MOBILIZING FARMER PARTICIPATION IN IRRIGATION REHABILITATION AND MANAGEMENT PROGRAMMES THROUGH TANK COMMITTEES: The Case of Tank Irrigation Modernization Projects

by
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Introduction

In the recent past, Sri Lanka has increasingly recognized the need for greater farmer participation in irrigation system management. With this goal in view, a range of strategies has been adopted in many irrigation improvement programmes. In this paper, the experiences of a major irrigation rehabilitation programme, the Tank Irrigation Modernization Project (TIMP), undertaken in Sri Lanka in the late 1970s, is examined. Th: strategy to mobilize farmer involvement in the project involved the establishment of a Tank Committee at the project level. In this presentation, details of the more significant experiences of the TIMP with respect to its plans, strategies, and achievements are examined in relation to the Tank Committees and other issues concerning participatory management.

Project Background

The TIMP is the first large scale public investment in the irrigation sector in Sri Lanka undertaken to improve the performance of older irrigation systems. The project was identified in the early 1970s and the plans were drawn up by the

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World Bank in consultation with the Irrigation Department (ID). The project was planned for completion during 1976-1980, but due to a variety of organisational problems, it was implemented in the period 1978-1983. Much of the project activities involved construction work for improving the conveyance system, for which the ID was responsible. The total estimated cost of the project was about US$ 30 million in 1976 currency.

Primarily for purposes of executing the project, the TIMP followed a three-tiered committee system. The committee at the Ministry level was chaired by the Secretary, Ministry of Irrigation, Power and Highways and included senior representatives of the concerned Departments and Agencies. This Committee was made responsible for overall project execution and coordination and was expected to meet quarterly to make policy decisions, to review work progress, and to approve budgets. The second level committee at the district level was chaired by the Project Engineer with representatives from various Departments serving at the district level. The third level committee was at tank level and was formed by the Project Engineer, local staff, and the farmer representatives (FRs).

Of the three committees, the committees at the Ministry and district levels met regularly. The Tank Level Committees, however, were not active to the extent envisaged. During the implementation stages, therefore, design and construction decisions were taken mainly by the Prnject Engineer in charge and his staff.

Project Location

The project involved five large irrigation schemes located in the North Central Dry Zone of Sri Lanka, and covered about 31,500 acres. The schemes are Mahavilachchiya and Mahakandarawa in Anuradhapura district, Vavunikulum in Mullativu district. Padaviya in Trincomalee district, and Pavatkulum in Vavuniya district. (See Map below) In terms of irrigation water supply/demand, the five tanks (reservoirs) represent most of the major irrigation systems in the Dry Zone that are fed only by the run-off from the local catchment. The catchments of all five schemes are poor in water supply and their water storage usually rises only in the months of December and January. Within them, however, the five tank areas show considerable variation:, hydrologically and otherwise. The command areas of the five tanks vary widely, from 2,600 acres in Mahavilachchiya to 12,500 acres in Padaviya (see Table I for hydrological features). Similarly, there are significant differences in the size of catchment areas as well. The area irrigated per unit catchment area ranges from 18 square miles per acre of irrigable land in Mahavilachchiya tank to about 68 square miles of catchment area per acre of irrigated land in Padaviya tank. Furthermore, the catchments of all these tanks contain a large number of small village tanks which intercept most of run-off to the main tank (Kariyawasam 1984).

