IIMI Working Paper No. 11

MANAGEMENT

Ranjanie Moragoda and David Groenfeldt

INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE

IIMI Pub 88-23, March 1989

IIMI HEADQUARTERS
Digana Village via Randy. Sri Lanka.

TELEPHONE (national 08; international 94-8) 74274, 74253, 74334
TELEX 22318, 22907 IIMIHQ CE
FAX (national 08; international 94-8) 32491

COLOMBO OFFICE
6 Longden Terrace, Colombo 7, Sri Lanka.

The authors, Ranjanie Moragoda and David Groenfeldt are, respectively, a Research Assistant and a Irrigation Specialist at the International Irrigation Management Institute (IIMI).

CONTENTS

FOREWORD

In October 1985 the research on irrigation management for crop diversification wae expanded to include a component to address specifically the institutional arrangements of irrigation management.. The results of this component for yala (dry season) 1986 are reported in this paper. The results from maha (wet season) 1985/86 have been reported in Social Aspects of Water Management during the Maha Season 1985/86 in Dewahuwa and Mahaweli H-2 Block 305: Precept and Practice, by Senarath Bulankulame (IIMI working paper no. 1, 1986). The data collection and analysis for the present report was carried out by Ranjanie Moragoda, IIMI Research Assistant, with guidance from Senarath Bulankulame, IIMI Research Associate, and David Groenfeldt, IIMI Irrigation Specialist. Mr. B.W. Bandara provided technical assistance in data analysis. The major portions of this report were drafted by R. Moragoda with revisions and supplementary information by D. Groenfeldt.

ORGANIZATIONAL ASPECTS OF IRRIGATION MANAGEMENT IN KALANKUTTIYA BLOCK, MAHAWELI SYSTEM H, SRI LANKA DURING THE 1986 DRY SEASON

BACKGROUND TO THE STUDY

Field research on water flows and agricultural production in the Kalankuttiya Block of Mahaweli System H was initiated by IIMI staff in mid-1985 during yala (dry season). The primary focus was to understand the effects of irrigation management practices on crop diversification from rice to "other food crops" (OFCs) such as chili, lentil, soybean, and onion. Faced with immanent self-sufficiency in rice production, but continuing large-scale imports of non-rice food crops, the government is trying to promote the cultivation of OFCs, which require intermittent irrigation, in schemes designed primarily for rice cultivation and more or less continuous water flows.

Rationale and Objectives

In recent years, various measures have been taken to improve irrigation performance through management innovations that place greater responsibility on farmers, while providing an organizational structure whereby the farmers' own management capacity can complement the work of the irrigation agency. The overall role of the social science component within the "crop diversification" research project was to identify organizational constraints to the more careful management required for irrigating OFCs, to understand the underlying reasons for those constraints, and during a later phase of action research, to suggest ways in which project management might address the constraints. The specific objectives of the social science component during the 1986 yala were to:

* document farmers' management practices in water distribution and maintenance;
* document the role of farmer leaders in irrigation management;
* document the practices of agency field staff and project staff in irrigation management, with particular reference to their interaction with farmers and farmer leaders; and
* identify possible improvements to the existing institutional arrangements which could lead to more effective irrigation management.

History and Physical Layout

Part of the country's largest irrigated settlement scheme, System H, was completed just six years ago, and is the oldest of five separate systems within the scheme, all fed by waters from the Mahaweli River, as well aa from smaller streams in each locality. Before construction, much of the 27,000 hectares (ha) which comprise the irrigated area of System H was jungle, with scattered villages based on irrigated agriculture from village-owned and-

managed small tanks, and chena (upland shifting cultivation) plots. The new canal system and associated land development obliterated many of these tanks, and incorporated others into on-line reservoirs of which Kalankuttiya Tank is one. Settler families who had previously owned land within the tank command, as well as families from outside the region, were allotted 1-ha parcels of irrigated land and 0.2-ha for house plots and gardens.

