CHAPTER 7

Participatory Action Research in Irrigation Management: An Example from Kirindi Oya

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INTRODUCTION[42]

IN MANY DEVELOPING countries, there are few national research agencies that work on irrigation system management research. Existing irrigation research units generally focus on specific components of research such as hydraulic model testing, soil mechanics, soil-water-plant relationships, socioeconomic base-line studies, etc.

IIMI has been experimenting with various modes of collaboration with national research partners, including irrigation management agencies, in capacity creation, knowledge generation and utilization. Participatory action research (PAR) is a mode of collaborative research now being used by IIMI in Sri Lanka to work with national partners. Unlike many of the approaches taken elsewhere (Levine 1992), participatory action research is a full partnership with IIMI's collaborators.

Participatory action research in irrigation management is a mode of research in which the system management agencies, including farmers, become the implementors of the research program. The basic premise of participatory action research is that full involvement of the agency and the farmers can be an effective method for ensuring that their concerns are incorporated into innovations and that they understand, accept and transmit the research results. Participatory action research can be an efficient mechanism for developing coordination among various agencies and the farming community for research-based problem-solving; also it results in more cost-effective, economical and sustainable internalization of research innovations.

This paper defines participatory action research in irrigation management, then describes its use in the case of the Kirindi Oya Project in Sri Lanka, and finally turns to evaluating its strengths and weaknesses.

42 The authors wish to acknowledge the contribution of Dr. Douglas J. Merrey who, with Dr. R. Sakthivadivel, conceived of the use of participatory action research as the methodology for Phase 2 work at Kirindi Oya when he was Head of IIMI Sri Lanka Field Operations.

PARTICIPATORY ACTION RESEARCH (PAR) IN IRRIGATION MANAGEMENT

In conventional applied research in irrigation management, research activities are carried out by researchers. The agency personnel and farmers in the field are the "subjects" of the research. The ideas are supplied by the researchers, tested in the field, and then documented in reports so that the results can be disseminated for use by others. In "action research" and "on-farm research," research activities are carried out by the local personnel under the directions of the researchers who then write up the results for use by others. Neither of these approaches ensures that the results will be adopted. It is normally left to extension or similar personnel to try to get others to adopt the successful innovations.

Participatory action research (Whyte 1991) is a methodology for applied research which incorporates the agency personnel and farmers not as subjects but as partners in the research work. In irrigation management research, the research activities are intended to improve the performance of an irrigation system.

In a PAR activity in irrigation management:

- Researchers together with agency personnel and, if appropriate, farmers, jointly plan innovations to be tested in the project.
- The planned interventions are made by the agency personnel and farmers.
- Much of the data needed to monitor and evaluate the innovation is gathered by the agency personnel and farmers.
- Researchers document the process and provide feedback to the implementors to allow for midcourse corrections.

The basic premise is that system operators and farmers should be involved in planning and implementing innovations because their detailed knowledge of the irrigation system workings will make improvements in performance more likely. With the involvement of the system managers in planning innovations, the innovations will respond to felt needs and not simply to outsiders' (i.e., the researchers') ideas. Also, if the system operators and farmers take part in planning and implementing the innovations, they will have a commitment to see them work. Involvement in data gathering gives the implementors direct access to the data so that their contributions to analysis of the happenings is magnified.

The implementors get involved to benefit themselves, not simply to provide data for a researcher to write up. Therefore, it is important to see that the results of the innovation are beneficial. This means that a PAR activity must be a learning process in which changes are made to ensure success as various things are learned. Researchers are specialists in documentation and reporting of the processes and results of the experiments. Their work in documenting what happens is essential to provide feedback to the implementors. Documentation also provides for wider dissemination of the results.

In PAR, the agency personnel and farmers are actors in the research process, not the subjects of research. Besides being documenters, the researchers are not only catalysts who bring new ideas to the problems but who help train the others in those ideas. To make these roles work, all involved have to put a good deal of effort into planning, training, and coordinating field efforts; teamwork is of vital importance.

The process yields three types of results:

1. Improvements in system performance that are likely to be implementable because they have been carried out by regular working personnel.

2. Internalization of the innovations among the implementors, including understanding how and why they work.

3. Research reports to disseminate the results of the experiment to others who can make use of them.

Unlike a conventional research approach, PAR ensures that the results are adapted to and adopted in at least one system. In order for a PAR activity to be a success, it must have results visible not only to the researchers but also to the system operators and farmers who have taken part. The system improvements and internalization of the innovations are of equal or greater importance than the reports.

PARTICIPATORY ACTION RESEARCH AT KIRINDI OYA

Kirindi Oya is a major irrigation scheme in the southeast region of Sri Lanka. It is a new scheme; the main reservoir, Lunugamvehera Reservoir, was completed only in 1985. It incorporates a much older river diversion scheme called the Ellegala Irrigation System.

IIMI was invited by the Asian Development Bank, the main funding agency for work in the new portions of Kirindi Oya, to assist with improvements in the system by carrying out diagnostic studies. The Phase I study results were published in 1990 (IIMI 1990) and the study concluded that:

The irrigation water use efficiency of Kirindi Oya was low and there was great potential for saving water if proper management policies are adopted for main canal operations. Water use efficiency can be considerably improved through effective use of rainfall and drainage water, skillful planning of scheduling and use of effective monitoring and feedback mechanisms.

- There would be a great improvement in water use efficiency if flexible scheduling were adopted, especially during the land preparation period, to match more closely the water use pattern adopted by the farmers.

