Farmer Participation in Irrigation System Management: Achievements and Drawbacks

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FOREWORD

Irrigated agriculture- the largest water consumer of the country, is facing severe challenges today. The biggest challenge in the near future is how to produce more food and enhance farmer income with less water. The government of Sri Lanka makes massive investments for development and improvement of irrigation infrastructure in the context of rising demand for water. Therefore, participatory Irrigation Management (PIM) as the key irrigation management policy of the country has to play a major role in increasing water and land productivity.

The concepts of decentralized management and community governance of infrastructure have gained momentum in the recent past. Though irrigation management turnover is moving towards this direction, the current scope of PIM should be widened for basin level management and regulation, watershed protection and control of water pollution. The line agencies have to be re-oriented to adopt and/or amend the relevant policies to face emerging issues.

It is essential to have high level political commitment towards consistent policies and regulations, active participation of stakeholders, consensus among stakeholders on practical issues in effective implementation of PIM and availability of functioning institutional arrangements at ground level to achieve the expected outcomes of participatory irrigation management.

The authors' of this report have comprehensively analyzed various issues of participatory irrigation management. I have no doubt that, this report will be a sort of benchmark for future policy formulation on participatory irrigation management.

Lalith Kantha Jayasekara
Director

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EXECUTIVE SUMMARY

Participatory Irrigation Management (PIM) has been practiced in Sri Lanka as a national irrigation management policy since 1992, after a decade of experiments and experiences. Under this policy, the government continues with the allocation of financial and other necessary resources to the Irrigation Agency for Operation and Maintenance (O&M) of the Headworks and main canals. The O&M tasks of Distributory Canals (DCs) and Field Canals (FCs) are the responsibilities of Farmer Organizations (FOs). The necessary institutional arrangements have been made at ground level by creating or strengthening beneficiary based water user organizations (FOs) and project level Project Management Committees (PMC) for the smooth implementation of PIM.

The major objective of this study is to assess the problems and prospects of the PIM policy implemented through different management models, namely Integrated Management of Agricultural Systems (INMAS), Management of Irrigation Schemes (MANIS), Mahaweli Model and Bulk Water Allocation (BWA) program practiced in Mahaweli system-H. Ten study sites were selected from Anuradhapura, Polonnaruwa, Kurunegala, Hambantota and Nuwara Eliya districts to represent different contexts, such as Agro-ecological zones, management models, the degree of water availability and past government interventions. 391 farmers were selected randomly for questionnaire survey. Key informant interviews, focus group discussions and direct field observations were also used to enrich the study.

According to the findings, strength of FOs, level of agency support for PIM, level of resource mobilization for sustainable O&M, physical conditions of irrigation infrastructures and sustainability of irrigated agriculture are best under the BWA program at Mahaweli H, followed by INMAS, Mahaweli model and MANIS schemes respectively. Although, the current policies expect to maintain the system in a sustainable manner, the relevant parties have not established maintenance standards to ensure sustainable O&M and the necessary guidelines to mobilize resources in an equitable manner. Overall, FO water distribution performance and control structure management activities have improved after PIM.

The main issues related to mobilization of adequate amount of resources for sustainable O&M under PIM policy can be summarized as follows; Farmer contributions are by and large limited to labor mobilization and they seldom invest cash and kind. At the same time irrigation agency is unable to do satisfactory O&M tasks due to inadequate allocation of resources by the central government. However, willingness to pay for improved irrigation services to their respective beneficiary organizations exists among the majority of the farmers in all the schemes, but, procedures are needed to collect these contributions and proper utilization of collected resources.

Provision of adequate awareness to all stakeholders of PIM regarding their roles, responsibilities, power and authority, and formulation of procedure and guidelines needed to ensure supportive actions of line agency officers for FOs and irrigation

system management and convincing officers to accept PIM as one of their duties have been recommended in the study. Some of the irrigation systems should be rehabilitated/ renovated so that farmers could manage them successfully. A separate maintenance fund should be established at scheme level by regular farmer contributions and utilization of savings from O&M and rehabilitation contracts awarded by the line agency. An arrangement to pay an honorarium for farmer representatives, especially '*Jala palaka'* for their voluntary services is vital for enhancing efficiency of FO leaders and minimize abuse of FO fund. Provision of catalytic efforts and allocation of more resources for organizational development are vital in MANIS schemes. The findings clearly indicate that the success of PIM depends on the continuous interventions by state intermediaries such as Irrigation Management Division (IMD) and Mahaweli BWA programme who have assigned full time officers to manipulate the various intricacies involved in PIM. Essentially PIM is not a means to an end, but a dynamic process where continuous state interventions are required in strengthening farmer organizations to a sustainable level until they are ready to take up joint management status.

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LIST OF ABBREVIATIONS

APC	-	Agricultural Productivity Committee
BWA	-	Bulk Water Allocation Programme
CC	-	Cultivation Committees
DAS	-	Department of Agrarian Services
DC	-	Distributory Channel
DCFO	-	Distributory Channel Farmer Organization
DCO	-	Distributary Channel Organizations
DOA	-	Department of Agriculture
FC	-	Field Channel
FCG	-	Field Channel Groups
FO	-	Farmer Organization
FR	-	Farmer Representatives
GOLB	-	Gal- Oya Left Bank
GOSL	-	Government of Sri Lanka
ID	-	Irrigation Department
IDO	-	Institutional Development Officer
IMD	-	Irrigation Management Division
IMT	-	Irrigation Management Turnover
INMAS	-	Integrated Management of Agricultural Systems
IO	-	Institutional Organizers
ISMP	-	Irrigation System Management Project
JP	-	*Jala Palaka* (Water Master)
MANIS	-	Management of Irrigation Schemes
MASL	-	Mahaweli Authority of Sri Lanka
MC	-	Main Canal
MDS	-	Multi dimensional scale
MIRP	-	Major Irrigation Rehabilitation Project
MRRP	-	Mahaweli Reconstruction and Rehabilitation Project
NIRP	-	National Irrigation Rehabilitation Project
O&M	-	Operation and Maintenance
PIM	-	Participatory Irrigation Management
RPM	-	Resident Project Manager
TA	-	Technical Assistant
TIMP	-	Tank Irrigation Modernization Project
VIRP	-	Village Irrigation Rehabilitation Project

CHAPTER ONE

Introduction

1.1 Background

Participation of farmers in irrigation system construction, operation & maintenance has been one of the key aspects in irrigated agriculture since ancient times. This was an obligatory requirement during the time of ancient kings and was called *'Rajakariya'* (work performed by the people to the king). '*Rajakariya'* was a service done for the king without payment. In ancient Sri Lankan society, all citizens had to contribute some service to the king. It was accepted that the king was the owner of all land. People got lands from the king for cultivation. In return, they performed a compulsory service to the king.

The institutions like village council & irrigation headmen (*Vel Vidhane*) played prominent roles in ancient irrigation management. *Rajakariya*, was the tie that bound peasant people. Through the performance of '*Rajakariya'* people worked for the benefit of the whole community. It was this spirit that was called M*ahasammata,* or the common consensus. However, after occupation by British rulers, they abolished the village councils and consequently the *'Rajakariya'* in 1833 as it was seen as a potential forum for organized opposition to colonial rule (Lowe, 2007).

After gaining independence in 1948, large proportions of public investments were allocated to irrigation development, mainly for new constructions. The development of large amounts of irrigation infrastructure demanded massive resources as recurrent expenditures. Unlike in community based irrigation systems, where the responsibility for maintenance rested with the user as incentives for maintenance and benefits were localized; in the government intervention systems farmers expected maintenance by the government bureaucracy. Thus there developed a gap in the resource requirement for irrigation system maintenance between bureaucracy and beneficiaries.

Therefore, since 1978 the government of Sri Lanka started experiments on farmer participation in irrigation system management & handing over of operation and maintenance (O&M) responsibilities to Farmer Organizations (FOs) or Water Users Associations. In other words, prior to 1978, all major & medium irrigation schemes in Sri Lanka were managed by the government with little involvement of farmers.

After a series of experiments and experiences of participatory irrigation management (PIM), and pressure from donor agencies to reduce public expenditure on irrigation system O&M, the government made attempts to introduce PIM as a national policy. As the first step, a Cabinet paper introducing the PIM process was submitted in 1983 which also approved the establishment of the Irrigation Management Division (IMD). Then, the Cabinet of Ministers agreed in Principle on PIM in 1989, but it has been approved as a policy only in 1992. Legal backing for FOs had been granted by the Agrarian Services Act of 1991. PIM for major irrigation had been approved legally by amendment to Irrigation Ordinance in 1994.

Participatory Irrigation Management Policy

The concept of PIM has been recognized all over the world as a tool for improving irrigation management along with sustainability of the system. The irrigation systems which consisted of sophisticated infrastructure finally had to be operated at least partly by individuals. Therefore, the level of co-operation & commitments among these individuals significantly affect irrigation performance (Lam, 1998).

The main goals of the PIM policy of the Government of Sri Lanka (GOSL) were twofold. Firstly, improving the irrigation performance and secondly; reducing the government expenditure on O&M by transferring the part of the O&M responsibility to user groups. Therefore the policy emphasizes the change in the traditional role of farmers from passive recipients of irrigation benefits to active partners in the management process sharing responsibilities with irrigation agency staff.

Under the PIM policy the government has to continue the financial allocations to the irrigation agency for O&M of the head works and main canals (MC). The O&M tasks of distributory canals (DCs) and field canals (FCs) are responsibility of FOs.

The major maintenance tasks of FOs are weeding, de silting, earth works and minor repairs to structures of DCs and FCs; maintenance of drainage canals and canal roads. The operational responsibilities of FOs are, control of all gates and other structures within DC and FC command areas, distribution of water according to agreed delivery schedules, and ensuring the safety of the system by careful operation and protection of gates.

The successful implementation of PIM must lead to formal management transfer from bureaucracy to farmer organizations. Management transfer is a long-term process, especially in the major settlement schemes where a mix of heterogeneous population is settled.

Therefore, there are roles & defined responsibilities for both farmers & line agency officials. There are basically two arms of institutional arrangements to ensure the participation of both farmers & officials to ensure the smooth implementation of PIM.

1. Beneficiary based water user organizations or farmers organizations

Strengthening of existing beneficiary based organizations or creation of new FOs, preferably based on hydrological boundaries is one of the basic requirements for successful implementation of PIM. There are two or three – tiered organizations for major medium irrigation schemes.

(a) Primary level field channel groups (FCGs) based on FC command areas
(b) Secondary level distributor channel organizations (DCOs), called as FO's, which is a federation of all FCG's
(c) In some schemes, all the DCO's are federated to form a System Level Farmer Organization (SLFO)

2. Project management committees

Each major and medium irrigation scheme consists of the Project Management Committee (PMC) with the participation of selected representatives of DCO's and scheme level officers from line agencies. This is a forum for joint planning, determination of priorities of system maintenance, and place for conflict resolution between farmers and agencies and also between DCO's.

Once FOs and PMCs are established and considered capable of handling the responsibilities, the irrigation agency formally implements management transfer via handing over (turnover) the responsibilities for O&M of DCs and FCs to FOs. The agency retains responsibility for O&M of head works, MCs and branch channels (if any). A formal agreement should be signed between the irrigation agency and the FOs/DCOs. This process is called irrigation management transfer (IMT).

The factors that motivated the GOSL for IMT were, shortage of government funds to be allocated for irrigation O&M, failure to collect sufficient fees from water users for O&M, making improvements to the O&M of irrigation systems, and recommendations from Donors of the irrigation rehabilitation projects. After the IMT, farmer organizations have the full responsibility of operation, development of business oriented activities and seasonal planning and partial responsibility of maintenance, financing O&M and enforcing sanctions and resolving disputes below secondary canal levels.

1.2 Research Problem

PIM programme implemented in Sri Lanka towards IMT since 1992 has been studied by many researchers in specific projects and locations. Past study findings show mixed results on the performance of PIM in irrigation system management, water use efficiency, agricultural production and the government cost reduction. Samad and Vermillion (1999) found that PIM has drastically reduced the government expenditure on irrigation, especially in the case of schemes that have been rehabilitated and transferred. Farmers' direct investment on irrigation system (in cash and kind) is less, but he/she contributes more labour for O&M. Significant improvement in agriculture was evidenced in the schemes where both management transfer and rehabilitation have occurred. The important observation made in this report was the under investment in maintenance under the PIM.

A detailed study conducted during 1993-1994 reported in IIMI and HARTI (1997) revealed that, PIM has improved water distribution performance, but there is no evidence of increased crop production or increased farmer income due to farmer participation. The report also noted that the prevailed situation of the time had created confusion and controversy about turnover. There were no well defined processes for turnover and some groups of people strongly objected to the transfer of maintenance responsibly to the FOs considering affordability of farmers to undertake it. Considering the context that existed, the study reports that, if the profitability of the

irrigated agriculture declines further, farmers may find it difficult to bear the O&M costs.

A study conducted by Thiruchelvam (2009) in Anuradhapura and Kurunegala Districts on institutional capacities of FOs in irrigation system management illustrates that there is a strong dominance of powerful farmers in FO positions and that there were marginal participation of farmers in 38% of sample FOs. Lack of accountability and transparency were the most common causes affecting the low level of participation.

Aheeyar and Smith (1998) discuss the challenges experienced in the process of irrigation management transfer and the related institution building. The major issue highlighted in the paper is the problem of continued dependency of FOs on the government support for irrigation management. Further, lack of financial accountability, inadequate incentives for FO leaders and insufficient legal framework and inadequate integration of responsibilities for irrigation and drainage canal maintenance threatening the sustainability of PIM in many schemes are also highlighted in this study.

Amidst these mixed results and pros and cons, PIM has continued to be the major irrigation management policy in Sri Lanka todate. It has been identified that, participatory management is a key element of the future development of irrigated agriculture in Sri Lanka (IMPSA, 1991, Fernando, 1992). Though the GOSL envisaged that this policy would help solve the problems in irrigated agriculture and water resources management, research observations show that long term sustainability and success of the management transfer program have raised doubts on the effectiveness of the policy. Participation has costs as well as benefits. The appropriate level of participation is problematic. The participation of farmers can be seen only when the beneficiaries get tangible benefits of participation from the costs incurred. Therefore, unless farmers are convinced of the benefits of participation, little can be achieved.

Therefore failure to mobilize adequate resources for O&M leads to deterioration of irrigation systems and necessitate pre-mature rehabilitation costing a huge amount of investment of public money. There has not been countrywide study conducted after the IIMI/HARTI research completed in 1994. Therefore, it is important to study the achievements and drawbacks of current PIM policy and the performance of institutional arrangements established for PIM under different management models to make necessary recommendations for future policy formulation. The study is aimed at providing insights to the current status of PIM under all four PIM programmes, namely Integrated Management of Agricultural Systems (INMAS), Management of Irrigation Systems (MANIS), Bulk Water Allocation Programme (BWA) practiced in Mahaweli H system and the Mahaweli Model implemented in rest of the Mahaweli systems other than Mahaweli H.

1.3 Objectives of the Study

The principle objective of the study is to assess the problems and prospects of the PIM policy under different management models. In order to achieve this broad objective, the following detailed objectives have been defined.

I. To assess the performance of the major components of PIM, i.e.; performance of the FO's, performance of PMCs and performance of IMT.
II. To examine the role of line agencies and effectiveness of other institutional arrangements to fulfill the entrusted PIM task.
III. To estimate the level of resources mobilized for system O&M by the stakeholders and its implications on sustainability.
IV. To formulate recommendations for each management model to make them more effective in O&M.

CHAPTER TWO

Irrigation Development and Management Policies in Sri Lanka

2.1 Irrigation Development Policies

2.1.1 Supply Augmentation Policy

Since independence, the major government efforts for economic development in general and agricultural development in particular have been directed at the development of the irrigation sector. The rationale for this policy has been that development of the irrigation infrastructure is the fundamental strategy for increasing food production in Sri Lanka. More than two thirds of the country's total land area, which lies in the dry zone, is not productive without the provision of irrigation water. Therefore, in the past, investments in irrigation have been concentrated on constructing new irrigation systems or restoring ancient tank systems in the dry zone which once supported the ancient island civilization (Aluwihare and Kikuchi, 1992).

At an early stage of agricultural development with abundant land resources, increasing production was not difficult, but when the population pressure pushed the cultivation into marginal areas, irrigation development became a more profitable base for agricultural growth than opening new land. As the area under irrigation expanded, the irrigation construction moved from the relatively easier and less costly sites to the more difficult and more costly ones (Kikuchi *et al*, 2002).

During the post-independence development, substantial amounts of investments were made in constructing new irrigation systems. The share of new construction in the total irrigation investment was as high as 96 per cent in the early 1950s, and irrigation investments as a whole took nearly 40 percent of the total public investment and nearly 10 per cent of the government budget during that period. However, as the economy developed, the share of total irrigation investment in the total public investment declined towards the mid 1970s. But the total irrigation investment jumped to an unprecedented level in and around 1980, bringing up the share of irrigation investment in the total public investment to more than 20 percent (Aluwihare and Kikuchi, 1992).

From 1950 to the early 1980s investment in new irrigation construction had been dominant and such a trend suggests that the major efforts in the irrigation sector had been directed towards attaining the national policy goal of self-sufficiency in rice through the expansion of the irrigated land base. Within this broad objective, it can be hypothesized that a basic economic factor behind the heavy investments in irrigation construction was the high profitability of such investments. The successive introduction of improved seed and fertilizer technology played a critical role in maintaining and enhancing the profitability of irrigation construction *(ibid)*. Project

management system in irrigation schemes from 1968-1974 also has contributed in production and productivity improvement.

Fluctuations in investments in new irrigation construction can be seen over the time and, three distinctive peaks can be seen in the early 1950s, the late 1960s, and the late 1970s to the early 1980s. During the periods between these peaks, new construction investments were reduced. Major irrigation works of the first peak are the Gal Oya, Parakrama Samudra, and Hurlu Wewa projects. Those of the second peak include projects such as Nagadeepa, Uda Walawe, and Rajangana. The third and the highest peak was the commencement of the Accelerated Mahaweli Development project in the late1970s, together with projects such as Inginimitiya and Kirindi Oya. A sharp increase in irrigation investment is witnessed after 2006, with the initiation of Uma Oya, Deduru Oya, Yan Oya, Moragahakanda multipurpose development projects and investments are expected to rise further in the near future with proposed projects of Gin Ganga, Kalu Ganga, Nilwala Ganga and North Central canal up to Iranamadu and Weli Oya development projects.

2.1.2 System Improvement Policy

Investment made for irrigation system improvement during post independence period until 1975 was only 1% of the total irrigation investment (Aluwihare and Kikuchi, 1992). However, more emphasis on the irrigation system improvement was made in the report prepared by FAO/IBRD mission in 1967 (Alwis, 1986). Therefore, the investment in irrigation system rehabilitation has shown a rapid increase after 1980s with the implementation of several rehabilitation projects.

2.1.2.1 Tank Irrigation Modernization Project (TIMP)

The Tank Irrigation Modernization Project (TIMP) which commenced in 1978 is the first large scale public investment made for the rehabilitation of irrigation systems in Sri Lanka. The project covers a total area of about 12,752ha of irrigable lands belonging to five major irrigation schemes; Maha Vilachchiya, Mahakanadarawa, Pavatkulam, Vavunikulam and Padaviya located in the North Central Dry Zone. The main objective of the project was to increase the agricultural production in the irrigated lands under the schemes by adopting improved agricultural and irrigation practices (Abeysekara, 1993). The major approach experimented in this project was physical improvement of the system and adaptation of strict water management and rotational irrigation practices (World bank, 1976; ARTI, 1984).

TIMP followed three tier committee system for the project executing purposes. The committee at the ministry level included senior representatives of related departments and agencies and was chaired by the Secretary, Ministry of Irrigation, Power and Highways. The committee had the responsibility for overall project execution and coordination. It was expected to meet quarterly to make policy decisions, to review work progress and to approve budget. The second level committee was at the district level and was chaired by the Project Engineer. It consisted of district level

representatives from various Departments. The third level committee was at tank level with the representation of Project staff and the farmer representatives.

The major focus of the TIMP was on construction related activities which were dominated by top down government interventions. In the early stage of the project poor emphasis was placed on farmer needs. This deficiency was identified in the latter part of the project and some efforts were taken to remedy the situation (Abeysekara, 1986). Two tier institutional mechanisms was established to get the farmer participation. Cultivation Committees which include farmer representatives were set up at village level and, Agricultural Productivity Committee (APCs) composed of representatives of the Cultivation Committees was at the higher level.

The duties of the cultivation committees (CCs) were to; undertake the maintenance and the distribution of water in the field channels, recommend any adjustments in the cropping pattern, cropping calendars, and water issue periods designed by ID, and to recommend the minimum water flows necessary for domestic purposes and livestock. Under this institutional arrangement the CCs were supervised by the APC and, problems faced by CCs had to report to the APC. In cases where remedial actions were not taken by farmers, the authority was given to the ID to take necessary action to recover any damages. Much of the irrigation water distribution tasks were undertaken by the irrigators (*Jala palaka*) of the ID, with the assistance of farmers in the area.

