencies for main system management with appropriate provision for consultation with farmers' organizations in the execution of such work.

Legal Framework

The present programs of participatory management in some schemes have been developed on an informal and voluntary basis. It is necessary at some stage to provide a legal framework to speed up this process and also to recognize the right and obligation of the parties, namely the government and the farmers. An amendment to the Irrigation Ordinance, which recognizes water users' organizations and which modifies the present kanna meeting procedures, would be necessary.

Transfer of Ownership

There has been a suggestion that in respect of village tanks and medium-scale works and in respect of the distributary system of the major schemes, ownership of irrigation networks be legally turned over to the farmers. While this is desirable in an ultimate sense it can remain as a long-term objective towards which future thinking could be directed.

It would be useful, however, to enact enabling legislation for such transfer over a period of time. Regulations can be so framed that in respect of each irrigation scheme the performance of the water users' organizations could be evaluated and strict criteria laid down to determine the stage at which such ownership should be transferred. For example, there should be a minimum probation period for these organizations at the turnout level to be legally recognized and certain performance criteria before which ownership could be transferred at different levels.

Figure I

Classification of Irrigation Schemes

Type	Size	Features
Minor	Village irrigation works up to 200 acres	Irrigated by a single canal and served from field with not FCs.
		Managed by DAS and maintained by farmers.
		Predominantly *praveni* or private land.
		Designed for 01 season maha cultivation.
		Crop invariably rice for subsistence.
Medium	200-500/1000 acres	Has a distribution system with FCs.
		Managed and maintained by ID.
		A mix of private and LDO land.
		Designed for a maha & part yala cultivation crop mainly rice.
Major	500/1000 acres to about 25,000 acres	A complete distribution system with: Branch, Distributary and Field canals.
		Predominantly LDO + a limited extent of private land.
		Fairly uniform holdings designed for a maha + a substantial yala.
		Rice + Other
Major	(River Basin Schemes)	Similar to (iii) above but most management decisions and allocations decided from a central point.

Figure II

Proposed Farmers Organizations for Minor Irrigation Schemes

Organizational Level	Av. Ac. & No. of Farmers	Consumption	Functions
1. Apex	5000 ac	Chairman-Project Manager, Reps	a. Resolution of issues sent up by D-canal organizations
Project Committee (Vyapara Sanvidanaya)	2000 farmers	Elected by D-canal orgn. irrigation personnel (IE & TA in charge water issue)	b. Preseasonal planning for the cultivation season.
			c. Determination of seasonal plans which include cropping patterns, are allocated for cultivation, water-delivery schedules and coordination of input supply.
		District-level representation from agencies connected with agricultural development (Secretary may be the IE or TA in charge of water issues)	d. Resource allocation for O&M and setting priorities.
			e. Monitor system performance and introduce modifications to operational plans.
			f. Facilitation of communication flow at all levels.
2. Secondary D-canal (Bedunela Sanvidanaya)	500 ac. 200 fars.	Chairman-Farmer Rep. Reps. from field-channel orgns. Technical Assit. Agrl. Instructors, Divisional-level officers	a. Resolution of problems and issues sent up by F-C Organizations.
			b. Planning water distribution at the D-canal level.
			c. Programing operation & maintenance activities in D-canal.

			d. Preseasonal planning at D-canal level.
			e. Monitoring of Irrigation practices
			f. Collection of water, O&M rates.
			g. Selection of representations to project committee.
3. Primary Field Channel activities (keth-ela Kandayama)	50 - 60 acs. 15 - 20 fars.	Chairman-Farmer Rep. Member are farmers. Irrigation (JALAPALAKA) Vel Vidane Yayapalaka	a. Promoting equitable water distribution and other water management b. Conflict Resolution.
			c. Protection of structures.
			d. Maintaining field channels
			e. Promoting efficient agricultural activities.

Notes: a.Large major projects (exceeding 10,000 acres) may separate subproject organizations in the nature of Branch Canal Committees, Main Canal Committees.

b. Election of members should be either by consensus or through secret ballot.