- The effectiveness of maintenance management was not up to standard to provide long-term sustainability of the system. It was necessary to work with the Irrigation Department to develop and implement a cost-effective maintenance management system applicable to Kirindi Oya and replicable in other systems as well.

- There was a need to establish a more effective framework for integrated management of the system and to monitor its effectiveness; strengthening of farmers' participation through a single Project Management Committee was important to achieve this end.

- In view of the scarce water resources and large area to be brought under irrigation, there was an urgent need to diversify crops to use the water resources more efficiently and to maximize farmers' production and income.

- The Phase I report proposed a series of innovations in (a) water resource management for long-term performance, (b) crop diversification and cropping patterns, (c) design-management and water management interactions, and (d) institutional strengthening.

High-level government officers selected a few important and implementable recommendations for field-testing through participatory action research at Kirindi Oya with funds provided by the Asian Development Bank. This work started in May 1991 and will be completed by September 1993. Three areas were chosen for research: main system management, tertiary system management, and a pilot program in other field crops (OFCs). The following key activities were selected (IIMI 1991a):

1. Improvement of main system management through development and implementation of crop planning and seasonal water allocation plans, through more efficient main canal operation, through water balance studies of the Ellegala Irrigation System, and through maintenance management studies. Part of this work, the development of a computer-based canal management system, is being funded separately by the Government of France (Baume et al. 1993).

2. Improvement of tertiary system management through strengthening of farmer organizations, better tertiary maintenance management, improved seasonal planning, coordinated acquisition of agricultural inputs, and improved operations in field channels and distributary channels during the land preparation and crop growth periods.

3. Pilot-testing of water management methods for diversified mixed crops in a pilot area of 240 hectares. This effort included addressing the economic dimensions (marketing, labor, prices and profitability) as well as water management issues. Research activities included documenting and evaluating seasonal planning, documenting and evaluating different land preparation methods, documenting and evaluating irrigation scheduling, water distribution and water use for OFCs, and evaluating the economic performance of different OFCs.

IMPLEMENTATION OF PARTICIPATORY ACTION RESEARCH AT KIRINDI OYA

The distinguishing characteristic of PAR is that the actors "on the spot" take part in research as well as their everyday activities. The key concern of the authors was to ensure their full participation in the planning and conduct of the research.

The problem was complicated by the fact that the recommendations to be implemented through PAR involved several different government agencies, including the Irrigation Department (ID), the Irrigation Management Division (IMD), the Department of Agriculture (DOA), and the Land Commissioner's Department (LCD).

The basic strategy to get participation was through the creation of committees to oversee the various research components. Each committee was chaired by a local officer and included personnel from the involved departments together with IIMI researchers. IIMI placed an interdisciplinary team of four researchers in Kirindi Oya to assist with the planning and implementation and to document the process and results.

The steps for implementation of PAR in Kirindi Oya were defined as follows:

1. Establishing coordinating and implementing committees.
2. Preparing an inception report with the participation of the agency personnel and farmers.
3. Organizing planning workshops and preparing action plans for each activity.
4. Training implementing-agency personnel and farmers.
5. Implementing the action plans in selected areas.
6. Documenting lessons learned.
7. Extending the successful approaches to the whole scheme.
8. Documenting the participatory action research process and its impact on irrigation performance and crop diversification.
9. Preparing reports and training modules for replication at other schemes.

The research began at Kirindi Oya in May 1991. The progress of each of the steps is briefly described below (IIMI 1991b, IIMI 1992).

Committees and inception report. The first two steps were taken very soon after work began. First, IIMI researchers prepared a Draft Inception Report. Second, IIMI researchers together with agency personnel constituted the three substudy committees to guide implementation of each of the three components. In addition, an overall Study Coordinating Committee and a Study Advisory Committee were established to oversee the work.

The Draft Inception Report was discussed with agency personnel in a series of scheme-level meetings. The activities for each component were discussed with the respective substudy committee. These together with other meetings with both agency officers and farmers helped IIMI researchers to refine the Inception Report. Adoption of this procedure helped make the key officials involved in each component activity fully aware of the contemplated work.

Planning workshops. The Inception Report was finalized (IIMI 1991a) in a workshop held in June 1991. The workshop brought together field-level officials, the heads of implementing agencies, policymakers, donor agency personnel and IIMI researchers for in-depth discussions.

Based on a suggestion from the Inception Report Workshop, a second workshop was conducted in early August 1991 at which the implementing officers and IIMI researchers prepared detailed action plans. This workshop concluded that there was a need for training programs for the field-level officials who would implement the research activities. In addition, this workshop emphasized the need to have periodic discussion at different committee levels so that problems that can be solved at that level can be attended to by the respective committee and only those that cannot be solved will be taken to the next higher-level committee.

The participatory planning process resulted in the rejection of most of the recommendations made in the Phase I study (IIMI 1990) as not implementable. The components outlined above were selected and modified from a much longer list of items identified in Phase I.

Training. In view of these outcomes, a very high priority was given to field-level training and workshops. A list of workshop and training activities up to the end of October 1991 is given in Table 7.1.

Table 7.1. Progress of the workshops and training programs.