Malfunctioning APCs and CCs paved the way to project management to propose a new system called Tank Committees, for the purpose of obtaining active farmer participation in 1977 (Abeysekara, 1986). The Tank Committees were composed of both Farmer Representatives (FR) and officials from various line agencies operating in the project area. Each FR in the Committee was from a group of about 50 farmers, operating under a single channel, in the project command area. The Committees were expected to meet regularly and to discuss various aspects of project implementation and operations for making appropriate recommendations to the project management. The Tank Committee was chaired by the Irrigation Engineer. With the introduction of the Agrarian services Act of 1979, the *Vel Vidhane* (Irrigation Headman) reappeared in the form of a representative elected by the farmers in a particular tract. The *Vel Vidhane* played an important role in water management and creating linkage between farmers and officials.

The project was criticized by many as drastic changes were brought in the technological design without any consultation with the beneficiaries. If the objectives of the project have been known to the beneficiaries before implementation, it might have been more successful (Godaliyadda *et al*, undated). Post project performance study found that, there were design errors in the concluded system improvement project and that innovations used for the water conservations were inappropriate. But majority of farmers felt that performance of irrigation network had improved (ARTI, 1984). The reason for the situation as identified by the assessment report was low level of beneficiary participation in the design and construction. The supervision of water rotations by the elected FRs was also mostly inefficient below the FC level but

the formulated model was effective at the DC level and above. However, the experience gained from TIMP gave many useful lessons in planning and implementing followed up rehabilitation projects (Murray-Rust and Rao, 1987; Merrey and Murray-Rust, 1987).

2.1.2.2 Village Irrigation Rehabilitation Project (VIRP)

The project is concerned with the scattered, irrigable areas commanded by small village tanks and anicuts. The project area covers the whole of the dry and intermediate zones, together with minor parts of the neighboring wet zone and excludes only the two major dry zone districts of Anuradhapura and Polonnaruwa. The objectives of the project were centered on increasing agricultural production and farmer income by rehabilitating about 1200 village irrigation schemes with improvements and repairs to tank infrastructure and irrigation distribution system, and modernizing the schemes in working condition to facilitate the introduction of systematic water management programs. The project was also aimed to strengthen the major government institutions involved in the management of minor irrigation systems (World Bank, 1981).

There were two implementing institutions for the VIRP, namely, Irrigation Department which was responsible for the civil works component of the project. The Department of Agrarian Services (DAS) was responsible for planning and implementing a water management program to ensure the optimum utilization of available water. Subsequent to rehabilitation, O&M activities became the responsibility of the farmers with the technical support and sponsorship of the DAS.

The experience of VIRP reinforces the merits of mobilizing farmers in the rehabilitation process. Farmers' involvement and their participation in designs, investigations, constructions and monitoring and evaluation of the rehabilitation program and the quality of work was almost non existent in many VIRP schemes. The implementation of the VIRP by the government departments did not take much effort to get the farmers' contributions. The farmers' involvement was limited to ratification of the project proposal prepared by the agencies. Even the Agricultural Plannig Team (APT), which was set up to achieve the institutional and management needs of the rehabilitated systems, was not represented by ID or farmers. This has resulted in an unhealthy situation in most of the rehabilitated minor tanks in regard to post-rehabilitation management. APT also had to perform a catalytic role and had to promote farmers to organize themselves, but APT did not have the resources or the skills required for organizational activity (Fernando, 1991).

Abeyratne (1986) observed that the omission of local knowledge and experience from the design and construction process was a serious drawback especially in the first few years of the VIRP. Farmers were hardly consulted or kept informed of the design plan. Usually labour and the contractors were not selected from the local area and were brought from outside. Local farmers were not used to work as labourers and they were not given an opportunity to comment on the quality of the work done by the

contractor. VIRP has failed as a rehabilitation project, but it provides lessons of importance of empowering farmers in rehabilitation projects.

2.1.2.3 Major Irrigation Rehabilitation Project (MIRP)

The Major Irrigation Rehabilitation Project (MIRP) was funded by the World Bank and co-financed by the Canadian International Development Agency (CIDA) and the Swiss Development Corporation (SDC). The project was planned to cover seven major irrigation schemes, but covered only five; Kantale, Giant's Tank, Rajangana, Nachchaduwa, and Huruluwewa. The project was implemented during the period 1985 to 1992. The primary objective of the MIRP was to increase agricultural production in the irrigation schemes mainly through improvements in water control and management. The development approach adopted in MIRP included three components a) the rehabilitation of the irrigation conveyance system; b) the development of the institutional organizations; and c) the improvement of crop production in the schemes through the strengthening of input supply and services.

Experiences gained from TIMP and Gal Oya Water Management Projects were heavily used in the designing of the MIRP. Mechanization for dry tillage which was introduced and failed in the TIMP was given up in MIRP. Channels were designed to carry up to two cusec of water to avoid the peak demand of water during the land preparation. Water rotations were rescheduled to permit gate operations only in day time compared to the 24 hour rotation schedule implemented in TIMP. MIRP also invested in installing more expensive broad crested weirs to avoid damage by farmers. The executing agency of MIRP was the Irrigation Management Division (IMD), but all civil works were undertaken by the Irrigation Department. The project organization was also linked to the Integrated Management of Major Irrigation Systems (INMAS) Program. The project management committee established under the INMAS program was responsible for coordinating the tasks relating to irrigation water management and those activities were supported by farmer Organizations at the distributory channel and field channel levels. An important component of this project was the utilization of the services of Institutional Organizers (IOs) to assist and develop the process of mobilizing beneficiary farmers and establishing viable farmer organizations.

The farmer organizations and the project management committee coordinating mechanism of INMAS model came into being in the MIRP project schemes just before implementation of the rehabilitation program. This particular mechanism facilitated the participation of the farmers in planning, designing and construction of the rehabilitation works. The construction priorities were jointly fixed at the project committee and FO meetings. The FOs could undertake and complete many construction works successfully (Fernando, 1991).

The absence of speedy responses from the project management to specific problems of the farmers has led to distancing of the farmers and the project managers. The role of Institutional Organizers in the establishment of farmer organizations was often constrained due to problems such as; undue political pressures affecting the formation

of farmer organizations and selection of farmer representatives, conflicts of interests between and within organizations and a misperception of the farmers on their role (Abeysekara, 1987).

2.1.2.4 Irrigation System Management Project (ISMP)

The ISM Project was implemented with the assistance of the United States Agency for International Development (USAID) for improving water management on Major Irrigation Schemes in Sri Lanka. The general purpose of the ISMP was to develop a national institutional capability to increase food production from existing irrigated land. The major objectives of the ISMP were: to develop and strengthen capabilities within FOs to assume responsibility for O&M, to enhance the O&M capabilities of the staff of the Irrigation Department, to support the program for Integrated Management of Major Irrigation Schemes (INMAS) under the IMD and to institutionalize the training capacities of the agencies involved in supporting FOs by improving O&M and project management skills.

The development strategies of ISMP were implemented in the irrigation schemes through the PMCs. At the local level, farmer organizations were utilized to mobilize farmer participation in operation and maintenance activities. The PMC, therefore, was expected to represent farmer interests, with the responsibility of ensuring overall supervision. This design of the organizational structure was based on the experiences gained from previous rehabilitation projects, particularly, the Gal Qya Project.

At the initial stage of the project, the staff of the line agencies had to be motivated through training and holding workshops with the participation of farmer representatives themselves. In these workshops the expectations of farmer representatives from the officials and vice versa were discussed. Farmer representatives themselves knew that the same officials would be working with them in effecting the improvements to the system and would also become trainers to train them (farmer representatives) in O&M and other related activities connected to the functioning of the FOs. At the same time Institutional Organizers (IOs) were also recruited and were given training to work as "change agents" in this development process. These IOs also attended the seminars held for the farmers and other officials.

2.1.2.5 National Irrigation Rehabilitation Project (NIRP)

NIRP project commenced in 1992 with a nationwide scope. The project was aimed at rehabilitating about 1,000 minor irrigation schemes covering some 25,000 ha and about 60 medium/major schemes with a command area of 12,500 ha, which accommodated about 7 percent of the total irrigated area as of 1990. The main objective of the National Irrigation Rehabilitation Project was to stabilize and increase agricultural production and incomes and to raise the standards of living through rehabilitation and improved O&M of existing irrigation schemes. Subsidiary objectives included (a) upgrading the skills of farmers and the staff of the implementing agencies, and (b) creating viable Farmer Organizations for managing the rehabilitation schemes and post project O&M (World Bank, 2004). The NIRP

having identified the problems related to the irrigation schemes suggested that there should be maximum participation of farmers at all stages of the rehabilitation. To achieve the beneficiary participation, NIRP had laid down three principles. Firstly the farmers were called upon to establish FOs at the preplanning stage, secondly, the FOs had to agree to contribute at least 10 percent of the total rehabilitation costs, and finally FOs had to agree to maintain the scheme in accordance with O&M plan. Therefore once the rehabilitation was completed, the scheme was handed over to the respective FOs (Irrigation management turnover). The FOs had to take the responsibility for O&M in field and distributory channels, while the agency continued to look after the headworks and the main channels.

2.1.2.6 Mahaweli Rehabilitation and Reconstruction Project (MRRP)

Mahaweli Reconstruction and Rehabilitation Project (MRRP) started in 1998 with financial assistance from the World Bank. The MRRP aimed to improve the efficiency of public expenditures, by way of transforming the Mahaweli Authority of Sri Lanka (MASL) from a project implementing agency into an entity responsible for overall water management and environmental protection. The proposed project consisted of three main components, namely, restructuring of the Mahaweli Authority with emphasis on development of FOs to take over O&M of simple downstream facilities, streamlining of public service functions such as extensions, and privatization of commercial activities and rehabilitation of irrigation facilities involving mainly distributory and field canals and strengthening environmental management including establishment of a monitoring capability and the capacity to address high priority environmental issues in MASL (World Bank, 2004).

One of the objectives of this project was the rehabilitation of irrigation network on Mahaweli system H, by handing over of Distributory and Field canals to the FOs for O&M for increasing farm productivity. System H was built in 1974-1980 period and it covers 31,500ha of irrigated land extent benefiting 30,000 farmer families. During a short period of less than 18 years, Mahaweli H has deteriorated to a level that needed rehabilitation. During the rehabilitation program 250 Distributory channel farmer organizations have been strengthened and an action plan has been prepared and implemented to ensure farmer participation at pre-construction, construction and post-construction stages of the project (Silva, 2002).

Bulk Water Allocation (BWA) programme implemented in Mahaweli H area is an outcome of MRRP. Coordinating committees established at the unit, block and project levels to facilitate conflict resolution and decision making in respect of scheduling seasonal agricultural plans, O&M, water distribution, extension, and marketing, and to help implementation and monitoring of those activities. A well planned institutional development program was launched to improve the conditions of farmers by changing their attitudes and to make them volunteer to accept O&M responsibilities of rehabilitated channels. In order to follow the participatory rehabilitation planning process within a limited time, eight multidisciplinary survey teams consisting 3-4 Engineering Assistants, two IOs with supporting staff were formed and assigned to each management block. Those teams consulted farmers by holding Participatory

Rural Appraisal (PRA) sessions, and each team was assigned to hold ratification meetings to get the concurrence of the farmers for final decisions (Silva, 2002).

2.2 Irrigation Management Policies

The GOSL has failed to make necessary policies to mobilize sufficient resources from irrigation beneficiaries to ensure proper maintenance of expanded and improved irrigation infrastructure. The allocation made from government for O&M has also decreased over the years at real prices. Direct charging for water was politically very sensitive and has caused severe negative consequences for ruling parties in the past (Silva and Vidanapathirana, 1984). However, historically there had been several instruments used by the government to collect revenue for the state to meet part of the irrigation cost. The recent attempts to recover the cost of irrigation are discussed follows.

2.2.1 User Fees

As indirect tax does not provide any incentive to use the water resources efficiently, GOSL has made several attempts to collect irrigation fee directly from water users. According to the economic theories, pricing of services or commodities is needed to ensure the optimum resource allocation in production. Water pricing methods can be based on volume of water consumed or extent under cultivation. In Sri Lanka O&M fee implemented was based on the area of land cultivated irrespective of the volume of water consumed. In economic efficiency terms, area based pricing is not efficient because farmers are inclined to use as much as possible water for the given fee in the absence of physical, administrative, legal or social restrictions, to prevent them.

Irrigation Ordinance No. 48 of 1968 provides for the imposition of an irrigation rate upon lands benefitted or to be benefitted by irrigation under any season. The government imposed a land tax of Rs 30/ac in major irrigation schemes with over 150 cropping intensity and Rs 20/ac in major irrigation schemes with less than 150 cropping intensity and minor irrigation schemes with more than 150 cropping intensity since 1978. This policy was implemented only during 1981-1983 in major schemes and collections were minimal (Silva, 1986). However, the government was under pressure from donor agencies to increase the revenue collection from beneficiaries to bridge the resource deficit existed in sustainable irrigation maintenance.

In 1984, the government introduced an O&M fee in all major irrigation schemes with the promise of improved irrigation services. The need to collect O&M fees arose from the inability of the state to generate and allocate sufficient funds to operate and maintain major irrigation schemes at optimum level. The direct consequence of the failure to allocate sufficient funds for O&M in the long run has resulted in rapid deterioration of irrigation infrastructure.

With the introduction of irrigation fee in 1984, the average cost of operating and maintaining an acre of irrigated land under major irrigation schemes was estimated at

Rs. 200 per acre. However government aimed to start with the recovery of 50% O&M cost. This was eventually to be increased in five year period to cover the full amount. Accordingly, the fee payable by farmers was set at Rs. 100.00 per acre in 1984.

Fee collection started with promising results, but did not last for more than four years. By the end of 1985, total collections of the 1984 fees amounted to slightly over 40per cent of the amount due. By the end of 1986, only 15per cent of the fees for 1985 had been collected, while collection rates for the 1986 fees stood at only 11per cent. This approach was translated by opposition political parties as an attempt to privatize the irrigation systems, and it became a contentious political issue, leading to failure of the new system. On the other hand fee collection plan also suffered from a variety of implementation problems. There were several reasons for this situation including; failure to live up to the promise of improved irrigation services, inability of linking the collected revenue for the system improvement, weak enforcement mechanism adopted for fee collection , failure to take action against defaulters and the ability to obtain the irrigation services even without fee payment. On the other hand in the gravity operated surface irrigation setting for small farmers, the prevention of access to water on grounds of default is virtually impossible unless cultivators are evicted (Small and Carruthers, 1991; Brewer, 1994 and Wikramarathne and Ekanayaka, 2002). Adoption of a uniform rate of O&M fee collection for all the schemes without considering the water availability and physical condition of a given scheme also had an impact on the failure of the policy. (Merrey *et al*, 1989).

2.2.2 Farmer Participation

The failures of past attempts in the collection of O&M fee demanded an alternative policy for the sustainable and efficient management of irrigation infrastructure and management of water resources. The participatory irrigation management (PIM) policy was formally introduced by the government in 1992 through a cabinet paper. According to this farmers were to participate along with the agency in the management of irrigation systems. The PIM policy is not solely a cost recovery policy; rather it was seen as a strategy of cost reduction and transferring powers and authority to beneficiary groups. The government expected to reduce the cost of irrigation O&M by 50% through the policy of PIM as stipulated in the cabinet Memorandum of 1989.

2.3 Evolution of Participatory Irrigation Management Policy

2.3.1 Farmer Participation until Late 1970's

In ancient times farmers themselves managed the irrigation system through their own institutions traditional customs, rules and regulations. As correctly pointed out by Silva and Vidanapathirana 1984 and Razaak, 1992, Sri Lanka's, ancient hydraulic civilization and concept of irrigation management was certainly centered on PIM. The specified irrigation management tasks were performed by the people in ancient times through the feudal system of '*Rajakariya*' (Literally work performed by the people to the king). The '*Rajakariya*' was a socially, morally and legally decreed requirement

of a given agricultural community. There were numerous rules, customary regulations and sanctions in regard to utilization of irrigation water to punish the rule breaker or free rider. All decisions regarding the irrigation and cropping were based on the concept of equitable rights which were implemented through '*Gamsabhawa'* headed by '*Gamarala'* (village headmen) (Leach, 1961).

The feudal '*Rajakariya'* system was abolished by the British colonial rulers in 1832. This led to inactivate '*Gamsabhawa'* and *Gamarala'* system and malfunction of customary rules and punishment systems. The ultimate outcome of the abolition of '*Rajakariya'* system was the deterioration of irrigation systems (Silva and Vidanapathirana, 1984). This was later realized as a serious mistake done by the colonial rulers as pointed out in Sir John Keane's irrigation sessional paper SLV, 1905 *(ibid)*.

In the latter part of the British administration, colonial government tried to improve the performance of irrigation facilities through the implementation of various ordinances. The first such effort was the introduction of Irrigation Ordinance of 1856. Under this act the earlier local representative or '*Gamarala'* was replaced by '*Vel Vidhane'*. The main duties of the '*Vel Vidhane'* were to decide on the date of commencement of cultivation season and the calendar of agricultural activities, to maintain a consensus among farmers in matters relating to irrigation and agriculture, and to act as representative of farmers when dealing with the government bureaucracy (Weeramunda, 1987). The establishment of Irrigation Department (ID) in 1900 shifted the trend of irrigation system management towards centralization and bureaucracy once again (Moore, 1982, Razaak, 1992). Irrigation management became the dual responsibility of farmers and the state.

Irrigation Ordinance of 1951 and 1956 deemphasized the farmer involvement. However formations of Cultivation Committees (CCs) with the introduction of Paddy Land act No. 1 of 1958 attributed to provide incentive and recognition for farmer participation. The CCs consisted of elected farmer representatives responsible for the resolution of land disputes, coordination of cultivation activities and distribution of irrigation water. Irrigation committees were established in irrigation schemes. Although the act had the provision for forming irrigation rules by CCs, no legal effect was given to this provision. Therefore the committee framed only draft rules.

The Agricultural Productivity Act of 1972 abolished cultivation committees and established Agricultural Productivity Committees (APC) in each village. The FRs for APCs were not elected by farmers, but they were selected by the Minister of Agriculture which limited the real farmer representations and were less accountable to farmers.

The Agrarian Services Act of 1979 abolished APCs and established Agrarian Services Committees (ASCs). The Cultivation Officers were responsible in cultivation matters at the village level. These committees comprised both farmer representatives and government officials. *Vel Vidane* at the local level assisted Cultivation Officers to perform water management tasks in small irrigation systems. ASCs could not function

independently and farmers failed to recognize the ASCs as their own institutions. This was the policy that existed until the introduction of PIM policy in 1992.

2.3.2 Lessons of Experiences of Pilot Projects Used for Participatory Irrigation Management

2.3.2.1 Minipe Water Management Project

In 1978, N.G.R. de Silva, then Deputy Director of Irrigation, Kandy Range, call for the help of various persons to organize and motivate farmers to undertake needed repairs in the Minipe system. This was a first formal attempt in post independence era to solicit farmer participation in a major irrigation scheme. The strategy of water management adopted in the Minipe scheme was based on an understanding of the entire range of problems and constraints encountered in water management by placing emphasis upon its social aspects.

The absence of awareness among the farmers regarding the economic and social benefits of regulated water use, organizational constraints on systematic irrigation practices, inadequacy of communication and contact among the different groups associated with irrigation, especially between administrative and technical officials and farmers, and the lack of opportunity for farmer participation in the affairs of water management were the specific issues upon which the strategy was focused.

At the stage of program initiation, a decision was taken to form a water management advisory committee consisting of representatives of the relevant government authorities, and initiate a system of water management through representative institutions and the participation of farmer representatives within the Minipe scheme. The water management project began on an experimental basis in a pilot area and subsequently was extended over the entire scheme. As a prior activity, a publicity campaign was conducted by non-governmental organizations with the assistance of officers from the ID, DAS and Department of Agriculture (DOA). De-silting of the main channel was done through a campaign to obtain voluntary labour of the farmers.

Minipe experiment made the pioneering effort to use the ‘Catalysts’ in initiating the transformation among farmers. The project fielded young people in the pilot area during the first year (Merrey *et al*, 1988). Three tier hierarchy of representative committees were formed in the project area to accommodate the farming community at various levels of decision making and decision implementation in water management, promotion of communication between farmers and officers and coordination of the functions of various government agencies. Farm level water management committee was at the ground level and, committee consisted of two or three farmer representatives, the water controller of the ID and the extension officer of the DOA. The committees handled routine water management activities, usually at tract level. Sub project water management committee was at the second level of the hierarchy, consisting of 12 elected farmer representatives and the field officers of the ID, DAS and DOA to serve the sub project area. The committee had to meet monthly for planning and implementing decisions on water use and on certain activities

relating to the upkeep of the irrigation system in the sub project area. The project water management committee was at the top and its functions were related to overall control and co-ordination of activities in water management in the entire Minipe scheme. The project water management committee consisted of 23 farmer representatives and about 20 officials of the Department of Agriculture, Irrigation Department and Department of Agrarian Services. According to the project evaluation of ARTI (1987), creation of participatory joint management committee was the key innovation.

