

Title:

Role of Farmer Organizations in canal irrigation systems: a case study in Udawalawa Irrigation & Settlement Scheme

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Summary:

In canal irrigation systems inefficient water use is a common phenomena and the operation and maintenance of the systems cost the state a large sum of money. Irrigation management Transfer (IMT) is one of the alternatives proposed by authorities to solve the problems of O&M, unfair and inefficient water use . Farmer Organizations are the key elements of the IMT. The idea of social development includes the conception that people would meaningfully participate, individually and collectively.

The impact of IMT in Udawalawa Irrigation Scheme is examined in this paper. The Udawalawa Special Area under controlled of Mahaweli Authority of Sri Lanka (MASL) was selected for the study because a large variation could be seen in operation of Farmer Organizations in the area.

Participatory Rural Appraisal Techniques (PRA) by participating farmer group meetings were administered to collect information about FOs and existing problems with their relative intensities.

Randomly selected 390 farmers were interviewed using a structured questionnaire to find the change of each aspects after the involvement of FOs in irrigation management and related activities using self evaluation method. The farmers' responses were categorized according to intensity and direction of the change. In addition to the above sample survey, two case studies were carried out for in depth information of irrigation management practices in Murawasihena and Embilipitiya Blocks. The paired signed test, Wilcoxon signed rank test and the Spearman's correlation coefficients were used as statistical tools.

Fairness of water distribution, conflict resolution, timeliness, canal maintenance and reduction of misuse of irrigation water have been improved with the activities of Farmer Organizations. Marketing aspects have not been developed simultaneously with the improvement of fairness of distribution of water.

Participation of women in decision making process is at very low level and the environmental aspects have been neglected by the activities of FOs.

Allocation of irrigation water has become fair and efficient after the FOs began its operation with IMT. There is no trade off between the efficiency and the fairness of distribution and they are interdependent in Udawalawa scheme because the system is operating behind the frontier of efficiency and fairness. There is a large space to improve both the efficiency and equity without any trade off.

Background of the study

Agriculture is the largest enterprise in Sri Lanka which provides employment opportunities for 47% of labour force in rural sector and 40% of the total labour force in the country in 1994 (Central Bank,1996). After the independence, 1948, there was a trend to develop irrigation works to fulfil the need of foodstuffs and to provide the employment opportunities for the unemployed youth. In irrigation schemes water is a free resource and therefore, farmers allocate water neglecting its value. On the other hand after the settlement of farm families with equal plots of lands, uneven distribution of income and variation of status of living among farmers could be seen obviously.

Water users neglected the care of canal maintenance, security of the canals, damages of the canals as a result of lack of property right. Further they tend to damage structures in order to get excess amount of water neglecting the other farmers' needs. All together externalities of maintenance of canal irrigation systems have made problems of persistency of the systems. Accordingly, to avoid water allocation problems and the high costs of operation and maintenance of the canal systems, in the 70's and 80's there was a move towards alternative institutional and organizational arrangements based on the principle of *Participatory Management*. In the system known as the **Irrigation Management Transfer (IMT)**, the responsibility of the complete operation and some section of the irrigation works in the field canals and distributary canals except irrigation head works is transferred to the farmers from the irrigation authorities.

However, farmers' group activities and involving farmers in irrigation works are not a something new in Sri Lanka. Collective activities and decision making in irrigation management could be seen in the history and more recently it was evident by the traditional *velvidane* (Irrigation leader in the village) who was elected by the farming community in each village tank systems. The *velvidane* was mainly responsible for water distribution, maintenance of irrigation works and conflict resolution. In 1958, the traditional *velvidane* system was abolished and the Paddy land Act No. 1 of 1958 established cultivation committees replacing traditional system.

After 1958, several steps were taken regarding the irrigation management by the government and Irrigation Ordinance of 1968, Agricultural Productivity act of 1972, Agrarian Service Act of 1979 and amendments of Agrarian Service Act in 1991 and the amendment of Irrigation Ordinance Act in 1994 to grant legal recognition and more power to Farmer Organizations are the important milestones of the path way of management of irrigation systems. Analysing these policy changes in irrigation management, it could be seen that the government and authorities have realized the importance of farmer involvement in

irrigation management in major irrigation systems.

Razak and Perera (1995) have used the self evaluation method to evaluate the effect of Water User Associations in the Galoya left bank irrigation system (Razak & Perera,1995). The study reveals that water distribution in the field canals had been more effective and equitable after the establishment of Water User Associations in Galoya Left Bank Area.