Name	Date	Venue	No. of participants	Purpose	Agencies
1. Irrigation and Crop Diversification, Phase II (English)	10–11 June 1991	Peacock Beach Hotel, Hambantota	58	To discuss Inception Report.	ADB, MEA, IMD, LCD, DOA, Ministry and IIMI
2. Planning Workshops a) Kirindi Oya (Sinhala)	5 Aug. 1991	DTC, Weerawila	45	To plan and create awareness of the program.	ID, IMD, LCD, DOA, DAS and IIMI
b) Walawe (Sinhala)	6 Sept. 1991	Centauria Hotel Embilipitiya	42	– do –	MEA, IMD and IIMI
3. Training for officers (Sinhala) a) Awareness training for field-level staff (Kirindi Oya)	17 Aug. 1991	DTC, Weerawila	42	To discuss their involvement and contribution.	ID, LCD, IMD, DOA and IIMI
b) Clerical Staff	5 Sept. 1991	MEA Auditorium, Colombo	18	To identify constraints and how to overcome them.	MEA and IIMI
4. Training for farmers (Sinhala) a) One-Day Farmer Motivation Program – 4 groups (Walawe)	16–19 Sept. 1991	MEA Auditorium, Colombo	80	To motivate and to internalize FC groups.	MEA and IIMI
b) Two-Day training for MKD & FC leaders	6–7 Sept. 1991	– do –	32	To provide knowledge in managing DCO.	MEA and IIMI
c) Training for FRs of DCs (Kirindi Oya)	29 Aug. 1991	DC, Weerawila	11	– do –	ID, IMD and IIMI
d) Training on water-sharing	3, 15, Sept., 2 Oct. 1991	Field	71		IIMI
e) DC meeting on research awareness for FRs (Kirindi Oya)	20 Aug. 1991	Field	12	Research orientation	IMD, ID and IIMI
f) Nursery Management (Kirindi Oya)	7 July 1991	Hamlet	30	Education on nursery management	DOA, IMD and IIMI
h) Land preperation (Kirindi Oya)	17, 18 Sept. 1991	– do –	30	Water sharing	– do –
i) Field trips (Kirindi Oya)	3, 17, 24 Aug. 1991	Field	30	OFC cultivation	DOA, IMD and IIMI
5. Research methodology workshop	4 Oct. 1991	SLFO, Colombo	12	Research methodology	IIMI

Notes:

ADB = Asian Development Bank
LCD = Land Commissioner's Department
DTC = District Training Centre
DC = Distributary Canal
FR = Farmer Representative
MEA = Mahaweli Economic Authority
DOA = Department of Agriculture
ID = Irrigation Department
MKD = Moraketiya Distributary
SLFO = Sri Lanka Field Operations
IMD = Irrigation Management Division
Ministry = Ministry of Lands, Irrigation and Mahaweli Development
FC = Field channel

Implementing the action plans in selected areas. The workshops concluded that the proposed innovations should be tried first in selected areas (distributary channels) before being extended to the whole of the Kirindi Oya Scheme. Since the research project started in May 1991, the yala 1991 season (May-September) was used for planning, training of field-level officials and farmers, and collection of additional baseline data (IIMI 1991b). Implementation of actions started in the maha 1991/1992 season (October-March) in selected areas. In maha, Irrigation Department officers put to use for the first time new techniques for main-canal management, undertook data collection for the water balance study of Ellegala Irrigation System, and used new techniques for the planning of maintenance activities. Farmers worked with personnel from several agencies in using new techniques for clearing channels before the season, in using new water distribution patterns to solve tail-end problems, and in planting crops other than rice under irrigation. Aspects of this work continued through yala 1992 (IIMI 1992).

Extension to the whole scheme. During maha 1992/1993, some of these activities were being extended to the whole of the scheme, including aspects of the new main system planning and management systems, maintenance management systems, tertiary channel management planning, and OFC activities developed during the preceding two seasons.

Documenting lessons learned. IIMI researchers have kept track of the progress of each activity and of the lessons being learned. Results were reported through detailed seasonal reports (IIMI 1991b, IIMI 1992). To supplement the data being collected by agency personnel, researchers used surveys and independent monitoring of selected channel flows. Daily interaction between IIMI researchers and farmers and agency officers provided much of the information. Through both formal and informal means, the researchers helped to keep the various participants in the project aware of what is happening. Through the substudy committees adjustments were made to plans regularly to accommodate lessons learned.

Analysis of impact and reports for replication at other schemes. These steps will be taken in the future by the IIMI researchers in cooperation with the implementors.

IMMEDIATE RESULTS

Participatory action research (PAR) at Kirindi Oya has had some immediate results, particularly results that have led to improved coordination and the general adoption of a system-level consciousness of problems and constraints by agency officers and farmers. Some of the most important immediate results include the following.

Coordination among the Implementing Agencies

One of the biggest changes introduced by PAR is close coordination and understanding among the various implementing agencies (Irrigation Department, Irrigation Management Division, Department of Agriculture, Land Commissioner's Department and farmer organizations) in planning and implementing the action-research program. The increased coordination and understanding stem from the series of workshops and training sessions organized for the research and from the committees created to oversee the work.

Establishing a Unified Project Management Committee

Prior to the start of this research, two Project Management Committees — one for the new settlement area and the other for the old Ellegala Irrigation System — functioned side by side. As a result, there was little coordination in seasonal crop planning, water allocation, and operation and maintenance (O&M) activities. Also, different procedures were adopted for establishing and strengthening farmer organizations in the two areas. The establishment of a single Project Management Committee in May 1991 for the whole Kirindi Oya Scheme has allowed the joint discussion of seasonal crop planning and water allocation among the farmer representatives of the separate subsystems. This has done much to promote a system-wide view of problems and water allocations among both farmers and agency officers.