Annexure III

Uda Walawe Proposal for Farmers' Organizations

It is recorded that, over the years, Sri Lanka has developed a considerable extent of land for irrigated agriculture. The colossal sums of money invested on these projects have failed to some extent to deliver the projected goals and objectives. The acute water shortage faced by the tail-end farmers during the yala season has always resulted in propagating conflicts within the farming community, resulting in the deterioration of the irrigation system.

Research studies have revealed that the main reason for this is that the farmer being the beneficiary, was not actively and effectively involved in the project mechanism; state mechanism, the farmers' lack of knowledge, discipline, or solidarity and non-cooperation are some others.

One such scheme is at Pimburettawa where the farmers' organizations have taken over the full responsibility of O&M of D/F channels. It is felt that this system might help their counterparts in the Uda Walawe special project area which has been lacking this concept of an organization for the past decade.

The Uda Walawe project is funded by the Asian Development Bank to rehabilitate the irrigation canal network. Water management activities are of prime importance because farmers have to change from growing rice-rice cropping system to OFC-rice cropping pattern concept, for all the farmers to get the benefit of the rehabilitation work.

The canal system at present has badly deteriorated. The control gates have been damaged and in some places are nonexistent. This has resulted in the wastage of irrigation water and this affects the environmental pollution too. Social structures and management systems have to be changed. To overcome all these problems the Water Management Division of the Nation Builders' Association (NBA) has suggested long-and short-term objectives:

1. To form strong water user organizational structures where the farmers will actively participate in decision making and take over the responsibility of the O&M of the irrigation system.
2. To establish good will and cooperation between the farmers and the state organizations.
3. To effect social cultural enlightenment among the farmers and enhance their efficiency.

Short-term objectives of convenient motivating programs to encourage leadership qualities of farmers, transfer leadership and farming on irrigation system management, reintroduction of traditional methods, crop diversification, reforestation program etc., thereby investigating and preparing technical plans to rehabilitate the canal system will be the contribution by the Central

Engineering Consultancy Board financed by the ADB. Coordination of project activities and providing inputs related to the cultivation plan will be the contribution of the MEA.

All expenses related to the activities of social change and environmental conservation will be Rs 4.46 million.

At the end of a three-year period all NBA personnel will withdraw from the water management activities in the area. It is expected that these activities would thereafter be continued on a systematic basis by the farmers themselves with the active participation of all the MEA officials in the area.

Annexure IV

Farmer Organization Component - System 'B'
Mahaweli Agricultural and Rural Development Programme

Tertiary-level farmers' organizations existed in System 'B' before the commencement of the Mahaweli Agricultural and Rural Project Programme as a prerequisite to the formation of water users' organizations. These existing turnout groups are strengthened with the help of the officers through a comprehensive training program. The newly recruited Institutional Community Organizers (ICO) are expected to play a positive catalytic role to bring about a change of attitude among the farmers and to educate farmers to act as socially cohesive groups. It is the most important social change required to direct people to work for a common goal. In order to avoid any conflict with the existing cadres in the Mahaweli Organization, task forces have been formed at unit, block, and project levels to synchronize the role of the Irrigation Community Organizer with that of the existing staff. Each unit task force will comprise of the Unit Manager, the Field Assistant, the Technical Assistant, FSE and the ICO. The unit task force is headed by the Unit Manager and through him, water users' association activities are linked with the block level.

The strengthening of turnout groups and the establishment of the D-channel water users' association will be done simultaneously. The rationale for this is that turnout groups through federating at the D-channel level will become stronger and will be able to articulate their requirements at a higher forum where the MEA officials play an important role. Efficient and equitable water management will be the main objective of turnout groups and the D-channel water users' association, at least until they become well-established. The D-channel organizations are expected to evolve into multipurpose farmers' organizations encompassing not only efficient water management, but also input supply, credit and marketing, and extension services. The third and fourth tiers of farmers' organizations are block organizations and project organizations, respectively. These two tiers are expected to evolve on the strength of water users' association as farmers gain confidence and experience and establish close relations with the MEA officers. They will be established on existing administrative boundaries and not on hydrological boundaries as in the case of the water users' association. Thus, these organizations will be multifunctional organizations of farmers.