Evaluation studies showed that, even though this project was designed to obtain farmer participation, most of the farmers were not aware of the program and the project objectives did not penetrate down to the farming community in a significant manner. The farmer representatives' acted as links between the farmer and the officers, but representatives had not been seen by the farmers as a part of the decision making apparatus in water management (Peiris, 1987; ARTI, 1987). However, there were some positive impacts of the project, but the project had failed in achieving the overall objectives (ARTI, 1987). The organizations established in the project attributed the lack of sustainability due to poor coordination with line agencies, poor farmer participation at meetings, problems in implementing project committee decisions and poor physical conditions of the system. Mobilizing the people in the process of decision making was a strategy used in the program and it was not a success due to many reasons. Farm level water management committee never got off the ground, but the farmer participation at sub project water management committee level functioned well at early stages. However, farmers started to move away from the committee gradually, loosing interest on committee established under the project. This was often seen as a consequence of inadequacy of resources made available to the committee to cater to the farmers' needs (Peiris, 1987).

Nevertheless, the Minipe experiment had a considerable impact on the development of water management activities in Sri Lanka, especially influencing the water management activities in other major irrigation schemes and changing the attitude of a large number of technocrats and other officers of the ID towards enlisting greater farmer participation in irrigation management (De Silva, 1985; ARTI, 1987).

2.3.2.2 Kimbulwana-Oya Water Management Project

In 1979/80 the government of Sri Lanka undertook the rehabilitation of the Kimbulwana Oya irrigation scheme under the Kurunegala Integrated Rural Development Programme (IRDP), funded by the World Bank. Along with the physical improvement of the irrigation system, the Kimbulwana Oya scheme witnessed the launching of a social experiment in water management. Prior to the implementation of the new water management project, the system was in a poor physical condition. This was mainly due to lack of farmer participation in O&M, lack of sense of ownership over the system among farmers, and insufficient coordination between government officials and farmers adopting management decisions and solving minor conflicts (Gunadasa, 1989).

With that understanding, maximum farmer participation was considered as an essential component in the process of rehabilitating Kimbulwana Oya scheme. Awareness programs conducted had created widespread interest on the farmers to take part in the rehabilitation works. They were willing to participate in construction works and labour availability was higher than the required level. Therefore, selection of laborers from enthusiastic farmers was done in a systematic manner. First, the Technical Assistant (TA) made a list of all available farmers. Second, the TA asked only the right number of farmers to work on dates when the Department needed them. Third as far as possible, an effort was made to accommodate those farmers with allotments under their respective field channels to work with the department supervisors. Rehabilitation works were planned to be executed during off seasons as a mean of household income. This particular approach inspired the farmers to make some effort to find solutions to the existing problems in the respective channels. Farmers were organized into labour groups under the competent supervisors and these teams had to expose every structure, where leaks were expected, and search possible cracks and waterways that were causing failures to structures. The direct involvement of farmers in this process helped the farmers to gain a greater understanding and awareness of the technical aspects of the systems, on the causes leading to deteriorations, and measures necessary to maintain the system (Gunadasa, 1989).

After the completion of the construction work, the government could not take the maintenance responsibility of the whole scheme, and it became necessary to hand over at least part of the responsibility to the farmers. Officials took action to make both farmers and farmer representatives understand the importance of proper maintenance. During these discussions farmers became aware of the importance of proper maintenance of the system to ensure reliable water supply to the fields.

Farmers' involvement in rehabilitation was the starting point of the sustainability of the Kimbulwana Oya irrigation scheme. Farmers' participation in rehabilitation process helped to create a sense of ownership of the system among them and the importance of it to their livelihoods. The Kimbulwana Oya rehabilitation approach also emphasized the importance of paying attention to the psychological aspects of farmers as the physical inputs for the sustenance of the system (Fernando, 1991).

2.3.2.3 Gal Oya Water Management Project

Gal Oya Left Bank (GOLB) Rehabilitation project which started in 1979, is considered as a landmark in irrigation rehabilitation in Sri Lanka. As part of this exercise, Farmer Organization concept was introduced as an experiment to obtain farmer participation in water management. The ID was appointed as the project implementing agency with the technical assistance of the PRC Engineering Consultants, Inc., of USA. Through a letter of understanding, the ID was further assisted by the ARTI (now HARTI) which worked on the software development of the project. The ARTI was assisted by the Rural Development Committee of the Cornell University, USA.

Prior to the project, cooperation and social relations among settler farmers who came from different areas of the country were minimal and the relationship between farmers and ID officials were very poor due to misunderstandings among the two parties. Preliminary studies found that the farmers' lack of confidence in government officials was the main obstacle to farmers' participation in O&M activities in the GOLB. Farmer participation in water management had been further discouraged by the heterogeneity of the population and rural leadership in the area (Perera, 1986).

Objective of the GOLB rehabilitation program was to establish better water management practices through rehabilitation of the system, and to promote the farmers' participation in water management and system maintenance at all stages via formation of Farmer Organizations. Beneficiary participation in management process was considered as an important component in GOLB rehabilitation program to ensure better utilization of water and after care of the system (IIMI, 1992).

Beneficiary participation through the formation of FOs in GOLB rehabilitation program started as a learning process approach for organizational development. For the purpose of creating farmer organizations, the project used a novel approach of using the 'catalyst' called Institutional Organizers (I0s) to function at the field level. Most significant feature of the process of establishment of FO was that IOs were not expected to establish a ready-made model organization in the community. First step was the familiarization with the area and farmers, and discussing the problems and needs of the farmers and recognition of the strategies to solve those problems by themselves. The next step was to organize an ad hoc committee or to choose a spokesman to represent the group, and to direct group activities such as de-silting a field channel, and repairing a broken channel gate. At the stage, when farmers got used to work together and realized that such group activity benefited them, farmers were encouraged to form a more viable FO at the field channel level.

Another key strategy adopted in this project was the mobilization of local knowledge and user participation in system improvement and management. These strategies proved quite successful. Farmer participation in the design process through group approaches was encouraged. Farmers as groups had been directly involved in the physical rehabilitation of the system in two ways. First, farmers had participated in the designing of their field channels. Second, they were responsible for doing earthwork in reconstruction of field channels. During the early phase of the project, each farmer group had two types of meetings with the engineers as; design meetings and "walk-along-the-channel" meetings. In channel walking meetings, Irrigation Engineer walked along a field channel along with the farmers observing defects of the system and discussing possible solutions. During these meetings, farmers informed the engineers about field channel conditions, the layout of the land, the length, position, and effectiveness of poles, etc., It would have been difficult for engineers to gather such information by themselves (Perera, 1986).

Razaak (1996) indicates that the FO program made significant growth in its initial three years and, thereafter, it began to decline. Such a trend was seen in many FO activities viz; FO meetings, farmer participation in water-saving methods, group

activities in system maintenance and relationship with farmers and officers. This study also revealed that there were four major causative factors for this kind of evolution in farmer organization programmes. They were, degree of catalyst support; bargaining capacity of FOs as independent organizations; degree of benefits offered through FOs; and support extended from the line agency (ID) officials for FO activities.

2.3.3 Models Adopted for Developing Participatory Irrigation Management

Three different management models have been introduced to manage irrigation schemes under the participatory approach in 1980s. They are; Integrated Management of Agricultural Settlements Schemes (INMAS) program implemented jointly by Irrigation Management Division (IMD) and ID; Management of Irrigation Schemes (MANIS) handled by ID and Mahaweli Economic Agency (MEA) model implemented by the Mahaweli Authority of Sri Lanka (MASL). The Bulk Water Allocation (BWA) Program is the latest management model experimented by Mahaweli Authority of Sri Lanka in Mahaweli 'H' zone.

3.3.3.1 INMAS Model

The INMAS programme was begun in 1984 with experience of earlier water management programs and funded by the World Bank Major Irrigation Rehabilitation Project and USAID Institutional Strengthening Project. INMAS covers 35 major irrigation systems, mostly of those with command areas greater than 400ha under the ID. To implement the INMAS program the Ministry created a new agency called the Irrigation Management Division (lMD) which is a separate entity from the Irrigation Department (Brewer,1994). The goal of this program was to create, and strengthen Farmer Organizations to eventually take over O&M functions of the system.

A specialized Resident Project Manager (RPM) is stationed in each INMAS system employed by the IMD and responsible for the establishment and strengthening of farmer organizations, for coordinating government agency efforts, and for chairing the Project Management Committee. The RPM is assisted by an Institutional Development Officer (IDO) specifically charged with creating and strengthening farmer organizations. In some INMAS systems, the IMD has appointed Institutional Organizers (IOs) on a casual basis to act as catalyst agents to create and strengthen farmer organizations until the farmer organizations develop their capacity (HARTIand IWMI, 1997).

Institutional arrangements under the INMAS model had a three-tiered setup and farmers were organized into informal field channel groups (FCG), with a leader in each case generally selected by consensus of the respective FC farmers. The FCGs were federated into formal Distributary Canal organizations (DCOs) comprising the entire membership of DC command area. At the top level PMC consisted of line agency officials and the farmer representatives of all DCOS in the scheme.

2.3.3.2 MANIS Model

The INMAS program dealt only with larger schemes and did not include the medium schemes. Therefore, in 1986, Irrigation Department created the Management of Irrigation Schemes (MANIS) program to serve the needs of medium schemes and the major schemes not covered by INMAS. The MANIS programme covered 160 medium sized schemes (80 to 800ha) managed by Irrigation Department. The basic organization and objectives were similar to INMAS except that it was solely managed by the ID. A Technical Assistant (TA) in the ID was assigned as a part time Project Manager for each MANIS scheme. At the early stages of the program the Project Managers did not have specialized assistances such as IDOs or IOs, and allocation of special inputs was limited. Some of the MANIS schemes were taken for the rehabilitation under the World Bank funded National Irrigation Rehabilitation Project.

2.3.3.3 Mahaweli Model

There are six hydrologically distinct irrigation schemes as Systems come under MASL namely, system H, System C, System B, System L, Bakamuna and Uda Walawe. The MASL had initiated its own version of the PIM program initially in the four of the large systems it manages.

Each Mahaweli system has a RPM as in the INMAS program. Each Mahaweli system is divided into several block areas under the leadership of Block Managers and each Block consisted of several Units led by the Unit Managers. The Mahaweli model used several mechanisms to organize farmers for participatory management. The creation of “turnout groups”, which is similar to FCGs in INMAS programme, was the first experiment in organizing farmers within the Mahaweli systems. Under this program a farmer leader was selected for each turnout and capacity building training was given to them. These leaders helped the management of irrigation and other issues in the turnout area. In 1985, MASL invited a non governmental organization called Nation Builder’s Organization to organize farmers in System B and Uda Walawe. Nation Builder’s Organization used field catalyst agents to mobilize the framers.

With the official announcement of the participatory irrigation management policy in 1992, MASL made efforts to create farmer organizations in all Mahaweli schemes. A central unit for Institutional Development was created for the Mahaweli and an IDO was appointed for each block. He was supervised by an Assistant Manager of the institutional development division of each scheme. Institutional Organizer Volunteers (IOVs) were appointed as catalysts for each scheme on a casual basis as similar to IOs fielded in INMAS to mobilize farmers at field level.

2.3.3.4 Bulk Water Allocation Programme

The concept of bulk water allocation (BWA) was introduced in Sri Lanka with the implementation of MRRP in 1998 as a pilot project in Mahaweli system H. Efficient use of water resources, equitable distribution of water with active farmer participation, creating a sense of ownership and attitudinal changes were the major

expectations of the BWA programme (Aheeyar *et al*, 2007). Under the BWA system, a specific quantity of water for a season was fixed for each Distributory channel in consultation with farmers. The specific quantity of water which is allocated for a DCO was decided on the basis of the total irrigated land within the DCO command area, types of crops to be cultivated and the quantity of water required per rotation to meet the crop water requirement.

BWA was designed to implement at three levels; System level allocation by Water Management Panel of MASL, Block level allocation by the Project Management Committee and D-channel level allocation by the Block level Farmer Federations (BLFF) or Block level PMC. Each DCO had to request for the seasonal water allocation from the BLFF or PMC. The BLFF prepared the water requirement for the entire block and submits to the MASL via system level PMC. The Mahaweli water panel at MASL adjusted the bulk water allocation for each system considering the availability of water in the reservoir and fixed it for the season.

The farmer participation in water management was carried out at three levels, namely a) field channel level, b) D- channel level and c) block level. Field channel organization consisted of about 10-15 farmers. A field channel leader was appointed informally for distribution of water. The leader is responsible for organizing the rotational water issues and scheduling within the field channel.

Distributory channel Farmer Organization (DCFO) consisted of about 100-150 farmers. The farmer in the relevant DCOs had to bear the O&M cost of turned over irrigation systems through a maintenance fund and they had to be involved in management and the O&M of their own irrigation system through mobilization of cash, labour and materials. Each farmer had to pay Rs 250/season for a hectare of low land to DCFO maintenance fund. In order to ensure the adequacy and timeliness of water issues, a Water Master was appointed by the DCFO on payment of an honorarium for his service, from the maintenance fund. Water Master was also responsible for keeping records on water issues to each channel and maintaining the notice board at the head end of D- channel to inform the farmers of the water schedule.

CHAPTER THREE

Description of the Study Area, Analytical Tools and the Methodology

3.1 Study Sites

Study sites were selected to represent different contexts, such as different Agro-Ecological Zones, management model, different degree of water availability, and different interventions. The list of selected irrigation schemes and the main features of the schemes are given in table 3.1.

Table 3.1 Selected Irrigation Schemes & Their Main Features

District	Name of irrigation schemes	Type of the schemes	Management model	Water availability	Other Remarks
Anuradhapuara	Kallanchiya	Medium Tank	MANIS	Water Deficit	No Rehabilitation
	Huruluwewa	Major Tank	INMAS	Water Deficit	Post Rehabilitation
	Mahaweli-H (Eppawala Block)	River Diversion	Mahaweli model Bulk water Allocation	Moderate	Post Rehabilitation
Polonnaruwa	Mahaweli-B (Pimburaththawa Block)	River Diversion	Mahaweli model	Abundance of Water	No Rehabilitation
Kurunegala	Bathalagoda	Major Tank	INMAS	Water Deficit	No Rehabilitation
	Maha Siyabalangamuwa	Major Tank	MANIS	Water Deficit	No Rehabilitation
Hambantota	Muruthawela	Major Tank	INMAS	Water Deficit	Recently Rehabilitated
	Mau-Ara	Major Tank	MANIS	Moderate	Newly Constructed and augmented
Nuwara eliya	Kande-ela	Anicut	MANIS	Abundance of Water	No Rehabilitation
	Ma eliya	Anicut	MANIS	Abundance of Water	No Rehabilitation

3.2 Data Sources

Four Interconnected tools were used to generate the necessary information for the study.

I Review of Existing Literature

Much information on the experience of PIM in major irrigation schemes experimented under different irrigation rehabilitation projects such as TIMP, VIRP, MIRP, NIRP, and ISMP have been documented in the form of published and unpublished reports and monographs. A comprehensive review was undertaken to extract the salient features and major issues in PIM to undertake the current study in a more focused manner.

II Key Informants Interview

Interviews were conducted using guided schedule/checklist with various persons in the agencies and leaders of system level farmer organizations and officials of PMC about the achievements, problems and prospects of PIM.

III Focus Group Discussions

Focus group discussions on progress of PIM were conducted among different groups of people in the selected locations such as water abundant areas, water scarce areas, OFC farmers, women groups and tenant farmers.

IV Structured Questionnaire Survey

Structured questionnaire survey was employed using trained investigators in the selected schemes representing different management models, different degree of water availability and different interventions. Data collection was conducted during the period May to September 2010.

3.3 Sample Size

From each selected irrigation scheme, two FO command areas were purposively selected to represent head and tail end of the scheme. In single FO schemes, entire command areas were considered as study area. From each scheme 10% or more farmers were randomly selected for the sample survey. The list of beneficiary members under each selected FO command area was used as the sample frame. The total sample size was around 391 farmers which is on average 18% of the total population of the selected FO areas.

Table 3.2: Sample Distribution

Name of the schemes	Selected FO areas	Sample size
Kallanchiya	Parakum FO	34
Huruluwewa	Mahasen FO (Head)	15
	Udara FO (Tail)	23
Mahaweli-H (Eppawala Block)	403/5D/2 Ekshanth FO (Head)	20
	D2/401 Eksath FO (Tail)	20
Mahaweli-B (Pimburuththewa Block)	Track 1 -Ekamuthu FO (Head)	24
	Track 8 -Samagipura FO (Tail)	19
Bathalagoda	Pannala FO (Head)	30
	Uyangalla FO (Tail)	21
Maha Siyabalangamuwa	LB FO	35
Muruthawela	Track 1, D1 FO (Head)	22
	Track 2, D9 FO (Tail)	32
Mau-Ara	Ranmuthuwewa FO (Head)	22
	Kadu Indiwewa FO (Tail)	13
Kande-ela	Gawarammana FO (Head)	15
	Puran wela FO (Tail)	15
Ma-eliya	Parakum FO	31
Total		**391**

3.4 Analytical Framework

Indicators were developed to evaluate each parameter. Quantitative and qualitative tools were adopted in the assessment. Qualitative assessment was based on farmer perceptions of different components and achievements of PIM such as strength of FOs, Level of agency support, extent of resource mobilization for system O&M, physical sustainability of irrigation infrastructure and profitability and sustainability of irrigated agriculture.

The parameters and indicators which were used to assess the performance of PIM under different contexts are shown in the table 3.3.

Contingent Valuation Technique was adopted to estimate the farmers' willingness to pay for improved irrigation service. The contingent valuation method (CVM) is a survey technique that elicits values people provide on the increase or decrease of benefits from natural resources at hypothetical market condition.

A questionnaire can be designed as a measure to elicit WTP for sustainable operation and maintenance (O&M) of the system in order to provide improved irrigation services and also to prevent deterioration of infrastructure.

Table 3.3: Parameters and Indicators Used in Assessing PIM

Item	Parameters	Indicators
Strength of FO	FO performance in organizational management	Number of FO members out of total farmers Quality of FO leadership Degree of financial viability of FOs Quality of FO financial management, Effectiveness of FO internal communication mechanism, Usefulness of FO meetings, Effectiveness of FO decision making process, Effectiveness of conflict management
	FO performance in water management	Effectiveness of FO water allocation mechanism, Effectiveness of water distribution mechanisms
	FO performance in control structure management	Performance of O&M planning Performance in mobilization of resources for O&M
Strength of PMC	PMC performance in effective co-ordination, seasonal planning and problem solving	Participation of line agency officials for PMC meetings Participation of FRs for PMC meetings, Effectiveness of PMC in making seasonal planning, Implementation of PMC decisions, Effectiveness of the agency's catalytic role in FO development, Levels of capacity building provided to farmers
Role of irrigation line agency	Performance of irrigation agency in implementation of decisions, cooperating with farmers, and main system management	Extent of farmer-official contacts Participation of officers for meetings Quality of main system management
Resource mobilization for sustainable O&M	Level of resource mobilized for system O&M and farmers' willingness to pay for improved irrigation services	Current level of resources mobilized for system O&M by the agency, Current level of resources mobilized for system O&M by FOs Farmers' WTP for system O&M

Direct inquiry on irrigation fee is very sensitive among farmers and they may resist answering certain types of questions. However, a traditional custom, which existed in Sri Lanka, was the giving of a certain proportion of paddy to Village Headmen after each harvest for his services, though it was not much practiced in new irrigation

schemes. Therefore, farmers chosen for the survey were asked about their WTP for improved irrigation services and sustainable O&M of irrigation infrastructure in terms of paddy. Before posing the question, the beneficiaries were informed of the existing status of irrigation infrastructure and expected future cost escalation and institutional context in which water resources are to be provided and nature of funding and farmers' responsibilities under the PIM. Then the WTP question was stated as follows;

"How many kg (or bushels) of paddy are you willing to give to your FO per ha of cultivated land per season in addition to your current O&M fee payment (if any) and voluntary labor mobilization for maintenance and FO activities in order to maintain the irrigation infrastructure in a better condition to provide improved irrigation services?".

The factors affecting the amount of WTP and relationship between different variables were established developing a multiple regression model. The following ten independent variables were identified and information was collected from sample farmers.

1. Total family income (Inc) – Rs/month
2. Total low land extent (land) – ac
3. Age (age) – Years
4. Sex (sex)- Male=1, Otherwise=0
5. DC location (loc) –Head/middle = 1, Otherwise=0
6. Type of farming (farm) –Full time = 1, Otherwise=0
7. Current rate of O&M fee payment(Fee)- Rs/ac/season
8. Labour contribution for meetings (meet) – No. of days/season
9. Labour contribution for maintenance (main) – No. of days/season
10. Water availability (avail)-Abandoned=1, Otherwise=0

The willingness to pay (WTP) estimate was regressed as a function of listed eleven variables.

$$WTP = \beta_0 + (\beta_{1\ Inc} + \beta_{2\ land} + \beta_{3\ age} + + \beta_{4\ Ioc} + \beta_{5\ farm} + \beta_{6\ fee} + \beta_{7\ meet} + \beta_{8\ maint} + \beta_{9\ avail})$$

Multidimensional scale (MDS) was used to obtain farmer perception on qualitative variables. Following parameters were assessed by this technique.