SRI LANKA, SHOWING LOCATIONS
OF TANK IRRIGATION MODERNIZATION PROJECT

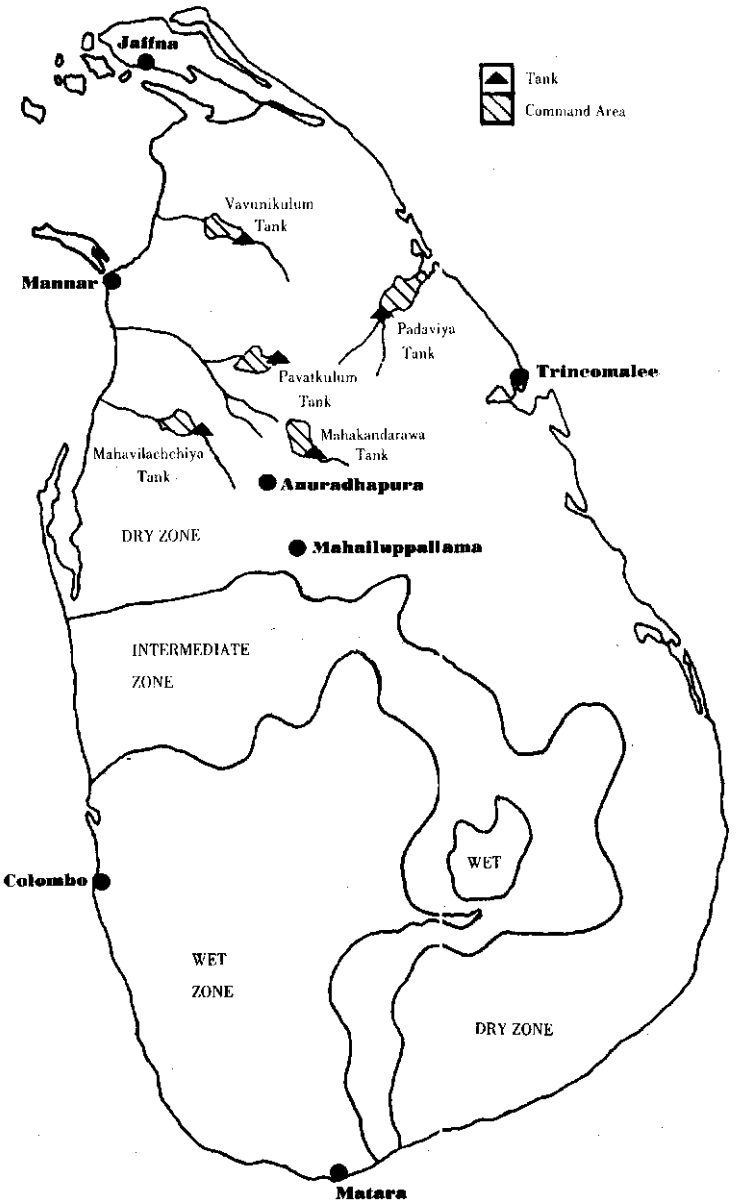


TABLE 1: Key Hydrological Features of the Five Tanks in the Time

Feature	Mahakana-darawa	Maha Vilach-chiya	Pavat-kulum	Vavuni-kulum	Padaviya
Tank Capacity (ac.ft.)	34,000	32.500	27,000	35,000	85.000
Tank surface area (ac.)	4,000	3,200	3,000	3,150	6,480
Head on outlet at full supply level (ft.)	19.0	22.0	19.0	24.0	24.0
Catchment area (sq.miles)	126	141	115	88	206
Irrigated area (ac.)	6,000	2,600	4,400	6,000	12.500
Area irrigated per square mile of catchment (ac.)	48	18	38	68	60

Source: ID

Setting of the Irrigation Systems in the TIMP

All five irrigation systems under the TIMP were in ruins when they were renovated in the 1950s. The irrigation systems were originally designed to provide supplementary irrigation for a single paddy crop during the main rainy season. About 10,500 farm families were settled. Each settler was given 3 acres of irrigable lowlands and 2 acres of unirrigable highlands. The bulk of the settlers were drawn from the Wet Zone areas. Currently, the population in the project area is estimated to he around 90,000.