TURNOUT GROUP STRENGTHENING AND WATER USERS' ASSOCIATION FORMATION

All turnout groups are to be strengthened before they are federated into the D-channel water users' association.

During the initial phase of the ICO deployment, five to six ICOs will be assigned to each of the six irrigation blocks. The ICOs in each block will form a team and will concentrate all their efforts on the task of strengthening turnout groups and forming water users' associations. Once a D-channel water users' association is formed, only one ICO will stay behind to deal with the association. The rest will move to another D-channel to form a new water users' association.

Three ICOs will constitute the monitoring unit of the Farmer Organization Programme (FOP). One of them will be assigned to monitor the activities and accomplishments of those assigned in Wijayapura, Ellewewa, and Dammina blocks. The second will be responsible for the FOP in Sevanapitiya, Senapura, and Dimbulagala blocks. The third person will collect and analyze data.

TRAINING FOR TURNOUT GROUPS MEMBERS

The existing turnout groups have one or two farmer leaders. These leaders attend training and cultivation meetings and are supposed to inform the members of what transpired at such training sessions and meetings. But the transfer of knowledge or information from the leaders is at best minimal due to the lack of commitment among leaders and interest among farmers. To correct this defect at the turnout groups level, Mahaweli agricultural and rural project consultants and MEA officials will conduct training classes at the unit level. In these training sessions, duties and responsibilities of both turnout group leaders and members, water allocation and distribution, repair and maintenance, farm credit assistance, farm inputs procurement, and marketing of farm produce will be explained in detail.

TRAINING FOR FARMER LEADERS

Each D-channel water users' association shall have two types of office bearers: a Board of Directors which decides policies, and Manager-President, Vice President, Secretary, Treasurer and Auditor. Managers will sit on committees that attend to different needs of the water users' associations.

The abovementioned officers or farmer leaders will be given special training in leadership, irrigation system management, and financial management. It will be a one-week live-in program at the Mahaweli Regional Training Centre.

ICO TRAINING

Rationale

The rationale of the introduction of a cadre of Irrigation Community Organizers (ICOs) into the Mahaweli System 'B' is to help its farming community in achieving increased incomes through organized farm and non-farm activities. The ICOs are expected to work with farmers and to instill in them the value of group activities in achieving their goals and in helping each other to develop an efficient water management system. As a catalyst agent, an ICO will be expected to play many a role -- farmers' friend, adviser, moderator, and technical adviser. However, ICOs are external to the farming community, and therefore it is necessary to plan the style of intervention and more importantly, how they will eventually be accepted by the farmers. This has to be done through careful training and orientation of the ICOs. Once they are trained, they should be in a strong position to catalyze the internal dynamics of the community and at the same time not to dominate it.

Contents and Methods

The initial induction training course will have three components:

(a) Basic instruction on agronomy and extension, water management community organization, and development. The ICOs will also learn about the history, structure, and goals of System 'B' and the linkages that exist and are being developed between the farming system and the external world.

(b) Practical exercises in map- and plan-reading, reporting, and planning in farming system approach.

(c) Field-training will allow them to test and experiment with the knowledge they have gained during the training. During the field-training, emphasis will be on practical on-the-job training in the methods of promoting farmers' participation by working in partnership with farmers. Furthermore, the ICOs will learn how to enter the rural community and establish good relations with farmers. Once the ICOs have completed their training, a panel of trainers will evaluate their performance and suitability for the positions.

OBJECTIVE OF THE TRAINING PROGRAM

The objective of the training program is to develop the capabilities of the ICOs in organizing sustainable water users' associations at both the turnout and distributary channel levels. Through such associations, farmers will participate in irrigation water management, particularly in O&M activities. Water users' organizations at the D-channel level should provide farmers with easy access to agricultural extension, storage and processing, and marketing facilities. Unless farmers can earn more income from their allotments through their participation in water users' associations (WUAs), it is difficult to get their support for the exercise of evolving sustainable WUAs in Mahaweli System 'B.' Since the MEA emphasizes the importance of crop diversification as the main avenue for increasing farmers' income, it is imperative that turnout groups and D-channel-level water users' associations involve agricultural crop production, particularly in profitable cultivation of other field crops. For this, ICOs need a comprehensive knowledge and practice in fields such as agronomy, water management, community development and group-based economic development activities. We believe that once the ICOs have followed the suggested Induction Training Program, they will be ready to go ahead organizing farmers into water users' assocations to achieve the abovementioned project objective.