(a) Strength of farmer organization- Number of FO members, method of selection of FO leaders, quality of leadership, FO financial transparency, usefulness of FO meeting, FO decision making process, FO horizontal linkages, FO communication mechanism, FO conflict management method, FO water distribution performance, technical capability of FOs to handle O&M activities, effectiveness of FO on O&M activities. Caste and other social divisions and political interferences were considered as main variables affecting the FO strength.

(b) Extent of agency support- Farmer official relationship supports given by the agency for FOs, and performance agency O&M were considered for this parameter.
(c) Extent of Resource mobilization by FO for O&M- Quality of FO maintenance, availability of fund and mobilization of cash and kind for O&M were studied to assess the extent of resource mobilization.
(d) Sustainability of Irrigated Agriculture- The indicators such as percentage of irrigated agriculture income, profitability of irrigated agriculture, and farmers' ability to pay for O&M were considered.

The result of MDS is only a relative measure and was used to validate the results of the descriptive analysis. There are several advantages of using MDS (De Vaus, 1990).

1. It assists in developing more valid measures. Since the method is based on several observations and therefore avoids misinterpretations.
2. Measurements are more reliable due to the use of several questions
3. The responses obtained from a single question does not allow to differentiate between people with much precision. Use of several relevant questions under different variables of a parameter increases the precision of a complex parameter.
4. Analysis is simplified by conversion of number of questions into one variable.

CHAPTER FOUR

Impact of Farmer Participation in Irrigation System Management

4.1 Impact on Physical Condition of the Irrigation Infrastructure

There are two major maintenance activities entrusted to FOs, namely Jungle clearing and de-silting both in the FCs and DCs. De-silting of DCs is sometimes done by FOs on contract basis in non turnover schemes. FOs are also expected to attend small repairs, minor earthworks such as bund filling and maintenance of channel gates by painting, oiling and greasing. In addition FOs in some instances undertake Main Channel (MC) maintenance under the contract agreement signed with irrigation agency through mobilization of labour in some schemes and sometimes on voluntary basis also..

Many issues were raised by the farmers on the current physical situation of the irrigation system that are the responsibility of FOs (DCs and FCs). Farmers were in a general consensus that irrigation systems should be rehabilitated before transfer to the FOs to make them technically and financially feasible to undertake sustainable O&M. Some of the problems expressed by the farmers are illustrated in Figure 4.1. Most common problem reported by them is broken channel bunds. The damaged condition of bunds is due to bad water management and maintenance and movement of livestock freely across bunds. The free range rearing system of farm animals is one of the common problems observed in most irrigation systems. Another problem reported in many schemes was insufficient de-silting, which has led to accumulation of excessive silt load over the years causing difficulties in manual de-silting.

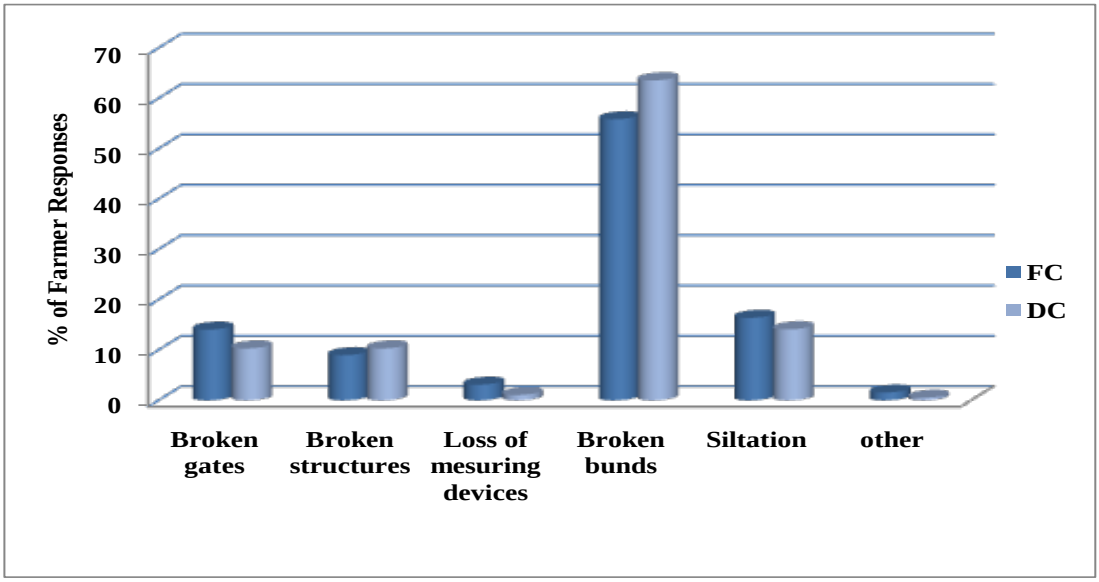
Farmer perceptions were obtained on the allocation of resources for the irrigation system maintenance by the FO's in the context of long term sustainability. Nearly, 80 percent of the respondents in MANIS, INMAS and Mahaweli B systems and the majority of the farmers in Mahaweli system H have reported that the investment of resources by FOs for O&M activities was not at a satisfactory level (Table 4.1). The reasons for the situation were investment from farmers were mostly limited to contribution of labour and neglected condition of broken structures, gates, bunds and pipe outlets which were responsibilities of FOs.

Table 4.1: Consent of Farmers on Sufficiency of Resources Allocation by FOs for Irrigation System O & M to Ensure Sustainability (% of Farmer Responses)

Indicator	Irrigation systems			
	INMAS	MANIS	BWA (Mahaweli H)	Mahaweli B
Agree	14.6	20.8	37.5	18.6
Disagree	83.1	79.2	62.5	81.4
Strongly disagree	2.2	-	-	-

Source: Author's Survey data, 2010

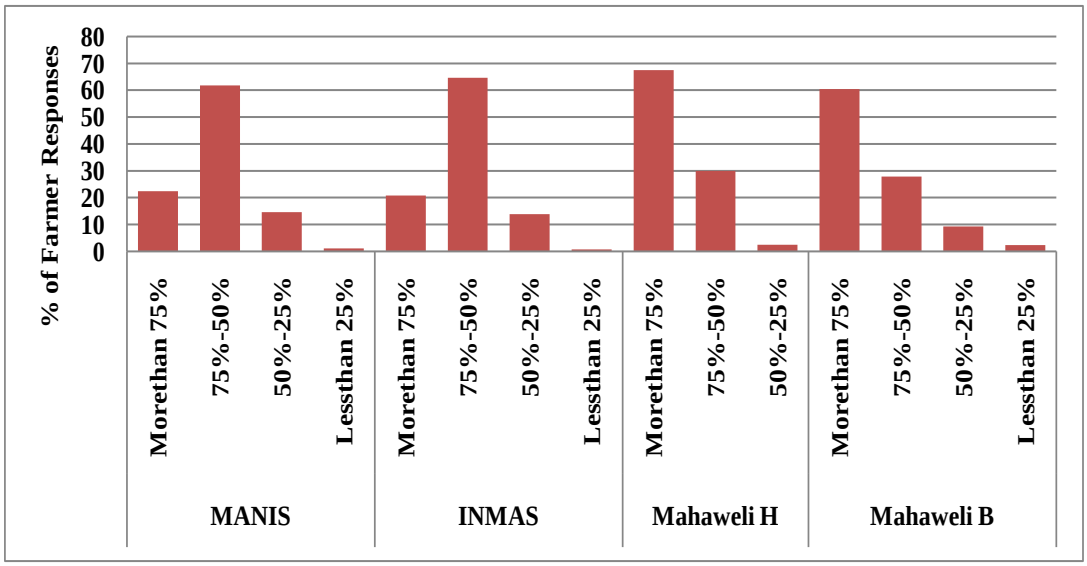
Figure 4.1: Farmers' Observation of Physical Problems in the FC and DC (As a Percentage of Farmer Responses)



Source: Author's survey data, 2010

According to the Figure 4.2, more than 60 % of Mahaweli H and B farmers stated that over 75 % of the DC channel length was properly maintained through de silting and jungle clearing. Mahaweli officers also indicated that they were satisfied with farmer participation in DC maintenance. However, in INMAS and MANIS schemes, more than 60 % of the farmers said that the proper maintenance of DC channel length is around 50 to 75 %.

Figure 4.2: Percentage of the Proper Maintenance of DC Channel by the FO's (As a Percentage of Farmer Responses)



Source: Author's survey data, 2010

As informed by irrigation officials, voluntary participation of farmers for maintenance activities was difficult to achieve in the past. It was difficult to get full farmer involvement in any event organized by the FOs in the past. But, the situation has changed with the linking of farmer participation and contribution as a compulsory prerequisite to get the approval of FO to obtain fertilizer subsidy. Fertilizer subsidy has indirectly strengthened the FO activities and has increased the participation in the voluntary activities organized by the FO's.

4.2 Impact on Water Distribution Performance

According to the literature, availability of irrigation water and location of land in the channel network has a significant effect on farmer participation. According to Chackacherry, (1993), water availability in terms of adequacy, timeliness and equitability would be the main motivation factors for farmers to undertake farming and to involve in the activities of FOs. Therefore an attempt was made to analyse the water distribution performance in terms of adequacy, reliability, timeliness, and equity and performance of following scheduled irrigation issues in the irrigation systems after implementing the PIM.

4.2.1 Adequacy, Reliability & Timeliness in Irrigation Supply

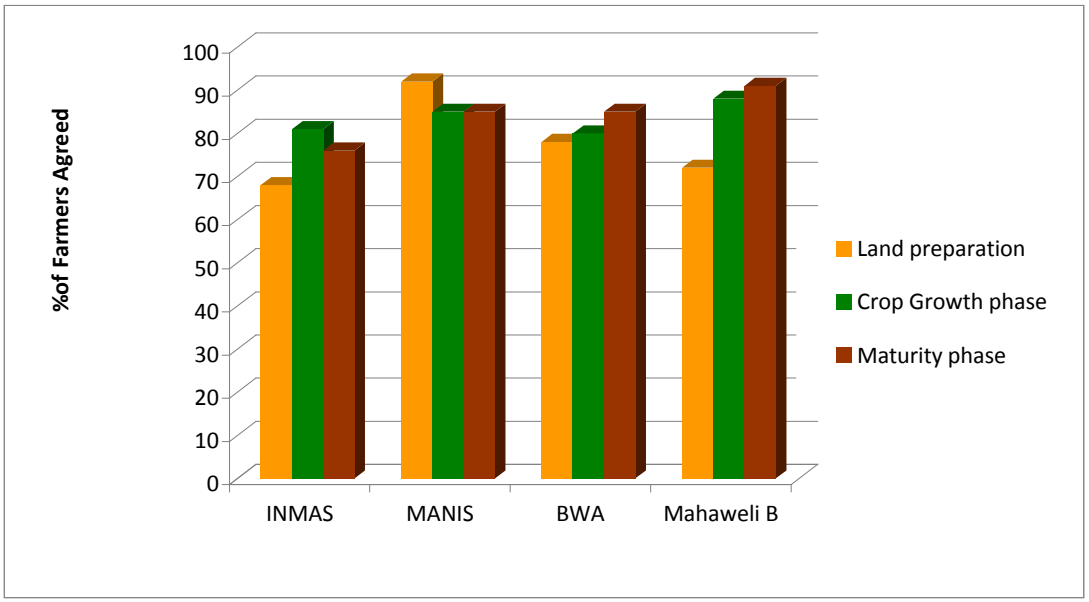
Supply of an adequate quantity of water at the appropriate time according to a planned schedule is one of the primary objectives of irrigation management. Adequacy, timeliness and reliability of water issues are defined by Murray-Rust and Snellen (1993) as follows:

Adequacy of water delivery is defined as the capacity of an irrigation system to meet the demands of farmers, and a measure of the ability of a water delivery to meet soil-plant water requirements. Adequacy objective can be achieved by matching cropping plans and calendars with water availability and/ or adjusting operational targets during the season. Adequacy therefore depends not only on scheme water availability and main system management, but also irrigation and agronomic practices at farm level.

Timeliness is supplying adequate amount of water matching with the time of crop water requirement, to avoid potential yield reductions caused by periods of water shortages. Reliability can be expressed as the expression of confidence in the irrigation system to deliver water as planned. Farmer perception of adequacy, timeliness and reliability of supply were verified by using the above definitions. Each item was clearly defined to the famers before eliciting their responses.

Farmers were asked about the timeliness and the adequacy of the irrigation water in different stages of crop namely, land preparation stage, plant growth stage and the maturing stage. The findings are shown in figure 4.3. According to the figure, over 70% of them received adequate and timely supply of water during the land preparation, crop growth and maturity stages.

Figure 4.3: Agreement on Supply of Adequate Irrigation Water on Time (As a Percentage of Farmer Responses)



Source: Author's survey data, 2010

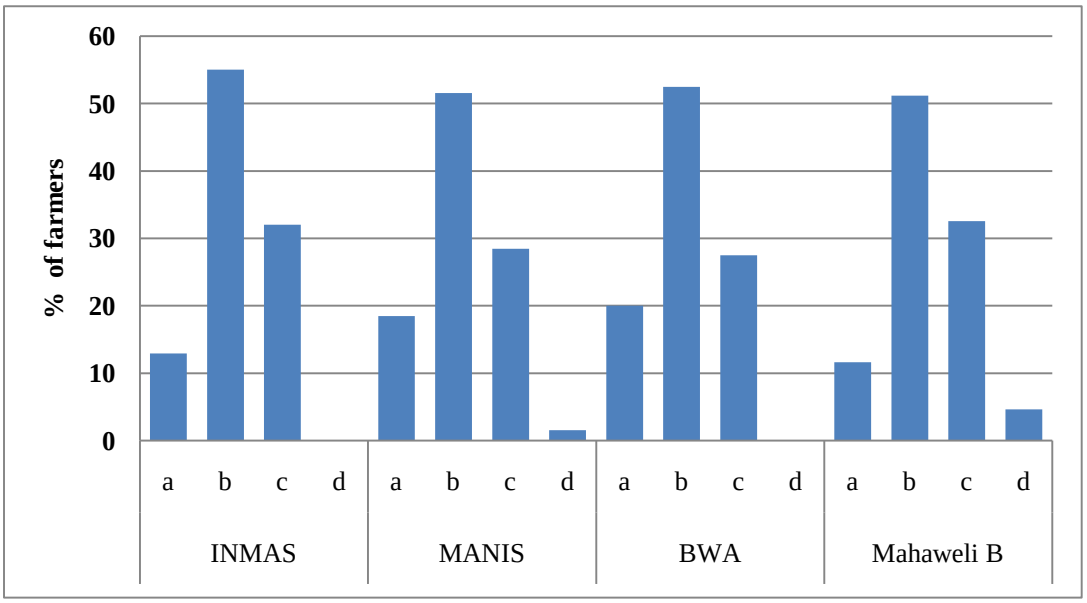
4.2.2 Performance in Implementation of Scheduled Water Issues

Most common ways of managing irrigation water are continuous water supply during the period of paddy land preparation and rotational supply for the rest of the season. Implementation of water delivery schedules as planned is important to avoid wastage, reduce water conflicts and to increase water use efficiency.

Implementation of water schedules and degree of water saving efforts practiced by farmers were investigated to assess the impact of participatory management on water management performance.

The study made an attempt to analyze the farmers' attitudes towards the water saving and management at the field level (Figure 4.4). The farmer perceptions were obtained on the attitudes of farmer community on their efforts of saving irrigation water through reducing the off takes of water as soon as they received an adequate irrigation supply. The farmers are mindful that, excess water is not only bad for their crop, but also a waste that will cause bad effects for fellow farmers. However, nearly 50 percent of farmers in all management models believed that, most of the farmers take vigilant actions to reduce water wastages. This is a good sign of progress in farmers' attitudes towards the water savings, but there is more room for the improvement in the particular aspect.

Figure 4.4: Attempts of Water Savings (As a Percentage of Farmer Responses)



Note:

(a) All farmers make efforts of saving irrigation water through reducing the off takes of water as soon as they received an adequate irrigation supply

(b) Most farmers make efforts of saving irrigation water through reducing the off takes of water as soon as they received an adequate irrigation supply

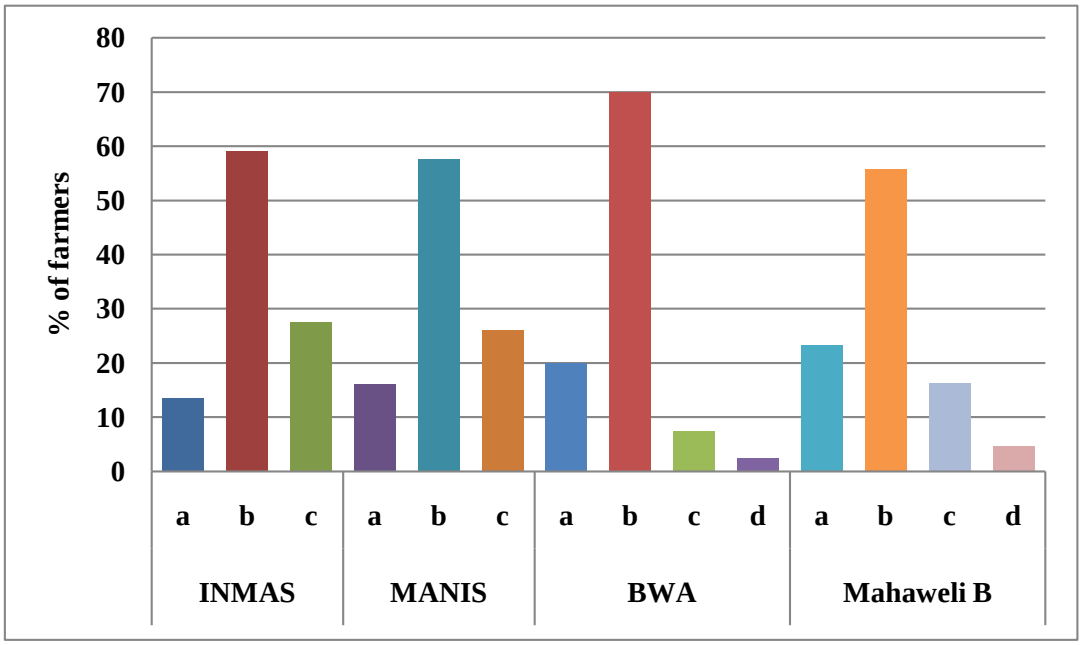
(c) Some farmers make efforts to save irrigation water through reducing the off takes of water as soon as they received an adequate irrigation supply

(d) No farmers made efforts of saving irrigation water through reducing the off takes of water as soon as they received an adequate irrigation supply

Source: Author's survey data, 2010

Figure 4.5 shows the reliability of irrigation water supply as perceived by farmers. Most of the farmers stated that the water supply was regular and changes could be known in advance. The advanced knowledge was reported to be useful to plan the activities and schedule the time for application of chemicals and fertilizer. However, in all the systems considerable amount of beneficiaries did not always receive regular water supplies. About 20% of farmers in the Mahaweli B area sometime or always receive irregular water supply, which is mainly due to the deteriorated condition of irrigation infrastructure.

Figure 4.5: Reliability of Irrigation Water Supply (As a Percentage of Farmer Responses)



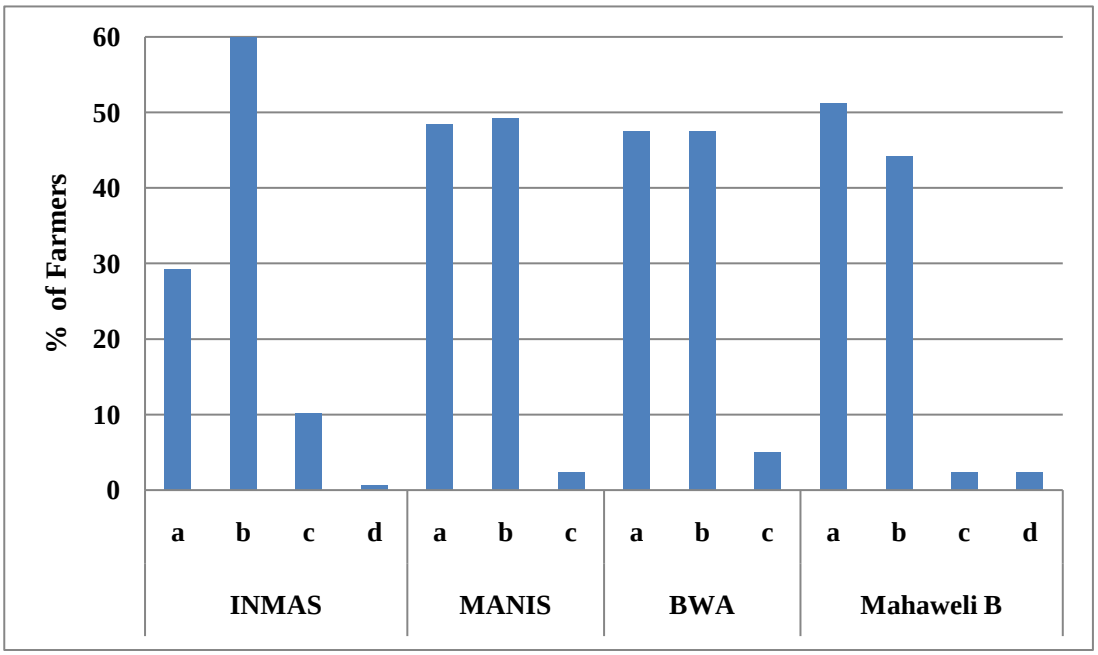
Note: (a) Always water supply is regular and the changes can be known in advance
(b) Most of the time water supply is regular and most of the time changes can be known in advance
(c) Sometimes water supply is regular and only sometimes the changes can be known in advance
(d) Water supply is irregular and cannot be known in advance
Source: Author's survey data, 2010

4.2.3 Equality of Water Distribution

There are incidences of allocating or receiving more share of water than required by head end farmers, whereas the farmers in the tail end often fail to get their allocated share of water. Head-enders, therefore, have vested interest in continuing the existing arrangements. This difference in the equality cause conflicts among farmers and is one of the major hindrances in mobilizing farmers for FO activities.