Organizational Changes in the Irrigation Department

Prior to March 1992, one irrigation engineer looked after the construction, operation and maintenance of the old Ellegala Irrigation System while the newly developed areas were under the charge of two irrigation engineers, one each for the Right Bank Main Canal and Left Bank Main Canal. This division of responsibilities created problems because the irrigation officers and lower-level functionaries felt compelled to espouse the interests of the farmer organizations in their respective areas.

Several features of the PAR project made these problems apparent to high-level Irrigation Department officers. First, sessions of the single Project Management Committee made it possible to give airing to the different interests of the various irrigation engineers. Second, the increased attention given to Kirindi Oya by officers through the research committees made happenings more visible. Third, the maintenance management studies carried out under the project made public the very high overhead costs of maintaining separate offices for these subsystems.

In March 1992, the Irrigation Department merged the old Ellegala Irrigation System with the Left Bank Main Canal under one irrigation engineer. The irrigation engineer in charge of the new division can now coordinate activities of both new and old areas to solve the water problems in a more realistic way. This merger has not only helped to improve the water allocation and operational problems but has also reduced O&M overhead costs.

Main System Management

Simulation modeling of the Right Bank Main Canal and related work under the French Project (Baume et al. 1993) have provided a methodology for canal operation monitoring and feedback that was implemented during maha 1991/1992 by the Irrigation Department. As a result of the implementation of the monitoring and feedback system, system managers are now in a position to know what is actually happening in the system under their control. The procedure used prior to the implementation of this system was to respond to farmers' complaints by making field visits. Now the system manager is in a position to know how the canal is functioning with a far smaller number of field visits. He is also in a position to give the canal operators clear instructions based on the data from the field.

Interviews with farmers reveal that water problems were reduced considerably during maha 1991/1992. The monitoring and feedback system has also helped the canal operators to perform

their duties systematically based on target discharge rather than on an ad-hoc basis by responding solely to farmers' requests.

Water Balance Study of the Ellegala Irrigation System

The Ellegala Irrigation System with its five interconnected tanks receives water from the Lunugamvehera Reservoir through a feeder canal from the Left Bank Main Canal. In addition, these tanks get rainfall runoff from their own catchments as well as drainage water originating from the new irrigated area. The releases from Lunugamvehera Reservoir to Ellegala vary from season to season depending on a large number of factors including the rainfall in the command area and the extent of new irrigated area.

Prior to this research, there were no reliable measurements of water releases to Ellegala and nobody knew how to calculate the amount of water from Lunugamvehera Reservoir needed by Ellegala. Without knowing this requirement, it is extremely difficult to allocate water to the new area, especially when it is a dry year. Because of the inadequate data, water releases from Lunugamvehera Reservoir to Ellegala were made on an ad-hoc basis. It was often observed that while the new system was in dire need of water, the tanks in Ellegala were spilling; this was the case in maha 1991/1992.

The flow measurement and water balance program initiated under PAR has provided limited but reliable flow data which allow the determination of the amount of water originating from the catchment rainfall and drainage as well as that released from the Lunugamvehera Reservoir. In addition, it has also provided information on the water released from the different Ellegala tanks during maha 1991/1992.

This has truly been a joint effort. The data collection plans were jointly designed by IIMI researchers and Irrigation Department officers, the data was collected by Irrigation Department employees, the computer model for data analysis was developed by an Irrigation Department engineer, and the actual data analysis and write-up done jointly by Irrigation Department officers and IIMI researchers.

Irrigation Department officers and IIMI researchers have used this information to develop a new release pattern from Lunugamvehera to satisfy the water requirement of the Ellegala Irrigation System as well as to make seasonal cultivation plans for the new system based on the expected inflow into the Lunugamvehera Reservoir.

Maintenance Management

The new maintenance management procedure developed ajd implemented at Kirindi Oya is based on diagnostic walk-throughs by agency officials and farmer representatives. Work is largely implemented using farmer contributions of labor to supplement resources provided by the government.

In maha 1991/1992, the preparation of work plans for one of the tanks in the Ellegala Irrigation System was done in a satisfactory manner using this approach and implementation during the closed season was successful. Preparation of work estimates on the basis of actual needs has been well-accepted by the agencies and farmers. The maintenance procedure and methods developed under this research appear to be implementable within the current government frameworks.

Table 7.2: Overall system performance.

Year	Season	Area cultivated (ha)									Water use		Rainfall (mm)
		RB Tr.1	RB Tr. 2&5	RB Tr. 6&7	LB Tr. 1&2	LB Tr. 3	EIS	B'giriya	Total	Total new area	New area (ft)	Old area (ft)	
1987	Yala	0	0		0		4,000	0	4,000	0			
1987/88	Maha	800	1,900		1,600		4,000	650	8,950	4,300	7.8	3.8	
1988	Yala	800	0		1,600		4,000	650	7,050	2,400	7.4	1.5	442
1988/89	Maha	800	1,900		1,600		4,000	650	8,950	4,300	9.5	1.4	720
1989	Yala	0	1,900		0		4,000	0	5,900	1,900	10.0	2.7	325
1989/90	Maha	800	0		1,600		4,000	0	6,400	2,400	9.7	2.5	370
1990	Yala	50*	0		2,400		0	650	4,900	250	16.0	5.1	351
1990/91	Maha	800	1,900	590*	1,600		4,000	650	9,540	4,890	8.6	2.1	780
1991	Yala	0	200*	150*	0		4,000	650	5,000	350	9.4	1.5	366
1991/92	Maha	800	1,900	740	1,600	120*	4,000	650	9,810	5,160	6.6	1.2	661

*OFC

Pilot OFC Cultivation

Pilot OFC cultivation in Left Bank Tract 3 during maha 1991/1992 demonstrated clearly the feasibility of raising OFCs in the maha season in well-drained soils. The experiment also provided information on the timing of OFC cultivation, land preparation requirements, drainage requirements and irrigation scheduling requirements for maximum production. The experiment is being repeated during maha 1992/1993. Meanwhile, the lessons learned from the experiment are being replicated in other tracts of the new area.