Another important aspect of improved with the WUOs is the water distribution. After the establishment of WUOs water distribution was more equitable and effective in the Gal Oya Left Bank Irrigation System (Razak & Perera,1995). According to the Razak and Perera (1995), farmers believe that inadequate water availability at the D- Canals discourage farmers in taking part in WUO activities at the field canal level.

Saving of irrigation water has increased as a result of farmers' participation in WUOs. About 70 % of the members of WUOs was concerned about water requirement of other farmers and therefore, attempt to save water by closing poles once they receive adequate water to their fields. However, in the areas where most of the farmers are not having membership of WUOs and the farmers are mortgagees and tenants water saving is inefficient due to absent of support from mortgagees and tenant farmers for water saving activities (Razak & Perera,1995). Razak and Perera (1995) reveals that physical rehabilitation and group works of farmers are equally important and they mutually strengthened each other. The conflict resolution is another important factor to consider in irrigation settlement schemes. In the Gal Oya System, several factors cause conflicts among water users viz; inadequate and unreliable water supply, damages to control structures, removal of canal flash gates, lack of confidence in water rotation and illegal water tapping. After formation of WUOs these conflicts among farmers have been reduced in considerable amount according to ARTI (1986). Razak and Perera (1995) also reported that conflicts over irrigation water in field canal level have been reduced mainly due to their ability to resolve misunderstandings and settle clashes quickly and in a friendly manner with WUOs. But in the areas where land tenure is complex with tenant farmers and mortgagees, the success of conflict resolution is low compared to other areas (Razak & Perera,1995).

Protection of canal structures are important because damages to canal structures by farmers were common in irrigation schemes (Atapattu,1994; Weerawardene,1988; Murray-rust, 1983; Uphoff,1986; ARTI,1985). With WUOs safe guarding the canals and minimizing the damages to the structures were at a favourable level in Gal Oya Left bank Scheme (Razak & Perera,1995). But selfish motives led some farmers to damage structures as they did not consider themselves to be members of the community (Razak & Perera, 1995).

Style of interaction among farmers were changed and improved with the activities of WUOs in Gal Oya Left Bank area and it improved the performance of the system according to Razak and Perera (1995). Relationship between farmer and irrigation officials also improved with activities of WUOs in irrigation systems (Wijayarathne,1987; Perera,1986; ARTI,1986). Members of WUOs realized the difficulties and constraints of irrigation water management in canal irrigation systems and made effort to solve their irrigation related problems through WUOs without going to irrigation officials (ARTI,1986). Razak and Perera (1995) pointed out that WUOs have played a great roll as a extension agent to communicate

effectively for distribution technologies among farmers.

Volunteer activities as a leader of a farmer group is an important issue with IMT and there is no incentive as a compensation for their works to the leader and that is a problem should be considered in promoting farmer groups (Karunanayake, 1980). One reason for the success of traditional velvidane system was the ability to enforce the law backed by the authority to resort to punitive actions. Therefore, there is a need to arm irrigation leaders with some degree of formal authority (Karunanayake, 1980). According to Karunanayake (1980) in spite of the organization of farmer groups in irrigation water management, there should be a well conceived training program in water management. Another important issue is the allocation of water among groups and however, in the Mahaweli projects this has become an important imperative of water management at a level of a complex rather than a unitary system (Karunanayake, 1980).

Hemaratne (1991) has shown that the poverty level of tail end farmers is three times higher than the poverty level of the head end farmers of the field canals in settlement schemes and the average income of the tail end farmers is equal to half of the average income of head end farmers of field canals. It reveals that the level of income of farmers could be explained by a regression model with several variables including the distance to their land from the field canals (Hemaratne, 1991). Income generated from moderate and large holding sizes (1.6 ha <) is sufficient only for their subsistence while farmers with small holding sizes are unable to survive even at the subsistence level in settlement schemes (Godaliyadda, 1988). In Mahaweli System-H area the average cultivated area has been decreasing towards the tail ends of field canals and resources are misallocated (Godaliyadda, 1988).

Moragollagama (1990) has shown that there is a significant improvement in farmer participation in irrigation management (O&M) of the irrigation systems in Sri Lanka. The distribution of water, input supply and coordination between farmers and agencies have been improved with the activities of FOs. With the farmers' participation in decision making, the yield, cultivated area and especially income of the tail end farmers have been remarkably increased (Moragollagama, 1990).

Objective of the study is to evaluate the impact of Farmer Organizations on several aspects of efficiency of allocation of irrigation water in the canal irrigation systems and the fairness of distribution of water among farmers.

Methodology

For the study, Udawalawa Irrigation Settlement Scheme is selected because of Udawalawa settlement scheme is a good research field for FOs due to existence of several stages of FOs and heterogeneity of the performance of FOs.