Among the environmental features influencing the activities in the project area, rainfall is most dominant. The average annual rainfall is less than 75 inches. It is markedly seasonal with about 70% of the annual precipitation occurring in the period between November and January (Maha rains). Minor rains occur in April-May (Yala rains). The rains are highly erratic and uncertain, particularly during Yala. The area is subjected to a marked dry period, from about 'May to September. The onset of the monsoon rains vary as much as 6 weeks from year to year, and the amount of rainfall show considerable annual variations. Even during Maha, the precipitations of 6 to 8 inches per week as well as dry periods extending to 2 to 3 weeks are not uncommon.

The soils in the project area contribute significantly to its agriculture and economic patterns. They are heavy soils with low infiltration capacities and low organic matter content. Consequently, the range between the wilting point and

the saturation point is narrow. These soils hence, require frequent irrigation. When dry, the soils are rock-hard and cannct he ploughed with ordinary farm implements. Under slightly moist conditions, they are sticky and are difficult to work with. Under saturated conditions, however, their workability is increased.

Cultivation **of** paddy lands as well as chena account for the bulk of the employment opportunities. Livestock rearing is limited only to few farmers. Employment in non-agricultural pursuits is seen in less than 5% of the labour force.

Within agriculture, paddy cnltivation in .he irrigable allotment is the major cash enterprise. Under usual circumstances, project farmers undertake a cultivation of the entire extent of their paddy lands in Maha season. A second crop of paddy in Yala is generally possible only once in 2 to 4 years. Average paddy yields in Maha seasons range from 30 to 60 bushels per acre. In Yala, yields arc lower due to lack of water during the latter part of the season. In Mahakandarawa and Mahavilachchiya, most farmers undertake cultivation of chenas (slash and burn agriculture) in the adjoining state forests as a supplementary income source.

Prior to implementation of the TIMP, farmers followed the traditional methods of irrigating paddy (Ranatunga and Abeysekera 1978). This involves continuous irrigation, to meet the consumptive use requirements of the paddy crop as well as to control weeds. The practice usually involves heavy demands on water, particularly on soils with high permeability. Normally farmers grow long-age (4 to 4 1/2 months) paddy varieties. The crop is normally grown only when the tanks are sufficiently full to assure an adequate water supply to the Maha crop. If the tanks are not full, land preparation is correspondingly delayed.

Objectives, Strategies, and Accomplishments of TIMP

Objectives. The primary goal of introducing the TIMP was to increase agricultural productivity in the five irrig: tion schemes concerned through intensification of land use and increased crop yields by adopting better water management and agricultural practices. The plan basically involved the introduction of new innovations designed for more efficient use of rainfall and tank water. As a secondary goal, the project also aimed at providing a more equitable water distribution system to project farmers. The TIMP plans were based on the assumption that with proper operation and management of the irrigation systems, improved irrigation methods, and suitable agricultural practices, it would be possible to substantially increase the irrigated area with existing water supply.

More specifically, the project estimated that at full development, i.e., after 5 years, the average cropping intensity in the irrigated lands would rise from 108% to about 156%. The average paddy yields were expected to rise from .9 tons (40 bushels) per acre to about 1.5 ton (74 bushels) per acre. Only minor increases in cropping intensity and yields were considered likely under the "without" project situation

The total Maha season paddy production in the project area was expected to increase by about 150% from 27,000 tons-45,000 tons while in Yala--paddy output was expected to rise by about 250% from 6500 tons to 15,000 tons (Table 2 below). The expected increases in output on non-rice crops were even more impressive. Prior to the project, the practice of growing noo-rice crops in paddy fields was virtually absent. At project maturity, it was expected that the total annual production of these crops would increase to about 7200 tons.

According to these plans, nearly *75%* of the output increases in paddy is expected to come from yield increases and the remaining 25% due land expansion, The yield increases were expected to be possible due to increased adoption of modern production techniques resulting from increased water availability through better management. The gross value of farm production was thus expected to increase from a preproject value of Rs. 4,150 to a post-project value of Rs. 10,700. Net farm income was expected to rise from Rs. 2850 to Rs. 7650. On the basis of these increases in yields, area and incomes TIMP plans anticipated an internal rate of return of 29%.