SYSTEM PERFORMANCE IMPROVEMENTS, MAHA, 1991/1992

Results from maha 1991/92 are presented to illustrate the outcome of the participatory action research. Three areas are discussed:

- Overall water use performance of the Kirindi Oya System.
- Main-canal operation performance.
- Tertiary system performance.

Overall System Performance

Overall system water use in Kirindi Oya System from yala 1987 through maha 1991/1992 is presented in Table 7.2. This Table brings out a number of interesting factors:

- The first water releases for the Kirindi Oya System were in yala 1986. Maha 1991/1992 was the first season in which all the area developed under the Kirindi Oya System was brought under cultivation.
- Water use for both the old and the new areas was the lowest during maha 1991/1992. There is a water saving of 2 acre-feet/acre from the previous maha season although the rainfall then was higher by about 120 mm.

As the total area of irrigation increases, water use generally decreases, thus partially explaining the improvements in maha 1991/1992. However, if one compares water use in maha 1991/1992 in the old Ellegala Irrigation System with that in Ellegala in maha 1990/1991, it is seen that there has been a dramatic decrease in the water supplied from Lunugamvehera Reservoir to the old Ellegala Irrigation System, although the rainfall has not been very different. This indicates that there has been an overall improvement in the operation of the Kirindi Oya System. This improvement is due in part to better understanding and coordination among the different line agencies and in part to the improved management performance by the Irrigation Department.

Main-Canal Operation Performance

In maha 1991/1992, the Right Bank Main Canal (RBMC) was selected as the pilot area for improvement of canal operations. The tract-wise performance of the RBMC is presented in Table 7.3. The average water use is about 6.3 acre-feet/acre against an overall water use of 6.6 acre-feet/acre for the Right Bank Main Canal and Left Bank Main Canal together. One of the main reasons for the higher efficiency of the RBMC was efficient operation of the main canal for economical use of the canal water.

Table 7.3. Tract-wise water use for RBMC, maha 1991/1992.

Tract No.	Area (ha)	Water supplied from canal (acre-feet/acre)	Rainfall contribution (acre-feet/acre)	Overall water use including rainfall (acre-feet/acre)
1	800	5.58	2.25	7.83
2	900	7.64	0.75	8.39
5	1,000	5.86	—	5.86
6 and 7	740	5.97	2.13	8.10

Table 7.3 shows that Tract 2 used the highest amount of canal water while Tract 5 used the least. In Tract 5, irrigation was started at the beginning of January instead of early November as in Tract 2. As a general rule, if irrigation is started very late in the maha season, water consumption is reduced considerably because rainfall reduces land-soaking and land-preparation requirements. Also, Tract 5 received a considerable amount of seepage water from the main canal as well as drainage water from Tracts 2, 6 and 7. Because of the dwindling storage in Lunugamvehera Reservoir, the Irrigation Department was also extremely careful in its supply of water to Tract 5. On the other hand, Tract 2, because of its very heavy canal losses, used the highest amount of canal water; also the rainfall contribution to this tract during crop growth season was much less than that to Tracts 1, 6 and 7.

An important result of this analysis is that the Irrigation Department officers who took part in the research by collecting and helping with the analysis of the data, now have a much better understanding of the problems of irrigating from the RBMC. They now have the ability to respond to the problems in a coordinated way that will serve all of the areas.

Tertiary System Performance

As shown in Table 7.4, the tertiary system management research component resulted in considerable saving of water. Table 7.4 indicates that the water used for land preparation on the pilot channel (Sub 1, Distributary Channel 5 in Right Bank Tract 2) was 577 mm in maha 1991/1992 against 840 mm reported for Distributary Channel 2 in RB Tract 5 in maha 1989/1990 (IIMI 1990). During the crop growth period, the Irrigation Department (ID) could not implement a rotation within the distributary channels as planned. Instead the ID responded to rainfall by closing the canal on rainy days. As a rough rule, they closed the canal for one day for every 30 mm of rainfall.