Udawalawa project area consists of seven blocks, two in the Left Bank command area and five in the Right Bank command area, and 173 FOs are distributed among above seven administrative blocks in 1995. The number of members of the FOs are varied from 2 to 280 and the levels of the performance are different from each other. However, it was difficult

to capture all FOs for the study and number of farmers of the sample represents the proportionate of farmers in each administrative blocks.

Participatory Rural Appraisal techniques were administered to collect the information regarding distribution of water, decision making process, and existing problems related to various aspects of O&M of the system by participating farmer group meetings.

From seven administrative blocks, a sample of 390 farmers was selected proportionately for cross sectional field survey in addition to two case studies carried out in Murawasihena and Embilipitiya Blocks. The sample size of farmers were determined by using the Pagoso Formula.(Pagoso, 1981).

Statistical tools

Paired sign test

Change of the impression of the farmers about the particular criterion before and after the Irrigation Management Transfer is tested through nonparametric statistical test: "the paired sign test". The test based on the signs of differences between two measures before and after. This test is useful and suitable where quantitative measurements is imposible or infeasible (Siegel and Castellan,1988).

Wilcoxon Signed Rank Test

The sign test discussed above utilizes information only about the direction of the differences within pairs of observations. If the relative magnitude as well as the direction of differences is considered, the Wilcoxon Signed Rank Test is more powerful. This test gives more weight to the pairs which shows a larger difference between two conditions than to a pair with small difference. To test the change of the criterion before and after the IMT, each criterion was categorized in to five groups (1 - very bad, 2 - bad, 3 - indifference, 4 - good, 5 - very good) and, therefore, their is a direction and a magnitude for the change of each criterion after IMT (Siegel and Castellan,1988).

Results and discussion

In 1996, majority of the farmers in the area are the members of relevant FOs while some of the farmers have not yet joined with the FOs depending on some reasons. The data shows that a large portion of farmers have taken the membership of FOs in Embilipitiya and Chandrikawewa blocks while in Murawasihene the percentage who having membership is small (53%). The difference of irrigation water availability in the area has influenced the desire of taking membership of FOs. Most of the farmers are not willing to obtain the membership of FOs in Murawasihena due to frequent failure of crops due to irregularity of water availability. Most of the farmers who are not the members of FOs in Murawasihena

block responded that they do not want having the membership of such organizations without any assurance of water availability to their lands to reduce the uncertainty of their crops. However, most of the non-members are not reluctant to having membership of FOs after realizing that the FOs are the legal and authorized body of water management in irrigation system.

Decision making regarding the crops and the time of cultivation

According to the farmers' response, the decision making power (40%) is still on the hand of Mahaweli officials. Only 8% of farmers reported that decisions regarding irrigation water distribution are taken by farmer groups while decision making power is on the hands of individual farmer, Farmer Organization, leader of Farmer Group, and Mahaweli Officials as reported by 20%, 2.7%, 13.3%, and 40%, respectively.

Farmer Organization has not a sole authority decide the crops which cultivated in the season or the time which is to be cultivated and other cultural practices. Mahaweli officials are dominant in decision making process about the crops and time to be cultivated. Still some farmers (20%) act on their own decisions neglecting the decisions taken by other authorities and it shows the absence of unanimity among farmers in decision making process and other cultural practices. This situation makes an adverse effect on the performance of Farmer Organizations in the area. On the other hand farmers are not fully satisfied with the decisions taken by bureaucrats. Results reveals that only 13% of the farmers in the sample is completely satisfied with the decisions taken by authorities and 6 % of the farmers totally disagree with the decisions taken by authorities. Results reveals that 44 % of the farmers agree with the 50 % of the decisions taken by the authorities and 36 of the farmers agree with some decisions but not with the most of the important decisions. However, this figures shows an improvement of the decision making process with Farmer Organizations than the totally bureaucratic dominance which were practised earlier.(Murray-Rust,1983).

Benefits of water management through FOs

Farmers were asked to compare their view through their experience after IMT with before IMT conditions. There were positive changes, negative changes and some farmers are indifferent between two options before and after the IMT. Descriptive statistics of the results are shown in the table 1. Amount of water received during the cropping season, fairness of distribution of water, timeliness of water availability, maintenance of distributary and field canals, reduction of conflicts among farmers and the conflicts between farmers and officials are the selected criteria and responses were categorized as;

- 1 - negative (Worse off with the activities of FOs)
- 2 - indifferent (No any positive or negative impact of FOs on the criteria)
- 3 - positive (Better off with the activities of FOs).