LEGAL IDENTITY

It is preferable to register unit-level societies under the Agrarian Services Act, as we expect these societies to play a multipurpose role to improve the standard of the farmers socially and economically. Even if these societies solely perform the functions of operation and maintenance of the irrigation infrastructure there is no legal provision under the existing Irrigation Ordinance to register them as water users' associations.

List of Members of Sri Lanka - IIMI Consultative Committee (as of February 1990)

Mr. A.A. Wijetunge
Secretary, Ministry of Lands, Irrigation & Mahaweli Development

Mr. Joe Alwis
Secretary, Ministry of Coconut Industries and Crop Diversification

Mr. Godfrey de Silva (Chairman)
State Secretary, Ministry of Irrigation

Mr. A.D.N. Fernando
State Secretary, Ministry of Mahaweli Development

Mr. H.M.C. Kapilaratne
Commissioner, Department of Agrarian Services

Mr. K.D.P. Perera
186/1 Hill Street, Dehiwela

Mr. D.G. Premachandra
State Secretary, Ministry of Lands

Mr. D. M. Ariyaratne
Director, Irrigation Management Division

Mr. S. Wirasinghe
Deputy Director (Ext.), Department of Agriculture

Dr. K.P.A. Gunasekera
Professor and Head, Department of Agriculture, University of Peradeniya

Mr. Jayantha Jayewardene
Managing Director, Mahaweli Economic Agency

Dr. Roberto Lenton
Director General, IIMI

Mr. Nanda Abeywickrema
Director, Field Operations, IIMI

Dr. Douglas J. Merrey
Head, Sri Lanka Field Operation, IIMI

Dr. C. R. Panabokke (Secretary)
Senior Associate, IIMI

List of Members of Workshop Organizing Committee

Dr. Douglas J. Merrey (Convener)
Head, Sri Lanka Field Operations, IIMI

Mr. Ananda Gunasekera
Deputy Director, Irrigation Management Division (IMD)

Mr. Joe Alwis
Secretary, Ministry of Coconut Industries and Crop Diversification

Mr. Jayantha Jayewardene
Managing Director, Mahaweli Economic Agency (MEA)

Dr. Masao Kikuchi
Irrigation Specialist, IIMI

Workshop Participants

Mr. Nanda Abeywickrema
Director, Field Operations
International Irrigation Management Institute
P.O. Box 2075
Colombo

Mr. Joe Alwis
Secretary
Ministry of Coconut Industries and Crop Diversification
320, T.B. Jayah Mawatha
Colombo 10

Mr. D.M. Ariyaratna
Director
Irrigation Management Division
Irrigation Department Building
P.O. Box 1138
Bauddhaloka Mawatha
Colombo 7

Mr. Jeff Brewer
Team Leader, Institutional Strengthening Project (ADB)
Room 4, 2nd Floor
Irrigation Department Building
Bauddhaloka Mawatha
Colombo 7

Mr. P. Dayaratne
Deputy Director
Regional Works
Irrigation Department
P.O. Box 1138
230 Bauddhaloka Mawatha
Colombo 7

Mr. Godfrey de Silva
State Secretary
Ministry of Irrigation
C/o Irrigation Department
P.O. Box 1138
230 Bauddhaloka Mawatha
Colombo 7

Mr. W. Ellawala
Deputy Director M&E
Irrigation Management Division (IMD)
Irrigation Department Building, 2nd Floor
Bauddhaloka Mawatha
Colombo 7

Mr. John B. Flynn
USAID
44 Galle Road
Colombo 3

Mr. Ananda Gunasekera
Deputy Director
Irrigation Management Division (IMD)
Irrigation Department Building, 2nd Floor
Bauddhaloka Mawatha
Colombo 7