Development strategies. The development approach of TIMP comprised two basic components: (a) strategy for improving irrigation water management and (b) strategy of improving crop management. Both these strategies were heavily biased towards improving management at the tertiary (farm) level. The development strategies adopted can be summarized as follows:

i. Physical improvements of the channel systems, redesign, and construction of the channel network to accommodate a strict, farm level rotation (intermittent) irrigation issue.

ii. Adoption of strict water management and rotational irrigation practices with day and night irrigation. Each farmer was supplied with 7-day rotations and his entire irrigation requirement was to be supplied in a period of 12 hours. Attempts were made to operate, shorter but firm irrigation schedules and to reduce the staggering of cultivation. With these objectives in view, an extremely detailed, farm to farm, rotational schedule was designed by the Water Management Consultant attached to the project. Under this system, of the 6 to 10 farmers in a field channel, only 2 were allowed to take water at a given time

TABLE 2. Tank Irrigation **Modernization Projrct**
Present and Estimated Future Prouction.

THE FIVE TANKS (31,500ac) 1/									
	Area (ac)			Yield (tons/ac)			Production (tons)		
	P 2/	W 2/	W 2/	P	W	W	P	W	W
Maha Rice	24,200	24.200	29,900	0.90	1.10	1.50	21,780	26,620	44,85
Cereals		600	1,600		0.80	Qw		480	1,44
Pulses		350			0.45			157	
Sub-Total	24,200	25,150	31,500						
Maha Intensity	77%	80%	100%						
Yala Rice	7,700	7,700	10,700	0.85	1.00	1.40	6,545	7,700	14,988
Cereals	150	500	2,650	0.65	0.80	1.10	98	400	2.91
Pulses	500	800	4,250	0.35	0.45	0.65	175	360	2.76
Sub-Total	8,350	9,000	17,600						
Yala Intensity	26%	28%	56%						
TOTALS	32,550	34,130	49,100						
TOTAL INTENSITY	103%	108%	156%						

** Figures in parenthesis give the net cultivable acreage.

2/ P = Present, W = Future Without Project, W = Future With Project.

Source: World Bank Appraisal Report on TIMP, 1974.

iii. Introducing a package of new agriculturalinnovations into the area with a view to changing the existing cultivation practices. The package involved: early tillage under dry conditions, using tractors: dry sowing of seed paddy to maximize the use of Maha rainfall during the crop growing period; cultivation of less water consuming, non-rice crops during the yala seasons; and cultivation of short-aged (3 to 3 1/2 month) paddy varieties to shorten the irrigation period.

The civil works constituted a major activity in the TIMP and accounted for about 70% of its total cost. This involved the construction of 1 cusec channels to serve an area of approximately about 40 acres. A large number of control structures and measurement devices were installed along the conveyance system. Most of the secondary and tertiary channels were lined with cement to reduce seepage losses. As a pilot exercise, the entire channel system, except the two main channels of Mahavilachchiya scheme was lined with cement. The farm turn-outs were enlarged, to 6-inch outlets to accommodate larger flows in the rotations. Prior to introduction of TIMP, the turn-outs were smaller 3 inch pipes.

Accomplishments of the TIMP. Detailed assessments of the overall impact of TIMP in its early stages has suggested that the project had little or no significant influence on the long-run development of the settler's economy (Abeysekera 1983.1985). In fact, due to problems inherent in the project, now it is widely accepted that "TIMP is not a success story in rehabilitation and improving major irrigation systems in the country" (Ministry of Lands, 1982: p.72).