Data in the table 1 shows that all the aspects regarding water management has been increased in varying degrees after the IMT but the amount of water received to the farmers' field has not been increased considerably. To test whether the increase of each criteria, the "Paired Signed Test" was carried out and the results are shown in the table 1.

Table 1. Parameter estimates of "paired signed test"

Criteria	Mean	Percentage of positive signs	'z' value	Probability level	
1.Amount of water received	2.14	34.7	1.6	0.1096	
2.Timeliness	2.34	58.7	3.2	0.0014	**
3.Fairness	2.67	76.0	6.1	0.0000	**
4.Canal maintenance	2.81	84.0	7.4	0.0000	**
5.Illegal access	2.76	78.7	7.2	0.0000	**
6.Reducing conflicts among farmers	2.70	74.7	6.8	0.0000	**
7.Reducing conflicts between farmers and officials	2.67	69.3	6.7	0.0000	**

(** - Significant at 0.01 level)

Figures in the above table reveals that the amount of water received has not been increased significantly after the IMT while other criteria have been improved remarkably. Timeliness of water receiving to the field has less improved than the canal maintenance and fairness of water distribution. Most of the criteria related to water management show that involvement of Farmer Organizations have created a favourable situation for the farmers. However, Fairness of water distribution has increased a greater extent than the amount of water and it provides an evident to reveal that there is a potential to improve the system performance while the amount of water remaining at the same.

Problems pertaining to the irrigation water management through FOs; Farmer perspectives.

In this section, farmers were asked to mention the existing problems related to water management by the FOs and responses of farmers are summarized in the table 2.

Table 2. Problems of water management through FOs

Problems	Percentage of farmers reported
1. Unfair distribution of water among farmers	17.3
2. Inadequate amount of water	64.0
3. Illegal access corruptions	16.0
4. Political interference	12.0

Source: Field survey, 1997.

Above table shows the existing burning issue related to water management is the

inadequate amount of water in farmers' point of view. Other problems have been declined up to certain level with the activities of FOs and unavailability of water is a critical and inherent in the system due to the location of structures and canals and it cannot be corrected by the activities of FOs within a short period of time.

Present situation after IMT

In this section of the analysis, 25 selected criteria were tested to find whether there is an improvement of each criteria with the activities of FOs using "Wilcoxon signed Rank Test". For each criteria, farmers' view about the criteria were questioned before and after IMT and magnitude and the sign of change were analyzed after dropping out the tallied pairs. Categories of the change;

1. Very weak
2. Weak
3. Not any change after the IMT
4. Good
5. Very good

Table 3 Shows that decision making aspects and warmth and support among farmer are at higher level compared to the previous management system and 'z' value of Wilcoxon signed rank test shows that above qualities have been increased after introduction of IMT. Participation of various social categories, rich farmers, poor farmer and youth, in water management activities is at a favourable level and the situation has been developed with the activities of FOs. However, women participation in water management activities has not been improved and not at a considerable level.

Political intervention is not a serious problem in water management activities in the area. Input availability, credit facilities, education and training and labour availability are at a low level because FOs have no attempts to organize farmers towards these aspects. Another very poor area is the marketing which is important but neglected or payed less attention. Prices for their products are very unstable and mainly prices are determined by the collusion of traders which were coming from out side areas. There is no bargaining power to the farmers because FOs are not organized to cater a better marketing channels for their products. In Murawasihena Block, FOs have made an arrangement to avoid the exploitation of producers from local traders and it has been functioning well.

FOs have not considered environmental pollution in their activities and awareness about the environmental aspects is at very low level. However, overall satisfaction about water management has been increased with the involvement of FOs and it is a favourable sign with the IMT.

Table 3. Present situation and the change of selected aspects.

Aspects	Mean	Mode	Median	'z'	"P"
1. Listening to the farmers	3.80	4	4	3.06	**
2. Frequent meeting and discussion	3.96	4	4	3.48	**
3. Solutions for farmers' dominant problems	3.63	4	4	4.78	**
4. Farmers contribution in irrigation management	4.03	4	4	6.19	**
5. Contribution of farmers in collective activities (Shramadana)	3.37	4	4	6.80	**
6. Social and cultural aspects	3.72	4	4	5.57	**
7. Fairness of water distribution	3.95	4	4	6.23	**
8. Input availability	2.48	2	2	-3.57	--
9. Participation of women	2.93	3	3	-0.63	--
10. Participation of poor farmers	4.04	4	4	6.58	**
11. Participation of rich farmers	3.91	4	4	6.21	**
12. Participation of youth	3.60	4	4	4.54	**
13. Free from political interferences	3.60	4	4	3.89	**
14. Education & training	2.95	3	3	-0.53	--
15. Labour availability	2.51	2	2	-3.19	--
16. Credit facilities	2.56	2	2	-3.12	--
17. Marketing of products	2.47	2	2	-3.79	--
18. Prices for the products	2.49	2	2	-3.80	--
19. Increase of family income	2.48	2	2	-4.29	--
20. Environmental aspects	2.70	2	2	-2.83	--
21. Mutual relations among farmers	3.71	4	3	3.48	**
22. Mutual relations between farmers and officials	3.65	4	4	5.08	**
23. Collection of water charges	2.24	1	2	-4.88	--
24. Reducing risk	2.64	3	3	-1.72	--
25. Overall satisfaction	3.37	3	3	2.97	**