*Table 7.4. Tertiary system management, maha 1991/1992.**

Date	Week	RF	ET	SUB	FC 51	FC 48	FC 49	FC 50
Total water use for land preparation period								
15-Sep.	1	0.00	55.40	58.40	99.11	116.06	25.40	41.04
22-Sep.	2	3.20	56.20	115.80	126.16	109.96	88.73	132.96
29-Sep.	3	18.10	33.10	108.36	133.67	137.06	87.12	106.69
06-Oct.	4	4.10	45.40	111.85	141.43	116.12	84.71	106.74
13-Oct.	5	59.40	23.30	70.48	77.27	43.57	54.13	79.27
20-Oct.	6	40.00	35.00	72.38	110.81	79.44	62.01	58.58
27-Oct.	7	103.10	8.30	39.54	47.51	42.48	37.11	35.31
Duty (mm)		227.90	256.70	576.81	735.96	644.68	439.21	560.60
Duty (acre-feet)		0.75	0.84	1.89	2.42	2.12	1.44	1.84
Total water use for crop growth period								
03-Nov.	8	43.70	15.10	80.54	91.21	98.81	79.10	59.41
10-Nov.	9	126.00	21.80	37.16	43.67	30.07	35.98	43.33
17-Nov.	10	27.40	18.80	34.61	37.89	13.10	25.53	37.86
24-Nov.	11	13.80	23.90	97.72	101.55	96.00	73.38	101.37
01-Dec.	12	0	36.10	97.77	127.09	60.92	81.29	90.50
08-Dec.	13	62.60	8.50	56.10	71.95	36.29	52.08	45.94
15-Dec.	14	146.30	18.10	4.41	6.05	6.60	4.35	1.87
22-Dec.	15	9.60	23.60	61.69	84.29	97.51	54.56	30.39
29-Dec.	16	12.30	23.30	89.11	97.75	62.53	78.23	91.64
05-Jan.	17	3.00	28.00	69.94	81.43	89.87	56.78	52.64
12-Jan.	18	2.10	24.00	53.10	64.57	67.31	43.68	36.00
19-Jan.	19	0	22.20	29.34	27.84	46.52	20.74	41.98
Duty (mm)		446.80	263.40	710.48	835.29	705.52	605.70	632.94
Duty (acre-feet)		1.47	0.86	2.33	2.74	2.32	1.99	2.08
Total for maha season								
Duty (mm)		674.70	520.10	1,287.29	1,571.25	1,350.20	1,044.91	1,193.53
Duty (acre-feet)		2.21	1.71	4.22	5.16	4.43	3.43	3.92

*The Irrigation Department believes that these figures seem "to be rather high" and that may be due to a measuring or calibration inaccuracy.

The low mean Relative Water Supply (RWS) and Cumulative Relative Water Supply ratios shown in Figures 7.1 and 7.2 indicate that the ID and the farmers succeeded in decreasing the use of canal water for land preparation but not during the crop growth period. However, a mean RWS value of 1.2 to 1.5 is a good achievement compared to a value of 1.5 to 2.0 in the previous seasons. A better water distribution plan during land preparation period coupled with better coordination among the implementing agencies and the farmer organizations appear to be the major reason for the improved performance of the tertiary system.

Figure 7.1. Cumulative RWS for field canals.

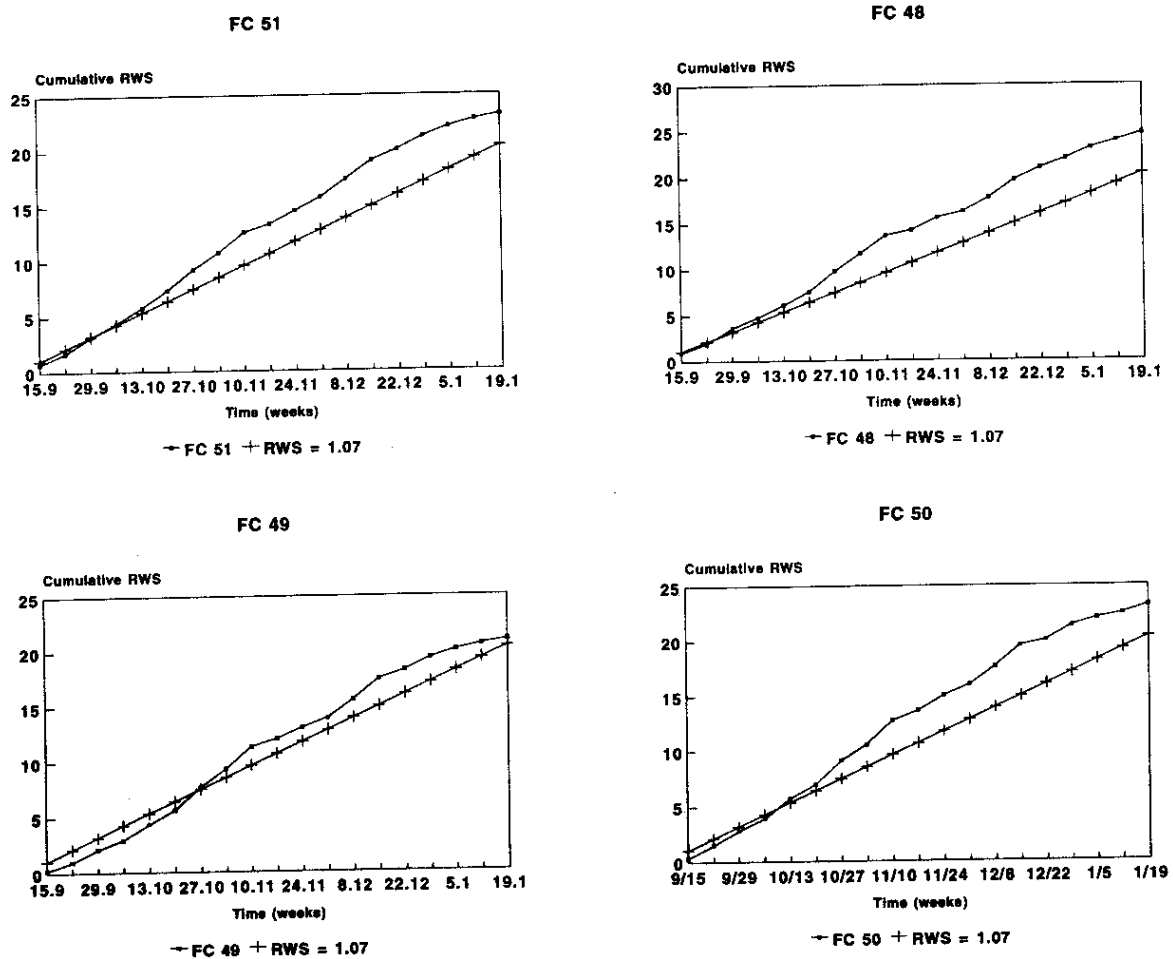
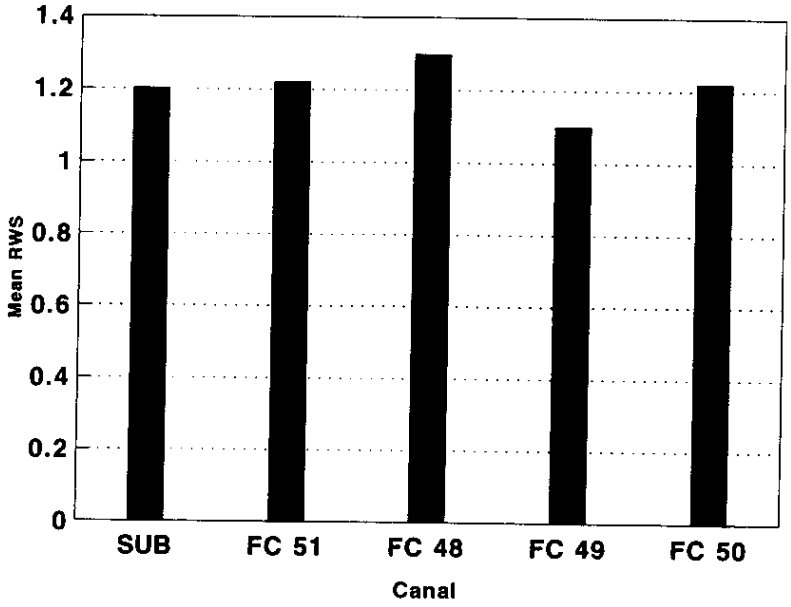