Investigations on the performance of the innovative, rotational water distribution system of the TIMP has shown that, despite the heavy reliance placed on the meticulously designed schedules for distributing water to each farm, the actual performance differed widely from expectations. The rotations appeared to work relatively well in channels above the tertiaries. The rotations were hardly operational below the field (tertiary) channels. The system therefore, has led to much confusion and conflict among farmers. Equitable and systematic water distribution to a reasonable degree was seen only in instances where Vel Vidanes (farmer representatives) in the area are effective and acceptable. This was mainly because the greatest responsibility for operating the tight rotational schedules was squarely placed on the Vel Vicane. In most instances, the Vel Vidane did not receive the level of cooperation he needed.

The structural changes in the channel system introduced by the TIMP in some instances led to major physical problem: into the water delivery system. The key problems were (a) faulty location of some farm turnouts, (b) incorrect levels of some lined secondary and tertiary channels, and (c) inadequate free

boards in the secondary and tertiary channels. The construction of field channels with a maximum capacity of **1** cusec and installation of larger farm turnouts, in particular, imposed serious operational rigidities into the system. Major deficiencies were also seen in the quality of some of the lining material used.

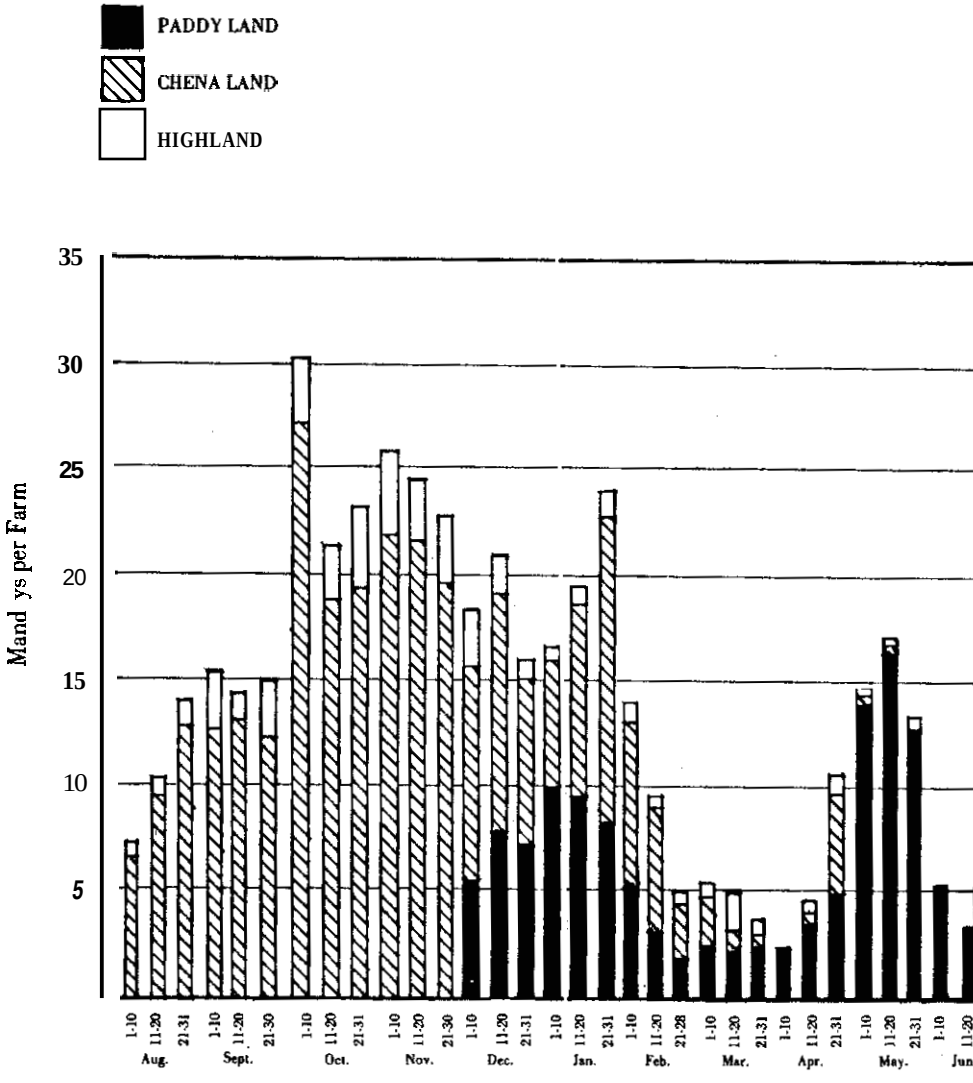
The newly built conveyance system therefore appeared to be incapable of delivering adequate water flows during peak water demand periods. The problem is acute in the paddy allotments located at the upper part of the channels where the soils are highly permeable. In these instances, the estimated total demand during peak irrigation periods is closer to the higher range of 9 to **18** m.m/day, while the 1 cusec channels are capable of providing a maximum flow of about 15 m.m/day. It has therefore, led to a situation of water shortage for the farmers at the lower end. Often farmers at the bottom-end of the field channels have resorted to breaking the structures at the top end in a hid **to** get more water.