Figure 4.6 illustrates the farmers' past experiences of receiving their fair share of water at the field channel level. Accordingly only about 5-10 percent of the farmers perceived that some or none of the farmers receive their fair share of water at the field level, which is by and large due to system deficiency (Mahaweli system B) and geographical location of the fields of the given farmers.

Figure 4.6: Irrigation Water Share (As a Percentage of Farmer Responses)



Note: (a) All farmers get their fair share of water
(b) Most of the farmers get their fair share of water
(c) Some of the farmers get their fair share of water
(d) None of the farmers get their fair share of water

Source: Author's survey data, 2010

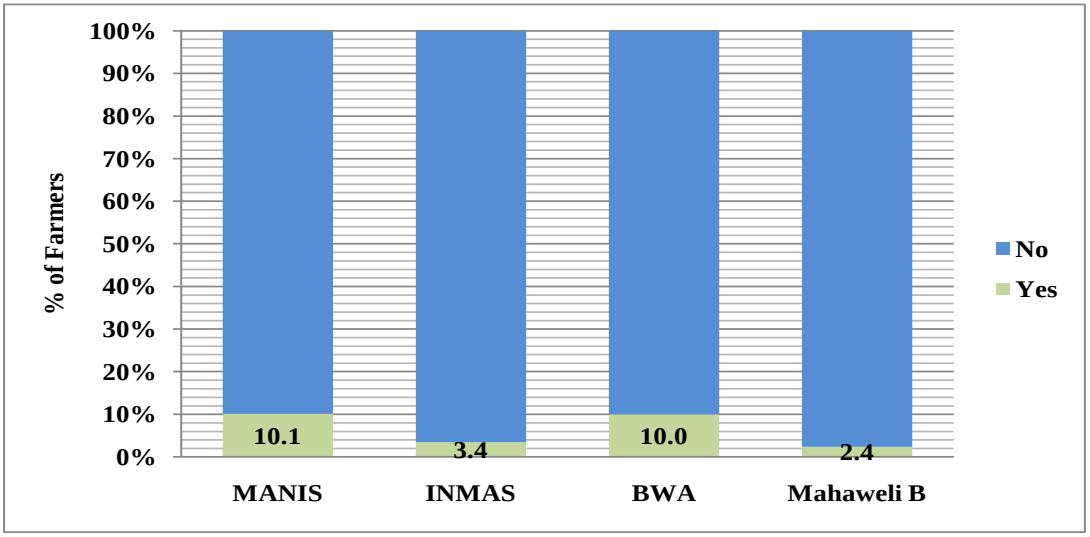
4.3 Impact on Agricultural Productivity

The most common agricultural productivity measures mentioned in the literature on management transfer are cultivated extent, cropping intensity, and yield. Generally, surveyed farmers in INMAS, MANIS, and Mahaweli H cultivated paddy in both seasons except in Ma-eliya and Kande ela Scheme (Under MANIS). In both Ma-eliya and Kande-ela irrigation schemes cultivation of tuber crops (Potato) was prominent during yala season. Water availability is sufficient to cultivate paddy in all systems for full command area during both seasons except in Muruthawela irrigation scheme.

4.3.1 Changes in Cultivation Extents

Theoretically efficient water management would bring more extent under cultivation, particularly during water deficit y*ala* season. More than 90 percent of the farmers experienced no increase in extent of cultivation in FC command area (Figure 4.7). It was mentioned that there was no room to expand the cultivable area, and reservation lands also had been already cultivated in many places. However, farmers said that the consistency of water supply had increased after PIM programme which had helped to increase the cropping intensity.

Figure 4.7: Increases of Extent in the FC (% of Farmer Perceptions)

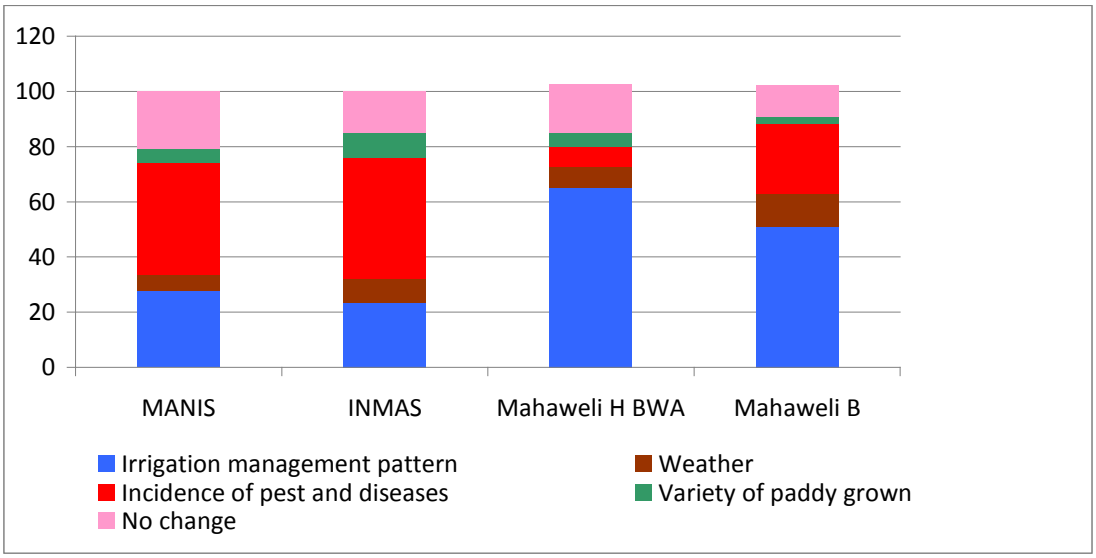


Source: Author's survey data, 2010

4.3.2 Changes in Yield

The level of yield is determined by multiple factors such as paddy variety, weather pattern of the season, pest and diseases attack and irrigation water availability. Farmers were asked about the main factor which determined the yield increases in the recent past. The results are given in the figure 4.8. Most of the farmers in all systems responded that the main factor which determined the yield level was method of irrigation management.

Figure 4.8: Main Determining Factors of the Yield Level (% of Farmer Perceptions)



Source: Author's survey data, 2010

CHAPTER FIVE

Performance of Participatory Irrigation Management and Sustainability of Irrigation Infrastructure

5.1 Strength of Farmer Organizations

The development of FOs with the basic function of dealing with irrigation affairs is one of the main aspects of participatory irrigation management. FO is one of the two key stakeholders (Irrigation agency is the other one) in the PIM process. Therefore, the strength of FOs has a direct relationship with the performance of the PIM. The neglect of maintenance and under performance of irrigation systems in developing countries had occurred not only due to the scarcity of resources, but also due to the unsustainable organizational structures leading to the sub-optimal allocation of available resources (Carruthers and Morrison, 1994; Moore, 1981). Therefore strengthening and empowering Farmer Organizations through the development of software aspects is very relevant and timely.

A strong FO must perform very well in its own organizational management activities and also should perform entrusted irrigation management tasks of water distribution and control structure management activities.

5.1.1. Performance of FOs in Organizational Management Activities

Membership:-
Members are the building blocks of an organization. A strong organization ideally must have membership of all farmers in the FO command area or the majority of the farmers to make an influence in the decision making process and be active partners in the participatory management. Land ownership has not been the problem in most of the FOs in granting membership, rather cultivation of land plot under the FO command area was considered as sufficient. As indicated in table 4.1 all the farmers had obtained FO membership irrespective of management models and localities. The requirement to be a member in the FO to qualify for obtaining government sponsored fertilizer subsidy is one of the main reasons for the 100% membership of FOs.

Although almost all the farmers had obtained FO membership, all the members were not involved in FO activities and some served as passive members. This is another factor directly affecting FO strength. FO leaders were interviewed to obtain their perception about the percentage of active members out of the total membership. The results are given in table 4.2.

Leadership:-
The effective leadership is one of the key factors that contribute to the strength of FO and determine the success or failure of FO. Personality skills, energy, dynamism,

commitment and style of public relations of leaders often determine the functional level of any community based organization.

Table 5.1 illustrates the levels of beneficiary supports to current FO leaderships under different management models. The findings show that, almost all the farmers accepted the current leaderships of the FOs. According to the farmer responses, almost 100 percent farmers expressed that, FO leaders and other office bearers were selected at the general farmer meetings without any external influences and mostly by consensus. However, this was not the case in the past especially in Mahaweli schemes as reported in IIMI & HARTI (1995) that, Mahaweli unit managers had often interfered in the selection of FO leaders.

Development of new leaders should occur at FC level. It is very important for an organization to identify and develop second tier of leaders to ensure the future sustainability of the organization. Farmers were questioned about the availability of suitable and ready to accept the future leadership at FC level. The findings are given in table 5.2.

Table 5.1: Percentage of Farmers Accepting the Current FO Leadership

Management Model	No of Farmers	
	No.	%
INMAS	175	98
MANIS	129	99
Mahaweli BWA	38	95
Mahaweli B	42	98
Total	384	98

Source: Source: Author's survey data, 2010

Table 5.2: Availability of Suitable Members and Willingness to Secure the Future Leadership at FC Level (% of Responses)

Availability of potential future leaders	INMAS	MANIS	Mahaweli-H BWA	Mahaweli - B
Most members	7	1	3	12
Several members	56	83	97	88
Only one members	3	1	-	-
No members	34	15	-	-

Source: Author's survey data, 2010

The findings in table 5.2 illustrates that, Mahaweli & MANIS programme had been able to develop second tier of leadership, but surprisingly it was less achieved in INMAS programme . This is in fact due to reluctance of farmers under INMAS programme to express themselves as the potential leaders to undertake a voluntary job in the present context of no incentives considering the various intense organizational

management activities undertaken by the current leaders of INMAS schemes and complexities of INMAS schemes.

FO Financial Mobilization and Management:

FOs have opportunities to mobilize necessary funds from various sources namely through collection of FO membership fee and seasonal/annual maintenance fee, income earned from the maintenance contracts given by the irrigation agency, and income earned from engaging in business activities. However it is evident from the FO financial records that, FOs are highly dependent on the income earned from the maintenance contracts given by the irrigation agency, especially under INMAS and Mahaweli programme. This was the case even during the late 1990s as observed by IIMI and HARTI (1997) and Aheeyar (1998). The level of funds available in the FOs under MANIS programme was generally comparatively low. The amount of routine fee collection via membership fee and maintenance fee by the sample FOs is given in table 5.3. The most important development in the financial mobilization by FOs is efforts to collect routine maintenance fee by some of the FOs. This was not the case in the late 1990s as discussed in Samad and Vermillion (1999) that farmers' direct investment in irrigation infrastructure through cash and kind was very low.

Handling of FO fund properly with accepted procedures and transparency directly affect the members' cooperation and contributions and consequently strength of FO's. According to survey findings, the majority of the farmers have approved the financial handling of FO's (Table 5.4). The reasons for the non acceptance of FO financial handling by about nine percent (35 farmers) of total farmers are given in table 5.5. It should be noted that only one farmer under the BWA programme in Mahaweli system H has disapproved the FO financial handling.

Table 5.3: Amount of Regular Fee Collection for FO Fund (at 2010 Prices)

Name of the Scheme	Manage-ment model	Name of the FO	Amount of maintenance fee collection (Rs/ha/season)	Amount of membership fee collection (Rs/annum)
Muruthawela	INMAS	Minimuthu FO (Tract 2, D9 FO)	100	100
		Gemunu FO (Tract 3, D1 FO)	150	75
Hurulu wewa	INMAS	Mahasen FO		
		Udhara FO	0	50
Bathalagoda	INMAS	Pannala FO	500	0 (entrance fee Rs. 10
		Uyangalla FO***	2 bu of paddy per ha (equal to Rs 1175)	120
Mau ara	MANIS	Pubudu FO	125	60
		Pragathi FO	700	15
Kallanchiya	MANIS	Perakum FO	0	60
Maha Siyambalngamuwa**	MANIS	Maha Siyambalamgamuwa FO	75	60
Kande ela	MANIS	Gawarmmana FO	0	60
		Puranwela FO	0	100
Ma -Eliya	MANIS	Perakum FO, Pitapola	250	0
Mahaweli H	BWA	Eksath kelesiyambalawa FO (401/D5 FO)	250	60
		Eksath Kirologama FO (403/SD2 FO)	250	60
Mahaweli B*	Mahaweli	Ekamuthu FO (track 1)	0	0 (entrance fee Rs. 1000)
		Samagipura FO (Track 8)	50	0 (entrance fee Rs. 750

* Not yet turned over to FOs

** Rs 750 is collected from each ha cultivated, but only 10 percent goes to FO fund, rest is provided to Jala palaka

*** Another ½ bushel of paddy is collected from each ha cultivated as *Salaris*

Source: Authors' survey data, 2010

Table 5.4: Level of Acceptance of FO Financial Handlings by the Members (% of Farmers)

FO Membership	INMAS	MANIS	Mahaweli BWA	Mahaweli - B
Yes	95	86	98	93
No	5	14	2	7

Source: Authors' survey data , 2010

Table 5.5: Reasons for the Non Approval of Financial Handlings by Current FO Management (% of Farmers who did not accept the FO Financial Handling)

Reasons	% of Response* (N=35)
Corruption	20
No proper Consultation with members	29
No proper records / book keeping	60
Non investment of the money for system maintenance	6

* Multiple answers make the total percentage more than 100
Source: Authors' survey data, 2010

Lack of established procedures & bookkeeping mechanism leads to financial malpractices by FO management & many such instances have caused organizational failures in the past. Financial management procedures and method of handling of FO fund effectively determine the level of members' contribution and development of FO fund.

Members are generally very sensitive & keen to know about the financial status of their organization & utilization of FO fund. Financial transparency helps to develop trust. Tables 5.6 show how frequent farmers came to know about the financial transaction of FO's. The majority of farmers expressed that, they learnt about the FO financial handling at annual FO meetings. This is not a healthy situation considering the large number of activities done by FO during a year. FO's must adopt a system to distribute summarized financial statements in printed form at least quarterly for the entire membership.

Table 5.6: Frequency of Farmers Coming to Know about FO Financial Transactions (% of Farmers)

Frequency	INMAS	MANIS	Mahaweli H BWA	Mahaweli B
Annual meeting	82	82	52	69
Seasonal meeting	4	2	10	5
Occasional farmer meeting	14	8	38	21

* Multiple answers make the total percentage more than 100
Source: Author's survey data, 2010

FO Communication Mechanism:

A strong FO requires well established communication mechanism to disseminate the FO decisions & also to mobilize members for FO activities. Communication mechanisms adopted by FO's under various irrigation system management programmes are listed in table 5.7, The most common methods of receiving information by the members of the FO are public notice and through the farmer representatives. Mahaweli schemes use the FRs most effectively in passing the messages which demonstrates the high level of coordinating arrangements in the institutional set up in the system, especially under BWA programme. However,

almost half of the farmers learn some of the FO information through their neighbour farmers indicating lapses in the current communication mechanisms adopted by the FOs. According to Table 5.8, almost 98-100 percent of farmers in all the programmes accepting the FO communication mechanisms are effective in disseminating information. But the current mechanism of communication does not provide opportunity for interaction.

Table 5.7: Method of FO Communication (As a Percentage of Farmer Responses)

Method	INMAS	MANIS	Mahaweli H BWA	Mahaweli B
Monthly meeting	38	25	25	23
Public notice	90	83	78	98
Through FR	59	70	98	93
Through catalyst agent	1	-	-	
From neighbour farmers	48	53	45	42
All above methods	41	1	20	

Source: Author's survey data, 2010

Table 5.8: Effectiveness of the FO Communication Mechanisms

	% of farmer responses			
	INMAS	MANIS	Mahaweli H BWA	Mahaweli B
Strongly agree	11	18	18	5
Agree	87	82	82	93
Disagree	2	-	-	2
Strongly disagree	-	-	-	-

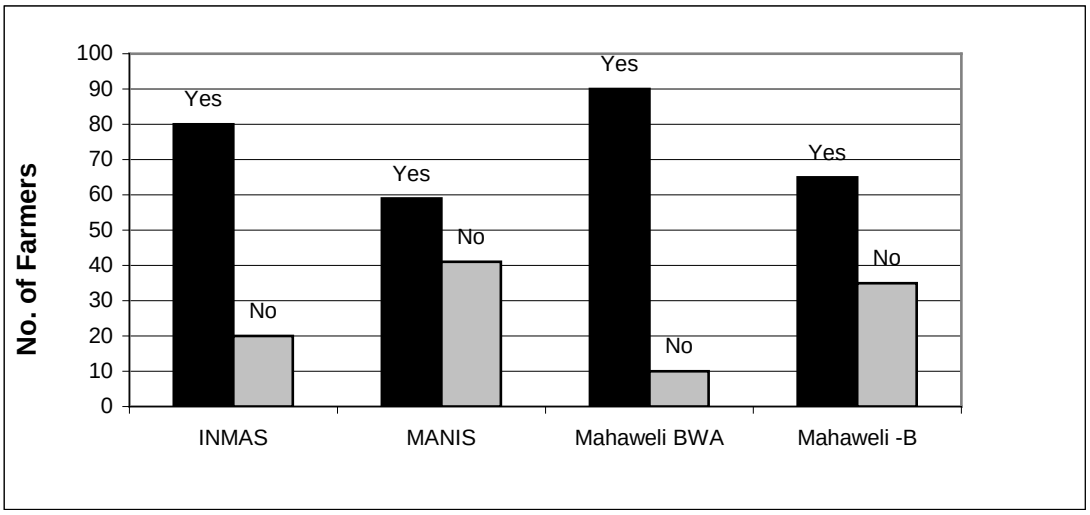
Source: Author's survey data, 2010

FO Meetings:

FO meetings are also one of the tools adopted to communicate information among the members. There are generally four types of meetings at FO levels viz; annual meetings, seasonal meetings, monthly/bi monthly meetings and FO committee meetings. All these meetings are generally common in all the INMAS schemes and Mahaweli schemes, but, most of the MANIS schemes hold annual meetings and seasonal meetings only. The monthly or other occasional meetings are held on need basis. The committee meetings of the FOs of MANIS programme are highly irregular and mostly convened on need basis. The participation of farmers for FO general farmer meetings is also comparatively lower in the MANIS programme (Figure 5.1). For instance, FO general meeting was not held during last four years due to lack of sufficient quorum in Kallanchiya scheme. In some MANIS schemes farmer participation for meetings is around 50% or lesser. The major reasons for the non

participation are lack of farmer interests in spending their time for FO meetings, logistic reasons (settled outside the village), lack of legal procedures for FOs and dependence on FRs (Table 5.9). About 98 to 100 percentages of farmers in all the schemes accept that whatever the meetings and other events such as *shramadana* works organized for general farmers they get information in advance.

Figure 5.1: Regular Participation of Meetings (As a Percentage of Farmer Responses)



Source: Author's survey data, 2010

Table 5.9: Reasons for Non Participation at FO Meetings (As a Percentage of Responses of non Participating Farmers)

Reasons	% of Response (N=36)
No information /Delayed information	3
Meetings are not productive	12
Decisions taken can be known from neighbour farmers	58
Decisions are taken without concerning farmers' views	2
Lived outside the village for employment purpose	22
Attend by land owner	3

* Multiple answers make the total percentage more than 100
Source: Author's survey data, 2010

The research findings show that almost all the participating farmers accept that FO meetings are always or most often very productive and farmers are able to express their views (Table 5.10). According to the table, meetings conducted by Mahaweli-H under BWA programme show very high productivity compared to other management models.