The physical layout of the residential plots and the irrigation canals in System H follows a regular pattern. The Kalankuttiya branch canal which serves the research area feeds 20 distributary channels (see Map 1), which take water to field channels, from which water flows through 4-6 concrete pipes into the individual 1-ha plots. Unlike the case in Dewahuwa Tank, there are no fields fed directly from the Main Canal or from the distributary channels. Each field, or each farmer, is part of a larger irrigated unit defined by the field channel and comprising between 7-15 allotments, most of which (68%) are farmed by the original allottees or close kin.[1]

Methodology

This report is based on data collected by Ranjanie Moragoda who spent maha 1985/86 and yala 1986 living in the home of a farming family and conducted interviews and observations both in farmers' homes and in their fields. In addition, she met periodically with project level officials of the Mahaweli Authority. Data collection focuses on an "intensive" sample of all 17 allotments within a single turnout (TO 2 in D-4), plus an "extensive" sample of 91 allotments spread over this and three other distributaries (D-2, D-3, and D-4 in Kalankuttiya Block). Within the 17 allotments of the intensive sample, all farmers (n=29) were included, in order to capture the diversity of land holding sizes and tenure arrangements, The "extensive" sample of allotments outside TO 2 in D-4 allowed close inspection of farmers' irrigation behavior. The extensive sample allotments were selected to coincide with the sample used in the engineering and agricultural components of the crop diversification study, of which the research reported here forms one part.[2] Within the extensive sample allotments, one or two farmers were selected, with preference given to farmers included in the 1985 yala sample, in order to provide some continuity. A total of 100 farmers were selected from the 91 allotments of the extensive sample. A single questionnaire form was administered to all farmers in both the intensive and the extensive samples. Interviews and observational data collected followed the same topics as during the previous season (e.g., water distribution, channel maintenance, land tenure, outside employment) with the addition of more detailed questions on credit, and operation and maintenance (O&M) fees.

---

[1] This figure refers to a sample of 56 operators from three field channels along one distributary, during maha 1985/86. During yala, the proportion of nonowner operators is generally higher,

[2] The report of the larger study on Irrigation Management for Crop Diversification, which also incorporates some of the data presented here, is currently under preparation.

ORGANIZATIONAL STRUCTURE

The organizational setup for the management of the Mahaweli area is based on three levels: project level, block level and unit level. The unit level which is administered by a unit manager entails direct dealings with farmers, The unit manager is responsible for *many* development activities including water management, agriculture, land matters, marketing, credit, and community development. In order to service 250 families in each unit, the unit manager is assisted directly by a field assistant and an agriculture extension assistant (KVS). The unit manager also consults the irrigation engineer and the engineering assistants in the block office, with regard to water distribution and technical matters in the unit.

In assuring adequate water for the distributary channel, the unit manager is assisted by an Irrigator, a casual laborer working under the Engineering Assistant at the block office, who is responsible for opening and closing the main Kalankuttiya Tank sluice and the distributary channel gates. Usually the Irrigator implements the instructions of the engineering assistant for using water for each distributary channel within his area. The Irrigator who controlled D4 in Kalankuttiya Block (No. 305) also controlled 305/D1, D2, D3, and 308/D1, D2, D3). In addition to his instructions from the engineering assistant, the Irrigator meets the unit manager every morning on the water issuing days to get information on water needs before he adjusts the distributary channel gates. For example, when the Irrigator met the unit manager of Unit 3 during the tenth water issue in August, he was asked to increase the water flow of D4/305 and D3/308, as farmers had complained that adequate supplies had not been received.

Fanner Organizations

Farmers' participation in irrigation management begins at the distributary channel level, The distributary channel representative (DC-Rep) and turnout leaders play a role, along with the unit manager, in operating rotations, cleaning, and also maintaining the field channels. The DC-Rep is supposed to be selected by the farmers within the distributary channel. The organizational structure introduced by the Mahaweli Authority at the distributary channel level has the following objectives: 1) arrange for a water distribution in the distributary channel and field channels, 2) get the assistance of farmers' organizations to maintain both the field channels and the D/channels, 3) get the assistance of farmers for minor repairs of channel structures on contract, 4) protect the irrigation system, and 5) make arrangements to prevent wastage of water.3

Farmer groups at the turnout level were formed by the Mahaweli Authority for the same reasons as in the distributary channel group. A leader for each turnout was selected by the original allottees belonging to the turnouts. However, many farmers were unaware of who their turnout "leader" was supposed to be. In the intensive sample (n=29; all fanners within TO 2 in D-4, Block 305) one-third did not know whether or not their turnout had a leader. Of

---

3 Internal memo from resident project manager's office, Tambuttegama, 1986.

the two-thirds who were able to identify the leader, fewer than half knew how he had been selected. In the extensive sample (n=100) of relatively larger scale farmers[4], most (94%) could identify their leader, but only about half (54%) knew how he had been selected (see Table 1). Nevertheless, nearly three fourths (72%) of the farmers felt that the turnout leader served a useful role (see Table 1). Of 12 turnout leaders of D3/305 and D4/306 who were interviewed as to how they were chosen, eight stated that they were selected by farmers within their turnouts, and three stated that they were appointed by the unit manager. One leader did not know how he had been chosen as a turnout leader; he was simply informed by the KVS that he was the turnout leader.