Key: 5 - very good, 4 - good, 3 - Normal,

2 - weak, 1 - very weak

* - Significant increase at 0.05 probability level.

** - significant increase at 0.01 probability level.

Source: Field survey, 1997.

Distribution of benefits among farmers in various aspects regarding to water management

This part of the text summarize the selected seven criteria considered to evaluate the effectiveness of FOs in irrigation water management in farmers point of view. Table 4 shows the percentages of farmers responses belonged to each category, viz; percentage of better off farmers, indifferent farmers and worse off farmers.

Table 4. Distribution of benefits among farmers in various aspects

Aspect	Better off	Indifferent	Worse off
1. Amount of water	35	48	17
2. Timeliness	70	6	24
3. Fairness of distribution	88	3	9
4. Canal Maintenance	97	0	3
5. Reduction of damages and misuse	85	12	3
6. Reduction of conflicts among farmers	77	20	3
7. Reduction of conflicts between farmers and officials	85	12	3

Source: Field survey, 1997. (N = 275)

The data in the table 4 shows that all the aspects considered in this analysis regarding the irrigation management after the IMT, except the amount of water has been increased with the involvement of FOs in the activities of irrigation management. The canal maintenance, fairness and timeliness of water distribution and reduction of conflicts have shown a remarkable development with the FOs. The number of worse off farmers are negligible compared to the number of better off farmers. Some farmers, although the number is small, are indifferent with the selected criteria and they do not see any difference after the IMT. Most off the worse off farmers are concentrated in head end area while almost all the farmers are better off in the tail end. However, amount of water availability does not show a significant improvement and it cannot be corrected by the activities of FOs because it is inherent with the irrigation structures.

Conclusion

Through the activities of FOs, both efficiency and the fairness of distribution have been improved in Udawalawa Scheme. There is an opportunity to improve both efficiency of the system and fairness of distribution without any trade of because they are inter-related.

The role played by Mahaweli Official is vital since 1991 to improve the FOs and, for the sustainability of IMT continuity of role of Mahaweli officials is important.

According to the farmer leaders point of view, there are several obstacles of activities of FOs. The main problem is the time limitation of the volunteer officers of FOs to devote to the activities of FOs. The volunteer officers are not paid for the services such as participating meetings and so on. Therefore, they spend a large time period for the activities of FOs without any gain and they could not do their own works in time.

Secondly, there is no continuous program for motivation the farmers and FOs towards the self management of irrigation water. Most of the programs are commenced in large scale with a large publicity and propaganda, but after a short period the motivation is vanished. Thirdly, it is experienced that in some areas, where officers devoted a longer time and effort to improve and to solve problems regarding the irrigation management, FOs are operating very effectively while in the areas where no attention paid by the officers, FOs are inactive. Fourthly, resolution of the problems related to land is essential for effective water management and the absent of this power to the FOs generate an inefficiency of the activities of FOs.

Another serious issue is the lack of incentives for the officials who devoted their time for the improvement of FOs. There is no any incentives for the efficient irrigation officials. On the other hand farmer leaders have a social prestige as a officer or a leader of the farmer group while as a paid employee, irrigation officer has not such a social prestige to be an efficient person. There should be an incentive scheme to promote irrigation officials because the performance of FOs are entirely depend on the efficiency of the irrigation officials who involve in the institutional activities.

There should be organized marketing programs supported by the government authorities for inputs and outputs to improve the importance of the FOs among farmers. Rented lands of the area have become a severe problem for the activities of FOs, because the farmers rent the land for a shorter period and, therefore, they need to cultivate paddy in all the area to pay the rent or to get a highest possible profit. Therefore, they do not agree with the decisions taken by the farmer groups to cultivate the limited extent of paddy. On the other hand they are not members of the FOs but outsiders. There should be a policy to act on this problem to improve the water management through FOs.

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