Table 5.10: Usefulness of FO Meetings

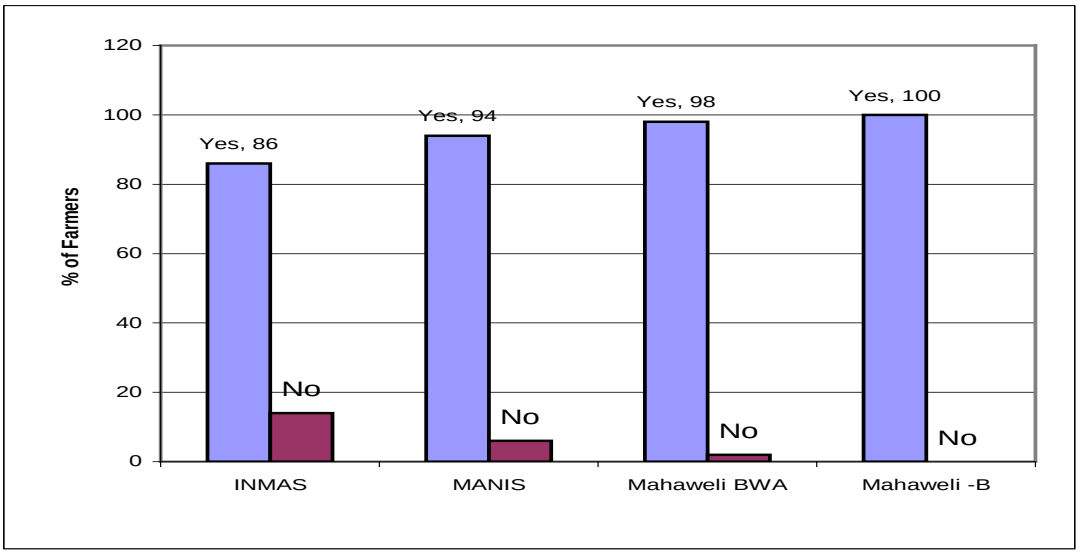
Farmer Responses	% of farmer responses			
	INMAS	MANIS	Mahaweli- H, BWA	Mahaweli B
Meetings are always very productive and farmers are able to express views	41	58	80	51
Meetings are often very productive and farmers often able to express views	52	36	20	47
Meetings are sometimes very productive and farmers are able to express views	7	4	-	-
Meetings are never very productive and farmers' are able to express views	-	2	-	2

Source: Author's survey data, 2010

Conflict Resolution Mechanism:

The conflicts could occur at any time in sharing common property resource, but there should be a mechanism to resolve the conflicts without damages to the user organization. FOs always try to resolve the conflicts locally at FC and DC level. About 28 to 30 % of farmers perceived that most of the conflicts are resolved at FC level, while 68-70% of farmers expressed that conflicts are mostly solved at DC level. However, some of the conflicts (1-2%) mainly on land disputes related to tenure arrangements and *Kattimaru/Thattumaru* method of land utilizations are taken to PMC levels and Agrarian Development Committee meetings or solved with the help of a catalyst. About 92 – 98% of farmers accept that farmer representatives always very effectively solved the conflicts. This was the case of 100% farmers in BWA programme under Mahaweli H. Leadership plays a key role in resolution of conflicts effectively which is essentially dependent on personal relationship of the leader and his recognition with external organizations. The level of recognition of FO leaders in conflict resolution and maintaining good relationships with external organizations are illustrated in figure 5.2.

Figure 5.2: Recognition of FOs in Conflict Resolution and Dealing with External Organizations (As a Percentage of Farmer Responses)

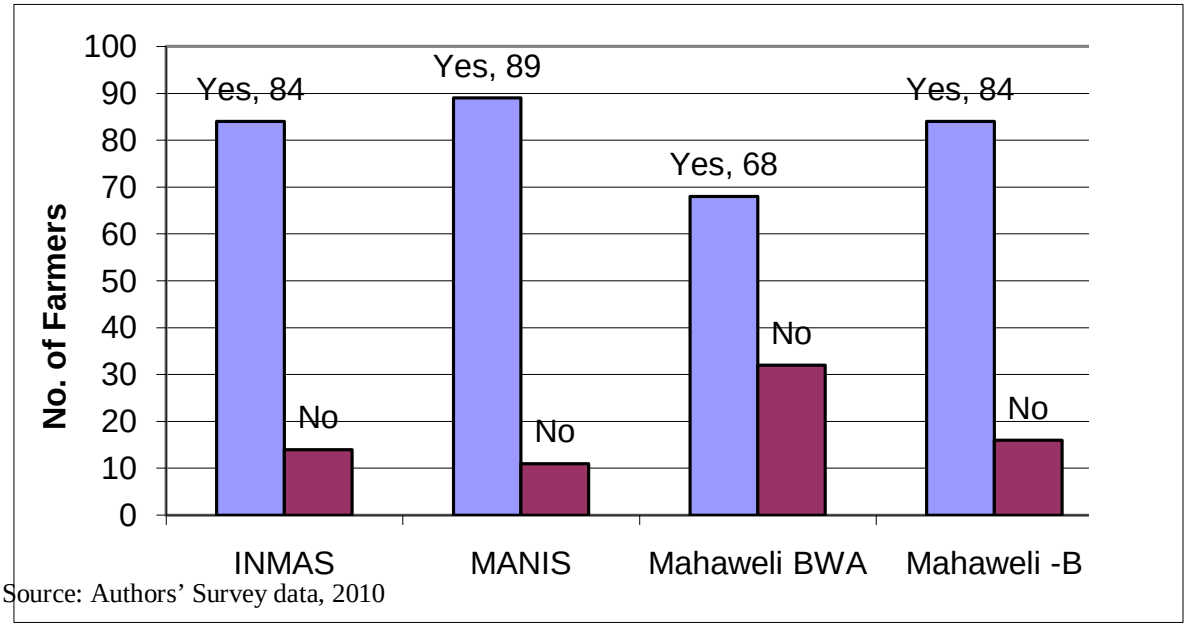


Source: Author's survey data, 2010

Legal Status and Legal Power of FO's

FOs are legally recognized entities if they are registered bodies in the relevant agencies. Agrarian Development Act (2000) provides necessary legal backing for FOs to prepare agricultural plan, engage in the improvement and O&M of irrigation system and implement sanctions and punishments for rule breakers. All the FOs are registered entities under the Department of Agrarian Development and have adopted a constitution to guide the organizational activities. Office bearers are elected or selected at formal general farmer meetings in all the places, although the frequency of selection differs from one organization to other. However there was a strong feeling among farmers in all the FOs that the legal backing provided by the current enactments are insufficient to reprimand defaulters and also to mobilize farmers on the scheduled work plan. This may be due to lack of awareness on current legal supports given by the existing Acts and non implementation of current law. The farmer responses on the requirement of additional legal power to FOs are illustrated in Figure 5.3. About 68- 90 percent of farmers wanted empowerment of the FOs with more legal power. Relatively less percentage of farmers under Mahaweli H preferred more legal power (68%) than current provisions. This indicates the proper enforcement of existing legal powers by the FOs of Mahaweli-H and higher strength of FOs. The major reasons for not favouring of more legal power by 10 percent of farmers are also given in table 5.11.

Figure 5.3: Requirement for More Legal Power for FOs to Implement Decisions (As a Percentage of Farmer Responses)



Source: Authors' Survey data, 2010

Table 5.11: Why FOs should not be Provided More Legal Powers? (As a Percentage of Farmer Responses)

Reasons	% of Response* (N=40)
Available powers are sufficient	40
Use of legal power can lead to splits within farmers	33
Legal power cannot be used under the prevailing social norms	25
Misuse of power by DCO leaders in the past	2

*Multiple answers make the total percentage more than 100
Source: Author's survey data (2010)

5.1.2 Performance of FOs in Water Management Activities

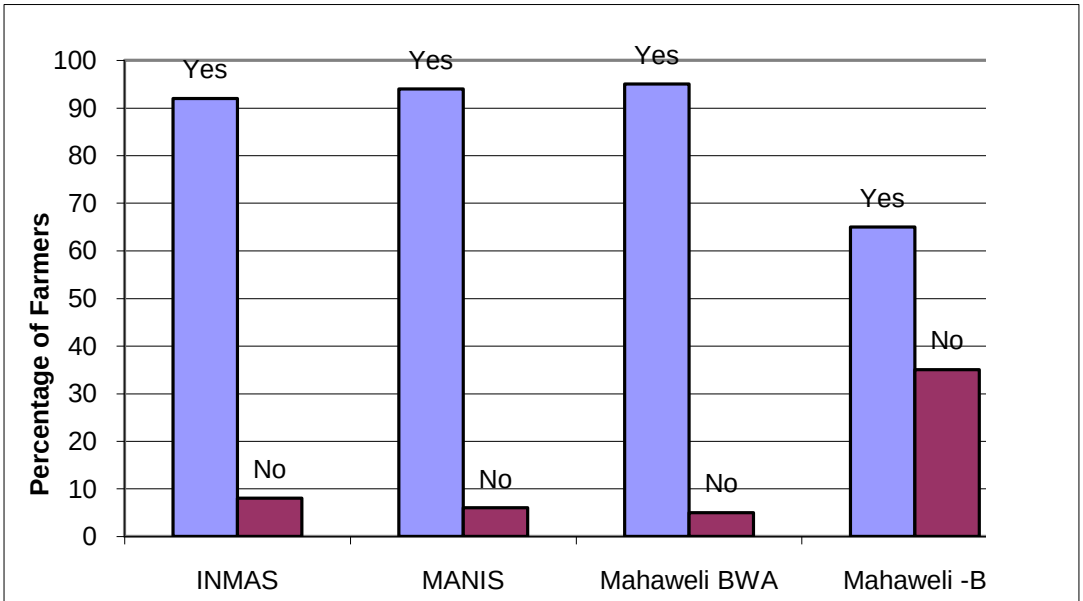
The main tasks of the FOs related to water distribution are acquiring an adequate amount of water for DC from the scheme level allocation, water scheduling within DC and water distribution. The study findings reveal that water scheduling among DCs are prepared by the line agency with the consultation of FO representatives at the PMC meetings in INMAS, Mahaweli BWA and Mahaweli B and most of the MANIS schemes. However, this was completely handled by the line agency prior to the PIM programme. The progress of the implementation of water schedules is discussed at the monthly PMC meetings and required adjustments are made accordingly. As PMC meetings do not regularly take place in most of the MANIS schemes, any flexibility of water schedule needed has to be personally discussed by FO with TA/PM of the scheme.

Land preparation for paddy consume higher amount of water within limited time. Therefore the way of planning and management of water for land preparation within

the stipulated period is one of the crude indicators to measure the effectiveness of FO water planning mechanism. Figure 5.4 illustrates the percentage of farmers who completed the land preparation on scheduled time. The system deficiencies in Mahaweli System B caused difficulties in reaching scheduled water deliveries on time especially for tail end farmers. The major reasons for the delayed land preparation is the difficulty in sending water to the fields due to system deficiencies as listed in Table 5.12.

In most of the cases FOs had been flexible in providing extended supply of water for farmers who delayed land preparation except in Mahaweli B where poor condition of the infrastructure is a serious problem in delivering adequate amount of water on time. The flexibilities in providing water is a positive point for FRs of greater understandings in fulfilling the irrigation requirement of their fellow farmers, but as a whole this is not right.

Figure 5.4: Percentage of Farmers able to complete the Land Preparation on Scheduled Time



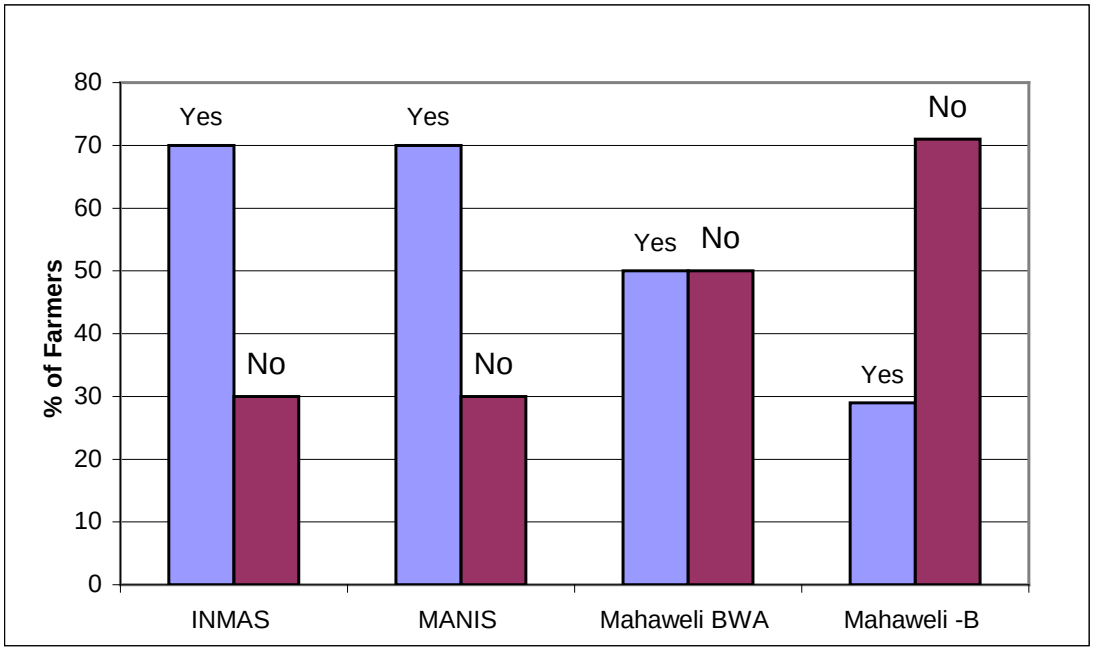
Source: Author's survey data, 2010

Table 5.12: Reasons for Non Completion of Land Preparation on Scheduled Time (As a Percentage of non Completed Farmer Responses)

Reasons	% of Response (N=36)
Late supply of water	90
Delayed harvest of previous season crop	7
Supply of insufficient water	3

Source: Author's survey data (2010)

Figure 5.5: Percentage of Farmers Who Received an Extended Supply of Water for Land Preparation (As a Percentage of the Responses Given by Farmers who Delayed Land Preparation)



Source: Author's survey data (2010)

Adequate amount of water on time is essential for a successful crop. The farmer perceptions on availability of adequate quantity of water on required time under different stages of the crop have been discussed in pervious chapter 4.2.1. The majority of the farmers in all the management programmes have agreed that the water delivered in various stages are adequate and timely (Figure 4.3). However there is a need for improvement for 10-20 % of beneficiaries in water schedules. The problems related to poor infrastructural conditions and insufficient maintenance allocation from central government had constrained in achieving the expected tasks as perceived by irrigation officials.

FO *Jala palaka* has to play an important role in water distribution via regulating control structures and sharing water among farmers. The time and efforts needed for water management activities are traditionally rewarded by paying an honorarium contribution by each farmer. The FO has to collect the specified amount of contribution and hand over to *Jala palaka* on seasonal basis. The incentive payment is vital to ensure efficient service by *Jala palaka* and make him accountable to beneficiary farmers. The table 5.13 illustrates the amount of contributions collected by the FOs in the sample schemes. The payment by some of the FOs is a noteworthy development in PIM to ensure the efficient water deliveries and the sustainability of the PIM programme.

Table 5.13: Collection of Contribution and Disbursement by FOs

Management model	Name of the Scheme	Name of the FO	Rate of Salaries collection (ac/season)	Rate of Salaaries payment to *Jalapalaka* (ac/season)
INMAS	Muruthawela	Minimuthu FO (Tract 2, D9 FO)	No collection	No payment
		Gemunu FO (Tract 3, D1 FO)	No collection	No payment
	Hurulu wewa	Mahasen FO*	No Collection, only O&M fee	Rs.150
		Udhara FO*	No Collection, only O&M fee	Rs. 150
	Bathalagoda	Pannala FO	Rs.150	50% of collection
		Uyangalla FO	½ bushels of paddy	½ bushels of paddy
MANIS	Mau ara	Pubudu FO	½ bushels of paddy	½ bushels of paddy
		Pragathi FO	½ bushels of paddy	½ bushels of paddy
	Kallanchiya	Perakum FO	0	0
	Maha Siyambalmgamuwa	Maha siyambalamgawa FO	Rs 270	Rs 270
	Kande ela	Gawarmmana FO	No collection	No payment
		Puranwela FO	No collection	No payment
	Ma -Eliya	Perakum FO, Pitapola	No salaries collection, paid from O&M fund	Total amount of Rs. 500 per season is paid from FO maintenance fund
BWA	Mahaweli H	Eksath kelesiyambalawa FO (401/D5)	Paid from O&M fund	Rs. 3000/season (Fixed amount)
		Eksath Kirologama FO (403/SD2)	Paid from O&M fund	Rs. 3000/season (Fixed amount)
Mahaweli	Mahaweli B*	Ekamuthu FO (Track 1)	No collection	No payment
		Samagipura FO (Track 8)	No collection	No payment

*50% of the O&M fee collected is used to pay *Jalapalaka* based on acreage under him
Source: Author's survey data (2010)

There are several reasons for the overall improvement in water distribution performance after PIM.

a) De-centralization of water management activities up to FC level and appointment of farmer representatives at FC level
b) Reduces conflicts for water with improved supply of water in terms of adequacy, timeliness and reliability
c) Improved communication between farmers and officials and enhanced mutual understanding between farmers and officials especially in INMAS and Mahaweli schemes

d) Improved maintenance performance
e) Improved operation performance
f) Less or no use of water for weed control

5.1.3 Performance of FOs in Control Structure Maintenance Activities

The performance of the FOs in control structure maintenance activities depends on the quality of maintenance of DCs and FCs, maintenance of canal roads and the gates and other regulatory structures.

The routine activities of maintenance such as de-silting, jungle clearing, minor earth works, and painting and greasing of gates were conducted by the FOs at regular interval, at least prior to commencement of each season. The painting and greasing of structures are not conducted in Mahaweli System-B and some of the MANIS schemes. Farmers mobilized their labour on pro- rata basis of their cultivated irrigated land holdings for channel clearing. There are punishment systems adopted by some of the FOs for non participating members. But this is not properly established in most MANIS schemes. For example, in Kallanchiya scheme, maintenance works is not properly divided among members based on irrigated land size, but whoever participates for the *sharmadana*, have to do the entire channel clearing. It was reported that less than 50% of the farmers in Kallanchiya scheme generally participated in *shramadana* works leading to under maintained channel system.

Although FOs mobilize their labour for O&M and collect some degree of cash and kind for maintenance activities, the investment in system improvement from FOs is not sufficient in most instances. The tables 5.14 and 5.15 shows the maintenance defects in DCs and FCs for a considerable period of time which are not being looked after by FOs or irrigation agency. The tables show the types of structural problems ranging from major to minor categories over a period of time. Although all of these problems are not the responsibility of the FOs, most of the problems should have been attended by the FOs mobilizing required levels of cash and kind, but continuous dependency of the FOs on external assistance has prevented them from these types of investment. Some of the problems should have been solved by the irrigation agency, but insufficient financial allocation from the central government has restricted their involvement.