Farmers' level of awareness about the DC-Rep was similar to that regarding the turnout leader; 69 percent of the farmers in the intensive sample and 58 percent in the extensive sample could identify the DC-Rep. Their knowledge of the selection process varied. A little over a quarter each of the intensive sample respondents (28%) and the extensive sample respondents (29%) had no idea how the DC-Rep had been selected,

Table 1. Farmer responses (percentages) to the question of how they selected their leaders, yala 1986.

	Intensive sample n=29		Extensive sample n=100	
	TOL[a]	DC-Rep	TOL	DC-Rep
Selected by farmers	28	41	40	20
Appointed by unit manager	--	--	14	9
No turnout leaders	--	--	3	--
Do not know	72	28	40	29
No responses	--	31	3	42
	100	100	100	100

[a] Turnout leaders.

In response to the question of how many neighboring turnout leaders each leader knew, four leaders said that they knew only two others; two leaders stated that they knew four others, one leader stated that he knew *six* leaders, and two stated that they knew seven others. One leader said he did not know any neighboring leaders. All the turnout leaders knew that they had a DC-Rep, but only eight knew how their DC-Rep was selected.

---

[4] As discussed in the Methodology section, the extensive sample included farmers from five distributaries along the Kalankuttiya branch canal, and was weighted towards relatively larger scale farmers within an allotment, in order to omit very small plots.

When farmers are faced with an irrigation problem, many (46 of the 100 farmers in the extensive sample) do not discuss the problem with their farmer leader; instead, they go directly to an officer, most often the unit manager. There are a number of reasons for this, relating both to the lack of responsibility felt by farmer leaders, and to the general efficiency (from the farmer's point of view) of taking concerns directly to project management, as represented by the unit manager (see Table 2).

Table 2. Reasons given by the 46 farmers in the extensive sample who went directly to officers for help with irrigation problems (percentages).

	Extensive n=46
Easy access of the unit manager	9
Turnout leader has no authority	17
Turnout leader does not care	63
Respondent is turnout leader or DC-Rep	11
	100

Farmers' responses to the question of why they needed turnout leaders included supervising water distribution and maintenance services, as well as serving as a link between farmers and officers. The most commonly cited reason was that turnout leaders could organize farmers to help in water distribution, both through rotations, and through resolving disputes among farmers. Cleaning field channels was also viewed as an important function of the turnout leader. The role of the turnout leader as messenger, communicating information between farmers and officers, even if not influencing policies adopted, was also cited. Finally, turnout leaders sometimes played a role in nonirrigation issues, such as smoothing relations among farmers, particularly in bethma[3] divisions.

Informal Farmer Groups

In addition to the formal structural setup for water distribution, small informal water groups were formed by farmers on an ad hoc basis for sharing water among all the operators in one allotment or turnout, and for exchanging rotational turns. For instance, a woman operator in turnout 2 (D-304) used to get water from another farmer within the same turnout during daytime due to the difficulties of coming to the field at night, when she was

[3] Bethma is a traditional as well as modern practice whereby a portion (usually 50%) of the total command is irrigated during a water scarce season, and farmers have rights to cultivate an area in proportion to their land holdings. In distributary channels of Kalankuttiya Block, bethma is practiced in alternate years, (yala only). The 1986 yala was a non-bethma year in the study area.

scheduled to receive water. Two other operators in turnout 2 usually took water simultaneously for 12 hours, instead of the intended 6 hours. Tail-end farmers of turnout 3 of D4 acted as a group in requesting extra water for their turnout (from the unit manager) as well as in operating rotations.

THE PLANNING PROCESS

A cultivation meeting is normally held at the end of each cultivation season, in order to set the date of the following season, and to discuss plans for the cropping pattern and practices. Prior to the block-level cultivation meeting, each unit manager has to call for a precultivation meeting to prepare a cultivation calendar for each unit with the help of the turnout leaders, 'the farmers, and the extension officer (KVS) who is attached to each unit. A precultivation meeting in unit 3 was held on 22 January 1986 in the presence of 60 farmers and 5 officers (irrigation engineers, engineering assistant, KVS field assistant, and unit manager). The meeting resulted in a number of guidelines for channel cleaning, crops to be grown, and water issues and rotations.