Figure 7.2. Mean relative water supply, RB Tract-01, maha 1991/92.



CONSTRAINTS ON PARTICIPATORY ACTION RESEARCH IN KIRINDI OYA

Research at Kirindi Oya has not progressed totally smoothly. There remain major difficulties in achieving some of the objectives of the research. Two of these difficulties are those with the PAR process itself.

Getting and Maintaining Participation

Maintaining the wholehearted participation of the agency officers and farmers is essential. They must feel that they "own" the project. Three factors have made it difficult to get and maintain sufficient participation:

- The roles and tasks of implementing officers.
- The commitment and leadership of the implementing agencies.
- Economic conditions of new settlement area farmers.

Roles and tasks of implementing officers. Participation in research activities requires a considerable amount of time and effort on the part of the implementing agency officers. Unfortunately, their roles and functions have not been redefined. The research activities are extra

work rather than activities that fit into their normal duties. The workload of many officers has been considerably increased by the need to coordinate, implement and monitor the program. While some of the officers are quite willing to put in the extra effort, others feel that the required effort is excessive. Also, some feel that there is no proper recognition and incentive for the extra work. If these research activities are to be internalized and sustained, there is a clear need to redefine the roles and functions of the implementing officials to build in an incentive system for better performance.

Commitment and leadership of implementing agencies. Four government agencies plus a number of farmer organizations are involved in implementing this research. The agencies at Kirindi Oya are headed by officers of more or less equal rank. A key requirement of these officers is their commitments to get the full participation of lower-level staff. Unfortunately, the local heads of departments vary considerably in their commitment to participation. The experience gained so far suggests that, at least in Sri Lanka, it would be more effective if there were a single manager at the project level who has the power and authority to coordinate the various line agencies, implement and monitor new activities such as the participatory action research and provide the necessary leadership.

Economic conditions of new settlement area farmers. Surveys conducted for the tertiary system management component show that at least 50 percent of the farmers in the new areas have serious economic problems. A great many have leased their lands to outsiders and others in their own hamlets. Many farmers have become wage laborers in their own leased out lands. A minority of the farmers are still entitled to bank loans; the rest are defaulters. The farmers complain that they are suffering primarily from water shortages which give poor yields and which limit the cropping seasons to an average of about one per year.

The farmers in the new areas are settlers brought from other areas. One result of the poverty is that only farmers without other resources live permanently in the new settlements; others live much of the time elsewhere where their income opportunities are greater. Since resident farmers can cultivate only one season per year, they depend more on wage labor and chena cultivation than on irrigated farming activities. Other farmers reside in their original villages outside the area and come to Kirindi Oya only when there is water for cultivation. Dual residence coupled with lessened dependence on irrigated agriculture has caused considerable problems in effectively organizing farmers for any purpose, including participatory action research. Basically, farmers are either not available to work with organizations or they have greater interest in other activities. As a consequence the farmer organizations are very weak.

Lack of Power to Make Needed Changes

Some of the management innovations needed require institutional changes and changes in operations and procedures of the agencies. Unfortunately, many of these changes are outside the authority of the local officers and require concurrence or action by superiors. However, as has been shown elsewhere, it is almost always far easier to demonstrate the value of management innovations than to get the necessary institutional changes made (Bandaragoda and Firdousi 1992). Interests in the status quo make institutional changes slow and difficult. This appears to be true for participatory action research in Kirindi Oya.