Dr. Wimal Gunawardena
Chairman
TEAMS (Pvt) Ltd
P.O. Box 262
55 Rosemead Place
Colombo 7

Dr. Gamini Herath
Head, Department of Agriculture Economics
University of Peradeniya
Peradeniya
Kandy

Mr. G.T. Jayawardena
ISM Project Director
Irrigation Management Division (IMD)
Irrigation Department Building, 2nd Floor
Bauddhaloka Mawatha
Colombo 7

Mr. Jayantha Jayewardene
Managing Director
Mahaweli Economic Agency (MEA)
493, T.B. Jayah Mawatha
Colombo 10

Mr. T.D.P. Karunathilleke
Chief Irrigation Engineer
Mahaweli Economic Agency (MEA)
493, T.B. Jayah Mawatha
Colombo 10

Mr. T.H. Karunatillake
Institutional Strengthening Project (ADB)
Room 4, 2nd Floor
Irrigation Department
Colombo 7

Dr. Masao Kikuchi
Irrigation Specialist
International Irrigation Management Institute
P.O. Box 2075
Colombo

Prof. Khin Maung Kyi
Senior Management Specialist
International Irrigation Management Institute
P.O. Box 2075
Colombo

Mr. Warren Leatham
Chief of Party
Sheladia Associates Inc.
BMICH, Block 2
Rooms 1-3
Bauddhaloka Mawatha
Colombo 7

Mr. J. Medagama
Acting Commissioner
Department of Agrarian Services
42, Sir Marcus Fernando Mawatha
Colombo 7

Dr. Douglas J. Merrey
Head, Sri Lanka Field Operations
International Irrigation Management Institute
P.O. Box 2075
Colombo

Mr. K.D.P. Perera
186/1, Hill Street
Dehiwela

Mr. Jack Pinney
USAID
44 Galle Road
Colombo 3

Mr. S.S. Ranatunga
Deputy Director (O&M)
Irrigation Management Division
Irrigation Department Building, 2nd Floor
Bauddhaloka Mawatha
Colombo 7

Dr. N. Ranaweera
Deputy Director, Economics
Department of Agriculture
Peradeniya
Kandy

Dr. R. Sakthivadivel
Senior Irrigation Specialist
International Irrigation Management Institute
P.O. Box 2075
Colombo

Mr. P. Senarath
MIRP Project Director
Irrigation Management Division (IMD)
Irrigation Department Building, 2nd Floor
Bauddhaloka Mawatha
Colombo 7

Dr. G.D.P. Seneviratne
Director
Agrarian Research & Training Institute
114 Wijerama Mawatha
Colombo 7

Mr. Peiter Smidt
Agriculture Department (West)
Asian Development Bank
P.O. Box 789
Manila
The Philippines

Dr. S. Somasiri
Head, Water Management and Soil Conservation
Resource Centre
Department of Agriculture
Peradeniya

Mr. Kapila Vimaladharma
Agridev Consultants
72/15 A, Wijenayake Gardens
Bahirawakanda
Kandy

Mr. D.W.R. Weerakoon
Senior Deputy Director, O&M
Irrigation Department
P.O. Box 1138
Bauddhaloka Mawatha
Colombo 7

Mr. Ananda Weerasinghe
Director
Settlement Planning & Management Division
Ministry of Lands, Irrigation and Mahaweli Development
42, Marcus Fernando Mawatha
Colombo 7

Mr. H.A. Wickremaratne
Chief Irrigation Engineer
Mahaweli Economic Agency (MEA)
493, T.B. Jayah Mawatha
Colombo 10

Mr. L.T. Wijesuriya
Senior Deputy Director, MIR
Irrigation Department
P.O. Box 1138
Bauddhaloka Mawatha
Colombo 7

Mr. A.A. Wijetunge
Secretary
Ministry of Lands, Irrigation and Mahaweli Development
500 T.B. Jayah Mawatha
Colombo 10

Mr. S. Wirasinghe
Deputy Director (Ext)
Department of Agriculture
Peradeniya
Kandy

Mr. K. Yoganathan
Director
Department of Irrigation
P.O. Box 1138
Colombo 7