Table 5.14: Structural Problems at FC Level

Name of the Institute	Name of FO	Broken Gates		Broken Structures		Lack of Regulators	
		No.	Period	No.	Period	No.	Period
Muruthawela	Minimuthu FO (Tract 2, D9 FO)	19	2-8 year	15	4-20 years	1	1-8 years
	Gemunu FO (Tract 3, D1 FO)	1	1-4 years	4	1-20 years	0	
Huruluwewa	Mahasen FO	4	3-10 years	4	5-10 years	0	
	Udhara FO	1	1-31 years	11	4-10 years	5	1-20 years
Batahalagoda	Pannala Fo	1	1-8 years	0		0	
	Uyangalla FO	12	1-12 years	0		0	
Mauara	Pubudhu	21	2-10 years	12	3-5 years	0	
Kallanchchiya	Perakum	15	2-4 years	0		0	
Mahaweli- B	Ekamuthu FO (track 1)	10	2-15 years	9	6-10 years	9	10-20 years
	Samagipura FO (Track 8)	1	1-6 years	11	1-6 years	11	1-6 years

Source: Author's survey data (2010)

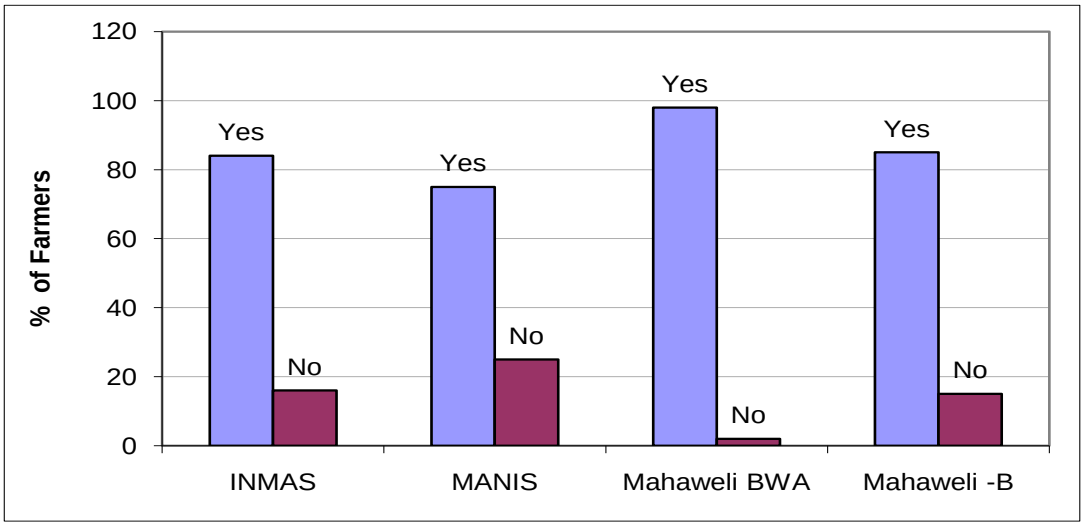
Table 5.15: Structural Problems at DC Level (As Perceived by the Farmers)

Name of the Scheme	Name of the FO	Broken Gates		Broken Structure	
		No.	Duration	No.	Duration
Muruthawela	Minimuthu FO (Tract 2, D9 FO)	5	1-6 years	1	1-8 years
	Gemunu FO (Tract 3, D1 FO)	4	20-25 years	1	20-25 years
Huruluwewa	Mahasen FO	1	1-5 years	4	1-10 years
	Udhara FO	4	3-20 years	3	2-10 years
Batahalagoda	Pannala Fo	0		Not known	
	Uyangalla FO	2	1-15 years	Not known	
Mauara	Pubudu FO	5	1-5 years	Not known	
	Pragathi FO	0		0	
Kallanchchiya	Perakum FO	2	4-6 years	Not known	
Maha Siyambalangamuwa	Maha siyambalamgamuwa FO	1	1-3 years	2	1-3 years
Kande ela	Gawarmmana FO	0		Not known	
	Puranwela FO	0		Not known	
Ma-Eliya	Perakum FO, Pitapola	1	1-5 years	Not known	
Mahaweli H	Eksath kelesiyambalawa FO (401/D5 FO)	0		3	3-7 years
	Eksath Kirologama FO (403/SD2 FO)	0		Not known	
Mahaweli –B	Ekamuthu FO (track 1)	3	1-15 years	8	6-12 years
	Samagipura FO (Track 8)	6	1-10 years	4	3-5 years

Source: Author's survey data (2010)

On the whole PIM has brought better irrigation services in all management models compared to pre-project situation as perceived by majority of the farmers (Figure 5.7). BWA programme demonstrate the tremendous improvement in providing irrigation services compared to other models.

Figure 5.6: Improvement of Irrigation Services after PIM (% of Farmer Responses)



Source: Authors' survey data (2010)

5.2 Project Management Committee (PMC) Performance

PMC is a forum for both the line agency officials and the farmers to discuss, debate and decide about the seasonal agriculture and water management plans, progress of the plan implementation, solution to the problems related to irrigation and agricultural activities, resource allocation (land, water and finances) and input coordination (water, technical advice, other inputs such as seeds, fertilizers and agricultural credit). As more than 50% members of the PMC are farmers, their voice in the decision making forum is powerful. The PMCs pave the way for grass root level decision making on water delivery, O&M and agricultural activities in a participatory setting. Thus, in principle, government irrigation agencies no longer have the final say on any major decision affecting the irrigation systems.

PMC meetings are regular events in all the INMAS and Mahaweli schemes, but in most of the MANIS schemes this is limited to seasonal meetings and occasional meetings as need arise. The absence of full time PM, lack of capacity in organizational management and negotiating skills for both PM and FRs, insufficient resource allocation for the PM to attend the regular project management activities and not holding regular FO meetings are the main reasons for irregular PMC meetings in MANIS schemes. PMs of MANIS schemes have very limited time and logistic support to provide catalytic actions for the FO development and capacity building. The success of INMAS programme to a great extent depended on the personal qualities of PMs (Harding and Franks, 1988).

FO leaders are happy about the past PMC planning and the past achievements. Farmers have benefited from voicing their concerns about seasonal planning and the agencies have benefited by learning from farmers experience. Obtaining farmers' opinion at early stages of development helps to incorporate farmers' traditional knowledge and wisdom plus their priorities or urgent needs in the development. The main drawback indicated by the FO leaders on PMC is that, though PMC meetings are regular events, the participation of officers at PMC meetings is highly irregular. The perceptions of the FO leaders on their satisfaction about the regular attendance of officers at PMC meetings are given in Table 5.16. The main reason behind the situation is that the participation of the officers at PMC meetings is voluntary without any incentives. Therefore, the attendance of officers from other departments who do not directly deal with irrigation is sometimes irregular and is not one of their high priority duties. It has also been reported in some places that the decisions taken at PMC meetings are not honoured by the respective agencies including irrigation department at various instances without giving a valid reason. The findings indicate the voluntary nature of participation and cooperation of the officers without any strict legal obligation and incentives to adopt the decisions made at PMC other than mutual understandings.

About 50% of FO leaders of INMAS and Mahaweli BWA programme have expressed that the rate of implementation of PMC decision is low or less than 50% of the total decisions made. Nevertheless, all the FO leaders accept that regular PMC meetings is a good opportunity for both parties to find out workable solutions for the problems and also to build up good working environment in management of irrigation schemes.

Table 5.16: Satisfaction on the Participation of State Officers at PMC Meetings (As a Percentage of Farmer Leaders)

Perception	INMAS	Mahaweli BWA	Mahaweli B
Vary Satisfactory	25	-	-
Satisfactory	25	100	100
Poor	50	-	-

Source: Author's survey data (2010)

5.3 Performance of Agency Support for Organizational and Main System Management

The line agency has to play an important facilitating role to build the capacity of FOs to become self sustain organizations while operating and maintaining primary canal system. Facilitation and capacity building were achieved by catalytic activities and conducting training programmes.

Catalytic Role in Institutional Development:

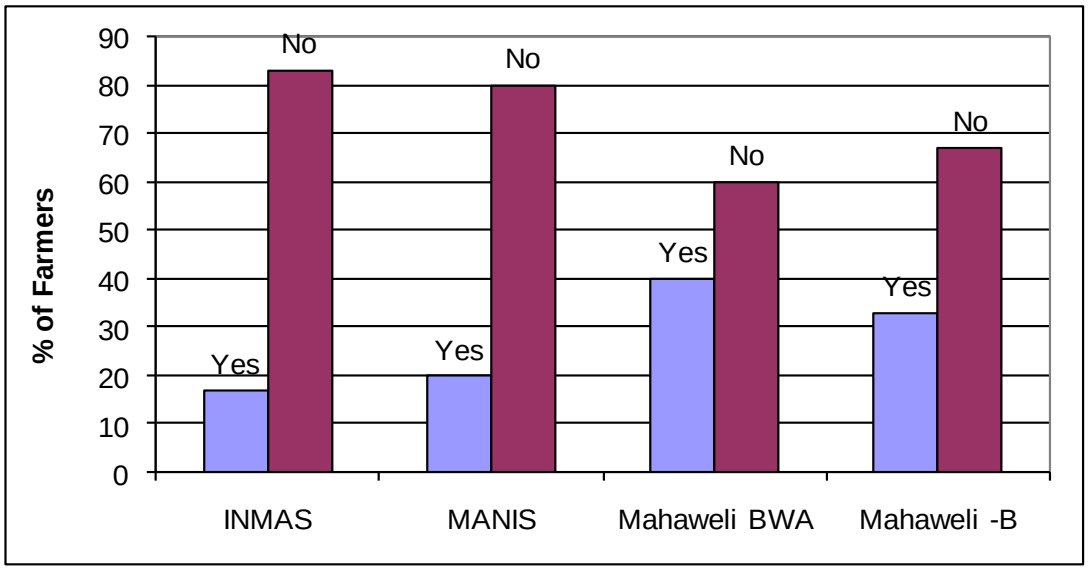
There are two categories of catalysts in INMAS schemes at the moment namely Resident Project Manager (RPM) and Institutional Development Officers (IDOs). The findings show that catalysts were instrumental in creating and strengthening FOs in INMAS schemes. The backup support provided by Irrigation Management Division (IMD) for INMAS schemes is very positive in FO development.

Mahaweli schemes also has full time staff and separate allocations to promote PIM at block level and unit level such as Block Manager, Unit Manager, and Block level IDOs. However, there is no full time catalytic staff or specific financial allocation for institutional development and FO strengthening under MANIS schemes. IE/TA or EA of the scheme act as the PM in MANIS schemes who have to cover more than one scheme on most occasions. Due to absence of resources and time, most of the MANIS PMs failed to provide sufficient catalytic support for FO development and other related activities.

Farmer Training and Capacity Development:

As the FOs are not formed voluntarily by farmers themselves, development of FOs technically and organizationally is very important to make them self reliant. The agencies responsible for the creation of FOs have to provide necessary training periodically to FO members and FO office bearers. At the beginning of the PIM, FOs were provided training on organizational management, leadership development, financial management, team building and other institutional aspects. However, the training programmes conducted on the above subjects during the last few years have shown a drastic decrease or no training. This is not a good situation considering the need of preparing the next set of leadership. Figure 5.8 illustrates the participation of farmers at training programmes during the last two seasons indicating absence of such programmes for the majority of the farmers.

Figure 5.7: Participation in Training Classes during 2010 (As a percentage of Farmer Responses)



Source: Author's survey data (2010)

The major reason for nonparticipation in the training is the lack of training classes (Table 5.17). Majority of the farmers of all the management models proposed the conduct of training classes in agricultural practices as a priority which indicates the

requirement of technical advisory services such as strengthening of extension services (Table 5.18).

Table 5.17: Reasons for Non Participation in Training Classes (As a Percentage of non Participated Farmer Responses)

Reasons	% of Response (N=311)
Previous training courses were not useful	1
No time for participation	23
Can learn from other farmers	1
No training classes conducted for general farmers	72
Age and poor health condition of the farmer	3

Source: Author's survey data (2010)

Table 5.18: Proposals for New Training Classes (As a percentage of Farmer Responses)

Proposed Training Area	INMAS (N=110)	MANIS (N=152)	Mahaweli BWA(N=36)	Mahaweli B (N=38)
Organizational management	9	10	11	5
On-Farm water management	25	32	25	18
Operation and Maintenance	23	27	8	29
Agricultural practices	88	95	100	97
No need for any training	9	5	11	10

Source: Author's survey data (2010)

Quality of Agency Maintenance:

The maintenance of Main Canal and Head Works by the irrigation agency are important for the successful implementation of PIM. Therefore agency has to perform well when undertaking routine main system management, but this is highly subjected to level of budgetary allocation made by central government and availability of human and physical resources with the line agency. All the irrigation officials expressed that the financial allocation they received for O&M is much lower than the actual requirement and therefore they had to prioritize the work based on annual budgetary allocations. About 48% of farmers belong to MANIS schemes and 42% of farmers in INMAS schemes reported that agency rarely do the proper main system management. The line agencies generally do the jungle clearing and weeding, but hardly get sufficient allocation to do the de-silting of main canals.

5.4 Level of Resource Mobilization for O&M

5.4.1 Resource Mobilization for O&M

The study identified the means of resource mobilization for system O&M in the following four categories;

a) Allocation of time (participation for various meetings)
b) Mobilization of labour for individually allocated tasks (FC maintenance)
c) Mobilization of labour for group works (DC maintenance)
d) Mobilization of cash and materials (*Salaries*, O&M fee, etc)

Mobilizations of all above items are equally essential for the sustainable maintenance of infrastructure. Table 5.19 and 5.20 illustrates the value of current level of labour mobilization based on the average time spent for particular activities and opportunity cost of labour in the given areas.

Table 5.19: Annual Cost of Attendance at Meetings (In Rs)

Scheme	Min	Max	Mean	SD
Bathalagoda	262.5	1462.5	672.22	298.00
Huruluwewa	262.5	2100.0	1290.30	506.46
Muruthawela	450.0	2800.0	1164.50	495.48
Kallanchiya	450.0	1800.0	1005.68	344.01
Kande Ela	450.0	1575.0	1012.50	293.96
Ma-eliya	450.0	1500.0	873.39	292.27
Maha Siyabalangamuwa	675.0	1837.5	1303.93	294.16
Mahaweli H	900.0	3200.0	1762.81	454.80
Mau Ara	450.0	2100.0	1277.14	386.51
Mahaweli-B	525.0	2400.0	1430.36	399.33

Source: Author's survey data (2010)

Table 5.20: Annual Cost of Participation in Voluntary (*Shramadana*) Works (In Rupees)

Scheme	Min	Max	Mean	SD
Bathalagoda	600	4800	1642	870.17
Hurulu wewa	336	5250	2004	1211.36
Muruthawela	576	7000	3028	1467.96
Kallanchiya	350	3600	1768	919.73
Kande -Ela	600	4900	2113	1359.28
Ma-Eliya	456	4900	1931	898.26
Maha Siyabalangamuwa	600	4000	1483	867.83
Mahaweli H	700	8400	3303	1998.92
Mau Ara	1200	500	2326	1247.25
Mahaweli-B	1200	8400	3028	2008.39

Source: Author's survey data (2010)

The cost of attendance at meetings includes the labour time spent for participation of FO general farmer meetings, seasonal meetings, and other special meetings. The cost of participation in voluntary works was calculated using the opportunity cost of labour time devoted for FC maintenance, DC maintenance and other *shramadhana* activities organized by the FO. The total value of the labour mobilization for FO activities is given in table 5.21.

The estimated values of resources (cash and kind) mobilization for system maintenance are given in the table 5.22. The findings show that majority of the schemes mobilized considerable amount of resources for the betterment of irrigation system. The level of resource mobilized in the MANIS schemes is relatively lower. Among the INMAS schemes, Muruthawela is the poorest in terms of resource mobilization. The lower level of resource mobilization for system maintenance in Mahaweli system B is due to the absence of formal turnover of O&M responsibilities to FOs and has increased the dependency on irrigation agency.

Table 5.21: Estimated Average Value of Labour Mobilization by FOs (Rs/Annum)

Scheme	Average Value of labour for meetings (Rs/Year)	Average Value of labour for voluntary works(Rs/Year)	Total (Rs/Year)
Bathalagoda	672	1642	2314
Hurulu wewa	1290	2004	3294
Muruthawela	1164	3028	4192
Kallanchiya	1006	1768	2774
Kande -Ela	1012	2113	3125
Ma-Eliya	873	1931	2804
Maha Siyabalangamuwa	1304	1483	2784
Mahaweli H	1763	3303	5066
Mau Ara	1277	2326	3603
Mahaweli B	1430	3028	4458

Source: Author's survey data (2010)

Table 5.22: Current Level of Resource Mobilization in Cash and Kind

Name of the Scheme	Name of the FO	Amount of maintenance fee collection (Rs/ha/ annum)	Amount of membership fee collection (Rs/annum)	Estimated value of *salaries* collected (Rs/ha/ annum)	Total Value (Rs/annum)
Muruthawela	Minimuthu FO (Tract 2, D9 FO)	200	100	0	300
	Gemunu FO (Tract 3, D1 FO)	300	75	0	375
Hurulu wewa	Mahasen FO	750	0	0	750
	Udhara FO	750	0	0	750
Bathalagoda	Pannala FO			300	150
	Uyangalla FO	500	120	1540	2160
Mau ara	Pubudu FO	250	60	1540	1850
	Pragathi FO	500	15	1540	2055
Kallanchiya	Perakum FO	0	60	0	60
Maha Siyambalmgamuwa	Maha siyambalamgama FO	150	60	270	480
Kande ela	Gawarmmana FO	0	60	0	60
	Puranwela FO	0	100	0	100
Ma -Eliya	Perakum FO	500	0	0	500
Mahaweli H	Eksath kelesiyambalawa FO (401/D5)	500	60	0	560
	Eksath Kirologama FO (403/SD2)	500	60	0	560
Mahaweli B	Ekamuthu FO (track 1)	0	-	0	0
	Samagipura FO (Track 8)	100	-	0	100

Source: Author's survey data (2010)

The low level of resource mobilization for system maintenance raises doubts about the sustainability of infrastructure. Although most of the INMAS schemes have set procedures to mobilize the cash and materials for FO fund, the regular collection of resources from beneficiaries and the investment from the maintenance fund collected for system improvement is not prominent, but FO leaders are keen to use the fund as the working capital for service provision such as input supply, paddy marketing and agricultural credit and also to use as working capital to implement maintenance contracts awarded by the irrigation agency. One of the reasons for the situation is that farmers still believe and expect that, maintenance works which needs cash investment would be done by the irrigation agency as it was done in the past, in spite of the DCs have been turned over to FOs. This is one of the reasons for the long term negligence of several structural problems reported in Tables 5.14 and 5.15.

5.4.2 Income from Paddy Farming

Paddy is the dominant crop cultivated in land coming under the irrigation systems in Sri Lanka. Although profit obtained from paddy farming is relatively low compared to the cultivation of other field crops (OFC), farmers prefer to continue paddy farming for various reasons viz; household food security, lower labour requirement, unsuitable soil condition to cultivate OFC, and lower investment requirement. However farmers should earn sufficient income to contribute to O&M expenses of turnover irrigation systems under the PIM policy.

The profitability of paddy farming was examined using *maha* 2010/11 crop budget data from the sample schemes. The results are given in table 5.23. The findings show that farmers could earn Rs. 9, 000 to 16,000 per month in a 5 month cultivation period. If the government fertilizer subsidy is withdrawn, the estimated income will be much lower than the current estimated level. Farmer families in most of the schemes received substantial income from upland cultivation, labouring off farm income, self employment, and other sources of income from the rest of the household members. Therefore farmer dependence on paddy farming for their livelihood or other irrigated agriculture need to be increased to make them more committed towards sustainable O&M.

Therefore, the GOSL has to motivate farmers towards crop diversification at least during *the Yala season* by taking appropriate policy measures and incentives. Panabokke (1989) identifies major constraints in crop diversification as unreliable and inequitable supply of water, lack of organization or communication between farmers and poor scheduling of water. All these factors are highly linked with the expected changes under PIM and therefore have great potential for improvement with the successful implementation of PIM.

Table 5.23: Income from Paddy Farming – Maha 2009/10

	INMAS	MANIS	Mahaweli - H	Mahaweli - B
Average size of land (ac)	1.44	1.34	2.5	2.5
Average yield (kg) (Maha 2009/2010)	2,212	2,116	2,442	2,193
Cost of production excluding imputed cost (Rs/ac)	22,361	22,361	21,764	24,120
Cost of production including imputed cost (Rs/ac)	34,305	34,305	32913	34,039
Gross farm income (Rs.)	89,188	79,392	170,940	153,510
Net farm income excluding imputed cost (Rs.)	66,827	57,013	116,530	93,210
Net farm income including imputed cost (Rs.)	54,883	45,087	88,657	68,412

Source: Author's survey data (2010)

Table 5.24 illustrates the major limiting factor affecting the productivity of rice crop under current circumstances. According to the majority of the farmers views, they are the extension related causes such as lack of know how of controlling pest and diseases and management of weeds limiting the productivity. Although the majority of the farmers under BWA programme expressed in sufficient water availability as a major limiting factor, they received highest paddy yield compared to all other management models. The reason for their current perception is due to the allocation of water on quota system, which limits the lucrative use of water as they did in the past.

Table 5.24: Major Factors Limiting the Productivity of Rice in the Current Circumstances (As a Percentage of Farmer Responses)

Factor	**INMAS**		**MANIS**		**Mahaweli BWA**		**Mahaweli B**	
	***maha* (N=106)**	***yala* (N=71)**	***maha* (N=149)**	***yala* (N-149)**	***maha* (N=37)**	***yala* (N=33)**	***maha* (N=38)**	***yala* (N=40)**
Water Availability	19	24	21	33	76	73	16	40
Amount / Time of Fertilizer Application	10	8	8	9	4	6	18	18
Management of Pest and Diseases	40	36	46	33	6	6	34	18
Weed Control	17	21	22	22	6	6	21	17
Quality of seed paddy/variety	14	11	3	3	8	9	11	7

Source: Author's survey data (2010)

5.4.3 Overall Assessment of PIM Under Different Management Models

All variables discussed in sections 5.1 to 5.4 were used to evaluate the overall strength of FOs, level of agency support, level of resource mobilization for sustainable O&M, physical sustainability of irrigation infrastructure in the current context and sustainability of irrigated agriculture using MDS. The results are given in Table 5.25. According to the MDS, the scores range from 1- 4 in which four is the highest level. All the parameters have received highest value for Mahaweli H BWA programme and lowest under MANIS programme. However, the physical sustainability of irrigation infrastructure is lowest in Mahaweli B as the system is with a dilapidated canal system and needs rehabilitation.

The scores of FO strength range from 3.34 to 3.54 out of maximum of 4 indicating a moderately high strength. The scores obtained for resource mobilization for O&M is lowest in all management models which need attention of policy makers to ensure sustainable infrastructure.