For example, research has clearly shown the value of the new monitoring systems in use on the Right Bank Main Canal. However, much of the essential data collection work is being carried

out by Irrigation Department officers as additional labor for which they are being rewarded with extra pay. This is not a sustainable situation. To get this work made part of their regular duties requires changes in the job definitions of these officers and a corresponding reduction in other duties. It also requires changes in evaluation of their performance by their superiors. None of this can be accomplished without the consent of their union and of the highest authorities in Colombo. Both of these have other concerns and interests to protect.

Probable Effects of Constraints

These two constraints affect both the conduct of the research project itself and the sustainability of the innovations:

1. First, without effective participation, many of the actors will not feel ownership of or commitment to the research activities thus making the activities themselves less likely to succeed. Without the power to make needed changes, some of the most valuable innovations cannot be tried. For both reasons, the research suffers limitations.

2. Second, without the understanding and internalization of the innovations brought about by full participation, the agency personnel and farmers are not as likely to continue the innovation following the end of the research. More importantly, without the institutional and procedural changes that reward maintenance of the innovations, it is quite likely that they will be abandoned once the researchers leave.

The second is the greater problem. Lack of participation can be and is occasionally remedied by increased participation by the researchers. For example, in the tertiary management component, one of the IIMI researchers was forced to provide help to a farmer organization when it became clear that the officers assigned to the duty would not be able to provide sufficient assistance. While the authors recognize involvement of the researchers in this type of action as a mistake, the limited time available for the research project sometimes forces such deviations. While involvement of the researchers helps with immediate implementation of the innovations being pilot-tested, it decreases the likelihood of their being sustained in the future.

THE VALUE OF PARTICIPATORY ACTION RESEARCH

In the Kirindi Oya System, participatory action research (PAR) has clearly demonstrated its ability to achieve significant improvements in system performance. As pointed out above, the constraints are most likely to affect the sustainability of the innovations being introduced. Although PAR is achieving some of the desired results in Kirindi Oya, there remain questions concerning its value as a research methodology. Some of these are considered here.

Is PAR a Research Method or a Development Method?

PAR clearly shares aspects of both research and development. As mentioned earlier, there are three expected outputs:

1. Improvements in system performance that are likely to be implementable because they have been carried out by regular working personnel.
2. Internalization of the innovations in the implementors, including understanding how and why they work.
3. Research reports to disseminate the results of the experiment to others who can make use of them.

The first two outputs serve development goals, only the third serves a research goal. Indeed, without the third, PAR is arguably a participatory development method rather than a research method. However, with the inclusion of data collection, reporting and analysis for a wider audience, PAR is not only a research method but is in fact the only method that can be used for many kinds of irrigation management research.

Most irrigation management research, by its very nature, must be carried out on live systems. Without the direct participation of the system managers or the farmers, the only way such research can be carried out is for the researchers to take over the system. In many instances of management research, participation of local personnel is limited to carrying out the orders of the researchers. Unfortunately, taking over the system means that many real world factors that affect the functioning of an innovation will be ignored.

Thus, if the goal of the research is to pilot-test an innovation in the real world, full participation of the local personnel, including their taking responsibility for both the planning and implementation of the research, is required. Only if local personnel can assist with planning and implementation will they be able to identify the relevant factors that have been missed by the researchers.

PAR as a Research Method: Rigor and Process Documentation

As a research method, PAR has the fundamental drawback that many variables cannot be controlled. Because the processes are modified during the work, a PAR activity is not a clean experiment. Results rarely include unambiguous confirmation or rejection of a hypothesis. Also, results are likely to be limited to the one system where the experiment is carried out.

In these circumstances, how can adequate rigor be guaranteed so that the results can be made useful to an audience of researchers? There is no simple solution and there is a current debate among researchers in organizational development about rigor within PAR (Whyte 1991).

If the process itself is documented so that both the idiosyncratic features of the local environment and of the process can be identified, general principles can be clearly separated from local circumstances. Such separation will allow the drawing of wider conclusions. Unfortunately, the authors cannot yet say that they are documenting the process in Kirindi Oya in sufficient depth, although they are making every effort to do so.

PAR as a Development Method: Sustainability and Support

One of the potential strengths of PAR as a development method is that, when properly done, it guarantees internalization of the successful innovations within the participants. Internalization, however, is not a guarantee of sustainability. As pointed out earlier, the sustainability of the

innovations is threatened by the lack of ability to control outside factors and by failures in getting the proper degree of participation.

How can the chances of making innovations introduced through PAR sustainable be increased? The authors suggest that PAR activities in irrigation systems should be coupled with development of a support institution, preferably within the agency most directly affected. The institution would not only be able to carry out PAR activities, including preparing and disseminating the lessons learned, but would be able to act as a lobby for the needed external changes.

In Sri Lanka, IIMI is now engaged in working with the Irrigation Department to develop the new Irrigation Research Management Unit (IRMU) into just such a support entity. It is expected that, in the future, the IRMU will carry out diagnostic activities on irrigation systems, and then mount PAR activities to improve system performance. By analyzing and collating the results of these activities, IRMU will be able to identify organizational and procedural reform needs requiring action at levels above that of the individual scheme. IRMU can then present well-documented proposals to the appropriate officials in order to effect the needed changes.

Finally, the authors suggest that this strategy of coupling PAR and a support unit is likely to be an effective means for institutional strengthening and for introducing management innovations in many developing countries.

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