The agricultural improvement programme envisaged in the TIMP, despite a heavy backing from the extension services, also failed to receive satisfactory levels of farmer acceptance. The dry tillage and dry sowing, major strategies recommended by TIMP to farmers for saving water, were almost totally rejected by farmers. This was due primarily to technical inappropriateness, low profits, and highly uncertain returns arising from area's soil conditions and sporadic rains. Even with the adoption of short-aged (3.3 1/2 months) paddy varieties, it was seen that farmers continued to show the conventional preference to grow long-growth duration varieties. Although under experimental conditions, the two varieties do not show significant difference in yield, under farm conditions, longer-aged rice varieties usually provided h gher yields. Similarly, the cultivation of non-rice crops in paddy fields during Yala has not been adopted by farmers on the scale anticipated. Indications were that the future potential for this practice is rather bleak under the existing low economic incentives to the producer.

Mainly due to the problems of physical improvements in the irrigation system and the unsatisfactory nature of the agricultural strategy of the TIMP, farmers have expressed a considerable dissatisfaction in the improvement programme. They seemed to have lost their confidence in the physical infrastructure facilities to provide them with better water supplies. The project planners placed a heavy emphasis on construction related activities on the basis of the assumption that once a technically efficient conveyance system is laid and the schedules for water distribution explained, all farmers would automatically adhere to the recommendations. The planner:; appear to have been guided by the notion of a maximizing behaviour of the farmers with respect to their irrigation water resources. The assumption appears to be an over-simplification of the circumstances faced by the farmers in the project area. In fact, a detailed study

of farm labour allocation in Mahavilachchiya scheme has suggested that farmers also place a heavy emphasis on optimising family labour use in cultivating their Chena plots and paddy holdings (Ranatunga and Abeysekera 1980). Chena cultivation is almost solely a family labour concern, and most of the **work** is undertaken during the dry months in which opportunity cost of labour is virtually zero (Figure 1). Due to the risk involved, farmers do not prefer to be totally dependent on paddy cultivation.

FIGURE 1. Distribution of Seasonal Labour Application for Farming in Mahavilachchiya Irrigation Scheme. 1976/77 Maha.



Source: 1976/77 Maha Season Survey

Project Strategy for Promoting Farmer Involvement

The irrigation improvement strategy underlying the TIMP is particularly remarkable for the low emphasis placed on farmer needs. However, this deficiency was increasingly recognized towards the later years of the project and some efforts were taken to remedy the situation.

The project plans and their implementation were almost solely focussed on construction-related activities. As a result, the project was solely operational through heavy state intervention. The ID was specificallj involved in preparing the final plans and designs, procuring necessary construction machinery, and undertaking all irrigation related work. The main mechanism planned for seeking farmer involvement in the project was through the two-tiered institutional mechanism of the Cultivation Cummittees (CCs) at the village level and the Agricultural Productivity Committee (APCs) at the higher level. The CCs included FRs, each selected from about 500 farm holdings. The APCs were composed mostly of the representatives of the CCs. All tanks in the TIMP area, had one APC, except Padaviya which had two.