Table 5.25: Results of Multi Dimensional Scale

Parameter	BWA (Mahaweli- H)	Mahaweli-B	INMAS	MANIS
Strength of FOs	3.54	3.37	3.44	3.34
Level of Agency Support	3.04	2.92	2.81	2.79
Level of Resource Mobilization for Sustainable O&M	2.91	2.74	2.77	2.66
Physical Sustainability of Infrastructure	3.16	2.94	3.01	2.99
Sustainability of Irrigated Agriculture	3.08	2.97	2.91	2.89
Dimension scale : 1 – 4				

Source: Author's survey data (2010)

Although, FOs show relatively higher strength in the irrigation schemes, there are some emerging issues which might curtail the FO strength in the future unless corrective measures are taken.

a) Low levels of financial strength of FOs and high dependence on external resources
b) Inadequate financial transparency between FO committee members and general farmers
c) Lack of sufficient immediate benefits for most of FRs other than the status they get in the society, intelligence on irrigation information, relationship built with government officials and training
d) Poor communication network may harm the timely passing of information on FO activities
e) Lack of awareness on legal recognition given to FOs under the Agrarian Development Act

5.4.4 Willingness to Pay (WTP) for Irrigation System Maintenance

The ability to pay does not necessarily mean that the WTP exists. WTP arises when surpluses are large enough, and when farmers are convinced that payment will lead to an increased efficiency in the system (Ranaweera, 1992). In Sri Lanka, a tradition exists to provide a fixed amount of paddy harvest to irrigation headmen or *Jala Palaka* as an honorarium for his services. However, this is not widely practiced in settlement schemes, though farmers are aware of this custom.

Farmers were questioned about the amount of paddy they were willing to provide to their respective FOs in addition to their current level of voluntary labour and cash and kind contribution, in order to maintain the infrastructure in a good condition. Tables 5.26 and 5.27 give the number of people willing to provide additional resources and amount to contribute for improved irrigation services. About 70% of people were willing to mobilize additional resources for system maintenance, if proper system for collection and utilization of resources are established. As Mahaweli –H has established a system to collect an O&M fee from all the farmers, the number of

farmers willing to provide additional resources is lowest compared to rest of the management models.

Table 5.26: Number of Farmers Willing to Provide Additional Resources (Cash and/or Kind) for Improved Irrigation Services

Scheme	Willing to Provide Additional Resources	
	No.	%
Bathalagoda	32	62.75
Huruluwewa	26	68.42
Kallanchiya	22	64.71
Kande Ela	27	90.00
Maeliya	23	74.19
Maha Siyabalangamuwa	27	77.14
Mahaweli H	21	52.50
Mau Ara	25	71.43
Mahaweli -B	31	72.09
Muruthawela	36	66.67
Grand Total	270	69.05

Source: Author's survey data (2010)

Table 5.27: Additional Amount of Resources Farmers were Willing to Provide for Improved Irrigation Services (Rs/ac/season)

Scheme	Minimum	Maximum	Mean	SD
Bathalagoda	100	600	295.31	192.34
Huruluwewa	100	500	280.77	162.53
Kallanchiya	100	600	163.64	109.31
Kande Ela	100	500	274.07	158.95
Maeliya	100	500	277.17	157.92
Maha Siyabalangamuwa	100	500	248.15	148.38
Mahaweli- H	40	200	111.43	57.47
Mau Ara	100	500	274.00	182.07
Mahaweli- B	100	500	258.06	159.74
Muruthawela	100	500	250.00	165.18
Grand Total			248.20	162.74

Source: Author's survey data (2010)

The findings show that a considerable amount of WTP exists among majority of the farmers to obtain improved irrigation services, but rates highly varied as indicated by high value of standard deviation. The WTP should be captured through FOs by proper guidance and establishing procedures. A clear guidance and system of collection should come from the government on collection of O&M fee from farmers, strict enforcement to utilize such funds for only operation and maintenance. The situation was correctly pointed out by Kloezen (1994) that, *"Participatory management programme in Sri Lanka focuses too much on sharing activities without making clear*

who is responsible for these activities and who can be made accountable if these activities do not take place". The financial transparency and management should be improved in order to convince farmers to contribute the resources to FOs. FO leaders are also not keen to invest FO money for O&M as they expect allocation from the government.

Table 5.28: Number of Additional Days Farmers were Willing to Spend for Voluntary (*Shramadana*) Works

Scheme	Min	Max	Mean	SD
Bathalagoda	1	6	2.45	1.06
Huruluwewa	1	6	2.74	1.35
Muruthawela	1	6	2.70	1.46
Kallanchiya	1	5	2.73	0.94
Kande Ela	2	5	3.37	0.96
Maeliya-Pitapola	1	6	2.87	1.43
Maha Siyabalangamuwa	1	6	2.91	1.56
Mahaweli- H	1	5	2.60	0.90
Mau Ara	1	6	2.67	1.40
Mahaweli- C	2	6	3.67	1.27

Source: Author's survey data (2010)

5.4.5 Factors Affecting the Willingness to Pay for Improved Irrigation Services

Multiple regression model was administered using Minitab software package as per model specification given in the section 3.4. Ten independent variables [total family income, total low land extent, age of the farmer, sex of the farmer, DC location (head, tail) type of farming (part time, full time), amount of current O&M fee, labour contribution for meetings, labour contribution for maintenance, water availability (abandoned, scarce) were identified from literature and the field experience that would influence the amount of WTP.

Initially Chi^2 analysis was conducted to find out the association between WTP and categorical variables described in the model namely; sex of the farmer, location of the irrigated land along DC, type of farming, and water availability. After the Chi^2 analysis it was found that, except DC location of the farmer, other variables showed no significant association with WTP. Therefore these categorical variables were dropped from multiple regression analysis. The results of the regression analysis are depicted in Table 5.29.

Table 5.29: Results of Regression Analysis

Predictor	Coef	SE Coef	T	P	VIF
Constant	-140.414	9.705	-14.47	0.000	
Income	123.136	1.083	113.67	0.000	1.041
Current O&M fee	0.04469	0.01740	2.57	0.011	1.071
Land size	-0.0001230	0.0001121	-1.10	0.273	1.027
Age	0.0732	0.1238	0.59	0.554	1.049
DC Location	2.864	2.030	1.41	0.159	1.014
Meeting days	-0.522	1.936	-0.27	0.787	1.093
Maintenance days	-0.5803	0.7080	-0.82	0.413	1.099

S = 29.8369 R^2 = 67.2% Adjusted R^2= 67.1%
Durbin-Watson statistic = 1.61553
The regression equation is;
WTP = -140 + 123 Income + 0.0447 current O&M fee - 0.000123 Land size
+ 0.073 Age + 2.86 DC Location - 0.52 meeting days- 0.580 maintenance days

The regression findings show that only two variables namely total family income and current O&M fee amount indicate statistically significant relationship with WTP for further improvement in irrigation services. These two significant variables explain 67% of the WTP model of this population. As the income from paddy farming is in the range of Rs. 9000 to 16,000 per month per household, the increase of agricultural and other sources of income is important to ensure sufficient resource mobilization for sustainable O&M. It is also evident that there is a huge potential for mobilizing more resources for O&M from beneficiaries who do not pay or pay lesser amounts than potential for O&M by establishing systematic procedures and utilization methods for resource mobilization.

CHAPTER SIX

Findings, Recommendations and Policy Implications

6.1 Major Findings

1. Strength of FOs is highest under Bulk Water Allocation (BWA) programme in Mahaweli-H followed by Integrated Management of Agricultural Systems (INMAS) schemes. FOs in the Management of Irrigation schemes (MANIS) shows lowest strength.

2. Agency support for institutional strengthening is lowest in MANIS schemes mainly due to lack of physical and human resources available in the line agency.

3. Impact of PIM on physical condition of infrastructure is ambiguous. Although current policies expect to maintain the system in a sustainable manner, the relevant parties have not established maintenance standards to ensure the sustainable O&M and the guidelines that are necessary to mobilize resources in an equitable manner. The following issues are major highlights in this regard

    a. FOs do a good job in maintaining DCs and FCs mobilizing their labour for channel clearing, de silting and minor earth works. FOs in many instances have undertaken maintenance tasks above the DC level even without any payment from Irrigation agency.
    b. The maintenance requirement which needs mobilization of cash and kind from farmers has not been adequately fulfilled as expected by PIM policy.
    c. Irrigation agencies receive a much lower allocation than the actual requirement from central government to undertake sufficient maintenance in main canal systems and to attend major repairs in DCs.

4. Willingness to pay for the improved irrigation service exists in all the schemes among the majority of the farmers for their respective FOs, but procedures are needed to make the farmers mobilize the resources and also a methodology for proper utilization of resources.

5. PIM policy does not adequately cover O&M part of the irrigation system that is operated by the state. Allocation for O&M by the government is inadequate to perform sufficient maintenance; the quality of O&M is on the decline. Unless this situation is reversed and the policy gap is addressed, many systems may call for extensive rehabilitation within a short period of time.

6. Insufficient allocation of resources from the central government has become a disincentive for farmers to do a good maintenance job for the turn over parts of irrigation scheme as proper maintenance of main system also determine the reliable and efficient water delivery in secondary and tertiary canals.

7. PMCs exist and functioning in all INMAS schemes and Mahaweli schemes, but functioning of PMC at regular interval in majority of MANIS schemes is poor.

8. PMCs have been functioning as the forum for joint maintenance planning and irrigation scheduling and more importantly bringing the farmers' problems to relevant authorities. Decisions on arrangements for annual irrigation maintenance works made at the seasonal meetings are continuously monitored at monthly PMC meetings.

9. PMC lacks power and authority. Therefore the decisions taken at the PMC are sometimes neglected by the line agencies. Participation at the PMC meetings from line agencies is also voluntary and the officers are accountable only to the heads of their respective departments, but not to the PMCs. Even if the officials of the line agencies attended the PMC meetings, participation itself was not a commitment for implementing the decisions taken. The successes of the PMC's plans totally depend on the performance of the functional agencies and their officials who are beyond the control of PMC.

10. Although irrigation management turnover has taken place in many schemes, it is hard to realize the real sense of ownership indicating some deficiency in the process. This was evident on many occasions as reported in the field. Farmers drive their tractors and buffaloes across the irrigation canals causing damages to canal system.

6.2 Recommendations and Policy Implications

1. FOs should be provided adequate awareness on the transfer agreement, their roles and responsibilities entrusted by PIM policy and the relevant acts dealing with irrigation management and the powers and authority given to FOs by the existing Acts.

2. All the relevant line agency officers should be educated about their roles and responsibilities under the PIM and PMCs in order to accept the PIM as their duty. Procedures are needed to ensure the supportive actions of officers for FOs and irrigation system management. One way of motivating officers is assessing their supportive roles for PIM in their performance evaluations.

3. Recognition and service priority should be granted to FO leaders when they deal FO affairs with line agencies and other public departments such as police, Pradeshiya Sabha (Local Councils) and *Grama Nildhari* office.

4. Farmers should be made aware of the PIM policy as an alternative of past irrigation fee collection and of the positive aspects of PIM compared to the earlier policy.

5. The irrigation systems should be rehabilitated or repaired to be farmer manageable level prior to transfer.

6. The government must provide guidance to formulate rules and regulations to establish financial accountability and transparency and necessary training and monitoring/auditing supports in this area.

7. Each FO should maintain a separate O&M fund from the resources collected from farmer contributions and the savings of O&M and rehabilitation contracts. The fund should be solely utilized for the system improvement and the O&M activities of the transfer system.

8. FO office bearers especially '*Jalapalaka'* must be provided an honorarium, for their services to increase their efficiency and minimize the abuse of FO fund.

9. Provision of catalytic efforts and more resources for organizational development are vital in MANIS schemes.

10. Lessons learnt from the BWA programme of Mahaweli-H must be incorporated into other management models.

11. It is necessary to pay due attention to increase the cropping intensity through more efficient water management together with improvements in cropping systems. This calls for a coordinated effort in the areas of agro economic research, water management research and effective extension plus participatory land and water use practices. Apparently the role of government policy in organizing such a coordinated effort has not been recognized by the authorities.

References

Abeysekara, W.T. (1986). Mobilizing Farmer Participation in Irrigation Rehabilitation and Management Programs Through tank Committees:The Case of Tank Irrigation Modernization Project. *Workshop on the Participatory Management in Sri Lanka's Irrigation Schemes.* Digana Village: International Irrigation Management Institute. Sri Lanka.

Abeywickrama, N. (1986). Government Policy on Participatory Irrigation Management, *Proceedings of the Seminar on Participatory Irrigation Management in Sri Lanka's Irrigation Schemes*, International Irrigation Management Institute, Digana Village, Sri Lanka.

Aheeyar, M.M.M.; Shantha, W.H.A., and Senevirathne, L.P., (2007). *Assessment of Bulk Water Allocation Programme in Mahaweli- H Area,* Research Study No. 118, Hector Kobbekaduwa Agrarain Research and Training Institute, Colombo.

Aheeyar, M.M.M and Smith L. E.D. (1999). The Impact of Farmer Participation on Water Distribution Performance in Two Irrigation Schemes in Sri Lanka. *Sri Lanka Journal of Social Scieneces , Vo*l 22 (1&2)27-43.

Aheeyar, M.M.M. (1997). "Participatory Irrigation Management and Sustainability of Irrigation Infrastructure: A Case of Irrigation Management Turnover in Sri Lanka," Proceedings of the International conference on Large scale Water Resources Development in Developing countries: New Dimensions of problems and prospects, October 20th-23rd, Kathmandu, Nepal.

Aluwihare, P. D and Kikuchi, M., (1992). Trends and Policy Directions for Irrigation Investment and Management in Sri Lanka Available at, *http://pdf.usaid.gov/pdf_docs/PNABN044.pdf*, accessed on 12th May 2011.

ARTI, (1984). *A Preliminary Assessment of the Performance of a Major Rehabiltation Programme: the Case of Tank Irriagation Modernization Project*, Research Study No. 60, Agrarain Reszearch and Training Institute, Colombo.

Brewer, J. D. (1994). The Participatory Irrigation System Management Policy in Sri Lanka. *Economic Review. Vol 20(9)* , 4-9.

Carruthers, I.D. and Morrison. J. (1994). "Irrigation Maintenance Strategies: A Review of the Issues", A Report Submitted to the Duetsche Gesellschaft Fur Technischue Zusammenarbeit (GTZ) GMBH, Ministry of Economic Cooperation and Development (BMZ), Germany.

Chackacherry, G. (1993). Farmer Participation in Irrigation Management. PhD Thesis, M.G. University, Kottayam, Kerala.284p, *www.jtropag.in/index.php/ojs/article /viewFile/135/129* accessed on 15th march 2011

De Vaus, D.A. (1990). *Surveys in Social Research.* London Unwin Hyman, London

Fernando, N. (1991). *Rehabilitation and Modernization of Irrigation Projects, Staff* Working Paper No.3.2, Irrigation Management Policy Support Activity, Colombo, Sri Lanka.

Fernando, N. (1992). "Beneficiary Participation in Irrigation Management", Proceedings of International Conference on Advances in Planning Design and Management of Irrigation Systems Related to Sustainable Land Use, Leven, Belgium.

Godaliyadda, G.G.A., Mullegamgoda, K.R.P.M., Alahakoon, A.M.U.B., (undated). Some Experiences on Modernization in Irrigation System Rehabilitation in Sri Lanka. Available at, www.fao.org/docrep/003/x6626e/x6626e14.htm, Aaccessed on 5th February 2011

Hardin, J. and Frank, T., (1988). "The Matrix Management of Irrigation Projects: Integrated Management of Major Irrigation Schemes in Sri Lanka". *Agricultural Administration and Extension, 28:*133-147

Gunadasa, A.M.M.S., (1989). *The Kimbulwana Oya Irrigation Scheme: An Approach to Improved System Management.* International Irrigation Management Institute, Colombo.

IMPSA, (1991). "Institutional Framework for Management of Irrigation Systems and Building Farmer Organizations", Policy Paper No. 2, Irrigation Management Policy support Activity, Colombo.

IIMI (1992). Study on cost effective irrigation modernization strategies for the 1990s, Final Report. Available at, *http://publications.iwmi.org/pdf/H_21616i.pdf* , Accessed on 5th February 2011

Kikuchi, M., Barker R., Weligamage P. and Samad. M. (2002). *Irrigation Sector in Sri Lanka: Recent Investment Trends and the Development Path Ahead*. Research Report No. 62. International Water Management Institute, Colombo.

Kloezen, W.H. (1994). "financing Participatory Irrigation Management in Sri Lanka", In Johnson iii, S.H. et al (Ed), Irrigation Management Transfer: Selected papers from International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September, IIMI nad FAO, Rome.

Lam, W. F. (1998). *Governing irrigation systems in Nepal: Institutions, infrastructure, and collective action*. ICS Press, Oakland, California

Leach, E.R. (1961). *Pul eliya, A Village in Ceylon: A Study of Land Tenure and Kinship*. Cambridge University Press, Cambridge.

Lowe W.N.S. (2007). Evolution of the Compulsory Service System *(Rajakariya)* in Sri Lanka. Proceedings of the Annual Research Symposium, Faculty of Graduate Studies, University of Kelaniya, Available at *http://www.kln.ac.lk/uokr/ ARS2007/2.20.pdf* accessed on 15th September 2012

Merrey, D.J., Rao, P.S. and Martin, E. (1988). Irrigation Management Research in Sri Lanka: A Review of Selected Literature, International Water Management Institute, Colombo.

Murray-Rust, D.H. and Rao, P.S. (1987). Learning from the Case of the Tank Irrigation Modernization Project of Sri Lanka, ODI/IIMI Irrigation Management Network Paper 87/2b, Overseas Development Institute, London.

Murray-Rust, D.H. and Snellen. W.B. (1993). Irrigation system performance assessment and diagnosis. International Irrigation Management Institute, Colombo.

Moore, M.P. (1981). "The Sociology of Irrigation Water Management in Sri Lanka". *Water Supply and Management*, 15:01, pp 23-34.

Peiris, G. (1987). *Irrigation and Water management in Peasant Settlement Scheme of Sri Lanka; A Study of the Water management Project of Minipe*. Agrarian Research and Training Institue, Colombo.

Perera, J. (1986). The Gal Oya Farmer Organization Program: A Learning Process. *Workshop on the Participatory Management in Sri Lanka's Irrigation Schemes.* (pp. 111-125). International Irrigation Management Institute. Sri Lanka, Digana Village.

Ranaweera, N.F. and Somasiri, C.S. (1990). "What Can Farmers do for Irrigation System Sustainability?, In IIMI., *Resource Mobilization for Sustainable Management*, Proceedings of the Workshop on Major Irrigation Schemes in Sri Lanka, 22-24 February, International Irrigation Management Institute , Colombo.

Razaak, M.G.M,(1996). The Rise and fall of the Farmer Organization Program in Gal Oya, In Haq, A. A. and Nandaratna, S.M.K.B (ed.). *Beneficiary-centered management of irrigation systems: Retrospection on recent endeavors: Proceedings of the Workshop held at the Irrigation Department.* International Irrigation Management Institute (IIMI), *Colombo,* Sri Lanka.

Samad, M. and Vermillion. D. (1999). *Assessment of Participatory Management of Irrigation Schemes in Sri Lanka: Partial Reforms, Partial Benefits*. Research Report No. 34, International Water Management Institute, Colombo.

Silva, E. V. (2002). Country Report on Participatory Irrigation Management in Sri Lanka. *Organizational Change for Participatory Irrigation Management* (pp. 266-278). Asian Productivity Organization, Tokyo.

Silva, M. (1986). The Evolution of Policies in Sri Lanka Relating to Covering of Water Charges from Farmers for Irrigation Services, International Water Management Institute, Colombo.

Silva, M, and Vidanapathirana, S. (1984). "Major Irrigation and Settlement Systems in Sri Lanka: Some Policy Issues in Operation and Maintenance", *Sri Lanka Journal of Agrarian Studies, 5:*2, pp 1-11.

Svendson, M. and Wijeratne, C.M. (1982). "The Spatial Distribution of Irrigation Water and Yields on the Gal-oya Left Bank", *Sri Lanka Journal of Agrarian Studies, 3*:02, pp 69-82.

Thiruchelvam, S. (2009). Enhancement of Capacity of Farmer Organizations for Sustainable Irrigation Systems in Anuradhapura and Kurunegala Districts, In K. Jinapala et al, (ed.) *Proceedings of the National Conference on Water, Food Security and Climate Change Volume 3: Policies, Institutions and Data Needs*, International Water Management Institute, Colombo

Wikramaratne N.and Ekanayake, S.A.B., (2002). Operation and Maintenance Requirements of Irrigarion Systems. In R. Shand (ed), *Irrigation and Agriculture in Sri Lanka*, Institute of Policy Studies, Colombo.

World Bank, (1976). Sri Lanka: *Appraisal of Tank Irrigation Modernization Project, Report 951a-CE*, The World Bank, Washington DC (unpublished).

World Bank. (2004). Project Performance Assessment Report on Sri Lanka National Irrigation Rehabilitation Project. Available at, *http://www-wds.worldbank.org /external/default/*, accessed on 5th February 2011