Channel cleaning and maintenance. The time schedule adopted called for channel cleaning during the first week of March and repair of channel structures before the first water issue on 15 March. It was further decided that: a) farmers must clean the channel individually, and b) those who do not clean their portion must pay labor fees to hire laborers. The DC-Rep was charged with enforcing these guidelines. Urgent repairs, including the removal of illegal water taps (as pointed out by the Field Assistant) would be completed before the water issue. Channel cleaning was to be completed (by the farmers) before the end of March, A special arrangement was made for Turnout 3 where the turnout leader would divide portions of the channel among farmers with the help of the Field Assistant.

Crops. Farmers within Unit 3 were permitted to grow both rice and other food crops (OFCs), including chili, green gram, soybean, onion, cowpea, and vegetables. The suggested rice type was a three months' variety. The planned cropping pattern called for 30 percent rice and 70 percent OFCs. Farmers were encouraged to grow crops other than chili, which is more susceptible to disease, requires more water, and takes a longer period of time, than do other non-rice crops.

Water. The date for the first water issue was set at 15 March. Following a period for land preparation (one month for OFCs and two months for rice), water was to be issued within the turnouts in 6-hour rotations. In distributing water to each turnout, the unit managers are responsible for operating rotations according to the cropping pattern and acreage. On 27 March the unit manager of unit 3/305 prepared his water distribution schedule for D4/305 with the help of four turnout leaders (one of the five leaders being absent). The Field Assistant, the KVS, and the DC-Rep also attended this meeting, along with other farmers. The unit manager prepared a water distribution schedule according to the expected cropping pattern provided by the KVS. The planned water issue was 1 April for OFCs, and 20 April for rice fields (for turnout 3 they planned to issue water later due to late

harvesting). The water distribution plan decided for the five turnouts within D4 is given below. The number of days refer to the days within each water issue (usually weekly, depending on rainfall) during which that particular turnout gate would remain open,

Turnout 1 (Not decided, since the turnout leader was absent)
Turnout 2 Open for 4 days (17 allotments)
Turnout, 3 Open for 4 days (20 allotments)
Turnout 4 Open for 3 days (12 allotments)
Turnout 5 Open for 3 days (11 allotments)

IRRIGATION PRACTICES

Kalankuttiya Block is part of the Kalawewa Resident Project Manager (RPM) division of Mahaweli System H, and falls within the subarea of H-2. The administrative block consists of five "irrigation blocks" (305-309) and eight administrative units, each directed by a unit manager, and comprising roughly 250 family allotments. The five irrigation blocks are served by 20 distributary canals taking off from the Kalankuttiya branch canal, and fed by the Kalankuttiya Reservoir. This section of the paper discusses irrigation practices of the "extensive sample" of farmers in five distributaries located along the Kalankuttiya branch canal, and focuses particularly on one turnout (turnout 2) within one of the distributaries (D/304). As discussed in the section on methodology (above), all farmers within this turnout were included in an "intensive sample."

Water distribution within Kalankuttiya Block is controlled jointly by project management and farmers. Distribution of water from the main sluice to the branch canal, and distributary channels is controlled by the block-level Irrigation Engineer (IE) with the help of two Engineering Assistants and irrigation laborers. Within the distributary channels, distribution is controlled by the unit manager, with the help of a Field Assistant and the DC-Reps. Below the turnout gate, distribution of water is controlled by the farmers, although even here water use is under the legal governance of project management.

Water Distribution in the Kalankuttiya Branch Canal

Although it had been decided at the Cultivation Meeting to begin water issues for yala on 20 March, it was postponed to 27 March as farmers were not ready to receive water due to the late maha harvest. On 27 March, water was issued only to six tail-end distributaries (D4/309, D5/309, D1/307, D2/307, D3/307, and D5/306) and on 29 March, water was issued to D1/309 and D1/306. On 30 March, D2/309 received water and finally on 1 April, all the distributaries, including D4/305, began to receive water.