In terms of mobilizing farmer involvement for project planning and construction activitics, this institutional mechanism was hardly effective. With respect to these functions, the ID, however, had the major responsibility. The operation and maintenance of the channel system down to the field channel was undertaken by the ID.

The maintenance and the distribution of water in the field channels were to be undertaken by the CCs under the general supervision of the APCs. The CCs, under this system were expected to recommend to the ID any adjustments in the cropping pattern, crop calendars, and water issue periods. The CCs were also expected to recommend the minimum flows necessary for domestic purposes and livestock. Under this system the CCs were expected to report any problems 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 of the ID, with the assistance of farmers in the area. As a consequence of the ineffectiveness of the APC and CC systems, the project management proposed a new system in 1977 composed of the Tank Committees.

The Tank Committee system and Farm Involvement

The Tank Committee of the TIMP was established for the purpose of

linking farmers with the implementation of the project. The first Committee was held in March 1977 in Mahakandarawa. Subsequently, attempts were made to adopt the system in other tank areas in the TIMP.

The Tank Committees were composed of FRs as well as officials from various line agencies operating in the project. Each FR in the Committee was from a group of about 50 farmers in the project area, operating under a single channel. The representative was chosen by a secret ballot. The Committees were expected to meet regularly and to discuss the 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 abolition in the **APC** and **CC** Committee system in 1978, the farmer leaders in the project area were replaced by the Vel Vidane (Irrigation Headman) appointed under the Agrarian Services Act.

The organisation of the Tank Committee was amended again in August 1982 to form Project Water Management Committees. The composition of the Committee, however, was not different to that of earlier Tank Committees. This change was undertaken in 24 major schemes in the Island including all five tanks in the **TIMP.** The Irrigation Engineer was appointed as the Project Manager to conduct activities of all Departments in the project.

The Vel Vidanes, who were also members of the Tank Committees, played an important role in serving to link the farmers and the ID. Perhaps their most significant task was to operate the rotational schedules prepared by the Project Consultant, in respect of each farmer. The schedule was given to the Vel Vidane, who in consultation with the irrigator, organized the actual water issues to the group of six to eight farmers in the field channel. Since at the most, only two farmers can obtain water from their field channel at any given time, the coordinating task became important. The modernized system often showed physical deficiencies and in such instances, the involvement of an intermediary such as the Vel Vidane became indispensahle. In some areas where the Vel Vidane is effective and acceptable, the rotations were implemented without confusion. Often, there appeared an informal collaboration between the Vel Vidane and the irrigator to extend water issue periods in channels above the field channels. According to the instructions given by the ID, an irrigator cannot change the water schedule given to him without the consent'of the Project Manager. Often, the Vel Vidanes served larger areas, 80 to 100 farmers, and this too posed major problems.

Major Lessons Learned

Implications for TIMP area. An in depth analysis of the efficiency of the management strategies in TIMP showed that the development plan would have a

low acceptability by farmers due to low profitability and uncertainties in water availability (Abeysekera 1985). Economic growth in the project area must therefore depend on longer term government policies designed to improve the farmer's technological and economic environment.

In the short-run, however, several development strategies may lead to improvement of the area: (a) increase farmer involvement in managing irrigation water; (b) introduce agricultural and irrigation management strategies that are more compatible with farmer interests and circumstances; and (c) increase institutional support to provide farmers with production credit and marketing facilities.

In the TIMP, from its inception, the plainers did not realise that equitable water delivery to individual farmers requires management inputs from farmers as well as officials, The current resources in the ID are extremely inadequate to allow satisfactory official control over water distribution at the field level. Consequently, farmers must be involved in the process of water management.

Therefore, as a first step in increasing farmer cooperation for better distribution, structural problems of the conveyance system introduced by the TIMP must be remedied. These problems such as faulty channels and incorrect positioning of farm turnouts, have seriously reduced farmer confidence on the ability of the modernized system to serve their needs. Such repairs are extremely costly, and the current maintenance budget is inadequate to carry out needed repairs. Therefore, priority should be given far allocating additional funds.

To increase farmer involvement in the routine activities of irrigation water distribution, current institutional mechanisms should be strengthened. One of the key changes should include increasing the number of Vel Vidanes in the area. Currently, a Vel Vidane serves a group of as many as 80 farmers. To be effective, a much smaller group of about 20 to 30 farmers would be desirable.

Since agricultural and irrigation practices recommended under the TIMP are unacceptable to farmers, they also need to be changed. In particular, recommended practices should bc designed to meet the needs of various cropping activities under different water availability.

The success of any long-term development strategy in improving agricultural production in the area appears to depend mainly on the ability of the research system to supply farmers with an adequate range of environmentally adaptable production technologies. This necessarily involves increased location-specific agricultural research.

Increased institutional support for credit and marketing facilities is a major concern that needs to he addressed. The current system of institutional credit does not serve the needs of the majority of farmers. Credit recovery also appears to he a problem facing the institutional lending system in the area. Major reforms on lending procedures as well as credit recovery appear to be a priority item. Rcnumerative prices, price stability, and assured markets are key components in increasing producer incentives.

Major Lessons for Future Policies

Many lessons can be derived from the experiences of the Tank Irrigation Modernization Project. The major issues with wider policy implications are briefly highlighted in this section.

Heavy bias towards engineering solutions. The heavy construction oriented attitude in the **TIMP** is a major short-coming in the plan. The strong emphasis on construction and other technical considerations ha5 led to a neglect of other complementary aspects necessary for project success. Physical improvements alone cannat guarantee project success. Other important strategies such as provision **of** appropriate farming practices and strengthening of farmer organisations must also he enacted. The relative importance of each of the development options will vary from one scheme to another. Hence, each location needs to he studied on an individual basis before any improvement strategies are designed.

Level of intervention required. Another key lesson that emanates from the TIMP experience relates to the level of management intervention needed for improvement. The TIMP is **a** classic example of a system that required a heavy management commitment by the project implementators at the field (tertiary) level. Due to many constraints, the level of supervision and attention needed by the project at the tertiary level could not be supplied. Therefore, there is a necessity to design projects which do not require extremely intensive management at the tertiary level. Furthermore, as was seen in TIMP, much of the problems in the project area such as water uncertainties, market imperfections, etc., emanate from outside the area. Unless these exogenous problems are remedied, it is unlikely that any efforts made at the tertiary level. within the schemes would generate adequate results.

Need to learn farmer circumstances. The TIMP also clearly shows that there is a critical need to incorporate farmers knowledge and experiences in planning and designing new projects. Farmers by virtue of their long experience have accumulated a wealth of knowledge and are **a** vital resource for identifying specific improvements. Furthermore. the production is carried out in individual farms and it is the farmer who decides what to practice and what not to practice.

It is only through identification of his exact circumstances that the planners are able *to* provide what the farmer needs.

Most farm level recommendations on agricultural and irrigation activities in the **TIMP** area are hased solely on experiments conducted at research stations. The direct transfer of production technologies from the research station to farmer fields in the project has resulted in unsatisfactory responses. More information at the field level could help alleviate this abortcoming.

Organizing farmers to participate in the project from the initial stages. The necessity to make arrangements to ensure farmer participation unfortunately, came almost after the project was completed. As a consequence, most of the improvements undertaken by the TIMP would have been avoided, if attempts were made to discuss the plans with the farmers concerned before the project was implemented. One of the major problems in this regard was the absence of a suitable institutional mechanism at the time of planning and implementing.