Except for brief closures during periods of rain (and during the Sinhala New Year and Vesak holidays), water was supplied for land preparation on a continuous basis to all distributaries until the end of May, a period of two months. On 2 June, the branch channel started a 3-day on, 4-day off rotation among distributaries. According to this system, only 15 head-end

distributaries received water until the 3rd day of water issue; on the 4th day of water issue, all 20 distributaries received water. On the 5th day of water issue, the upper 15 distributaries were closed and water was issued only to the 5 tail-end distributaries. In the morning of the 8th day of the cycle, the main canal was closed.

At the beginning of the 8th water issue, this pattern was changed by the project management by extending the number of days during which the main canal was closed; this was due to water shortage in the main reservoirs. The 8th water issue was scheduled for Monday, 21 July to Sunday, 27 July. The 8th issue was delayed until Wednesday, 23 July and the canal was closed on Tuesday, 29 July. For the 9th water issue, the canal was opened on 2 August and closed on Friday, 8 August. This pattern of extended closures continued for the remaining three issues, in order to conserve water (see Table 3).

Because the days of closure were extended during dry weather (when the reservoirs were low), farmers irrigated more heavily than normal when water was available, thus requiring extended water issues. For example, D3/305 was kept open for an extra 3 days during the 8th water issue (27-29 July); D4/305 was kept open for an extra 2 days during the 8th water issue and was also open for an extra day during the 10th water issue (16 August). The main canal was closed on 8 September. Tables 3 and 4 give a summary of water issues in D4/305 starting with the first water issue for land preparation on 1 April, to the end of the season on 8 September.

Table 3. Water issues for land preparation in D4/305, yala 1986.

Number of days open	Date opened	Date closed	Number of days closed
4	1 April	5 April	3
1	8 April	9 April	1
2	10 April	12 April	5
7	17 April	24 April	5
2	29 April	1 May	2
13	3 May	16 May	1
6	17 May	23 May	2
4	25 May	29 May	
39			19

Table 4. Rotational water issues in D4/305, yala 1986.

Rotation number	Date started	Number of days open	Date closed	Number of days closed
1	2 June	4	6 June	3
2	9 June	4	13 June	5
3	18 June	4	22 June	1
4	23 June	4	27 June	3
5	30 June	4	4 July	3
6	7 July	4	11 July	3
7	14 July	4	18 July	5
8	23 July	5	28 July	5
9	2 August	4	6 August	6
10	12 August	5	17 August	3
11	20 August	4	24 August	6
12	30 August	4	3 September	
		50		43

Source: Writer's field observation (cross-checked with unit manager's records).

Water Distribution at the Distributary Channel Level

Water distribution within the distributary channel is the responsibility of the unit manager. A Field Assistant (and to some extent the DC-Rep) implements the unit manager's instructions, The Field Assistant normally opens all turnouts in the morning of days when there is a water issue, since there is no rotation system within the distributary channels, At times he has to open only one or two gates as the others have been kept open all night, He also makes adjustments to the turnout gates, either through instructions from the unit manager, or based on farmers' requests. The DC-Rep often acts for the Field Assistant in opening or adjusting a turnout gate. However, unlike the Field Assistant, the DC-Rep does not have his own "key?' (wrench for opening the turnout gates). If he does not take the key directly from the Field Assistant, the DC-Rep has to go to the unit manager's office and ask for the key. Authority to open the turnouts would be given, along with the key. DC-Reps are relied upon particularly for opening and closing turnout gates during the night and during holidays, when the Field Assistants are on leave.

Water distribution within D4. Following two months of more or less continuous water flows for land preparation, for a total of 39 issue days, the first rotational water issue in D4 began on June 2. During this first issue all five turnouts within D4 received water simultaneously; no formal rotations were followed within the turnout. During the second water issue (one week later), farmers experienced water scarcity and attempted rotations. Since most of the channels had not been cleaned (contrary to the preseason agreements), the unit manager ordered the distributary channel closed for two

days (16-17 June) before releasing water for the third water issue (see the section on Cleaning and Maintenance for more details).

Water Distribution at the Turnout Level

Below the field channel and within the turnout areas, fanners are responsible for the distribution of water among the allotments by operating rotations, and water is allowed to flow through the outlets into the allotment. Although it was decided to operate a 6-hour rotation at the cultivation meeting (giving the entire field channel discharge into one allotment for six hours), there was no standard rotation system in practice. Farmers followed various patterns of rotation until their water requirements were fulfilled. In D4 (Block 305), only two turnouts operated structured 6-hour rotations. Turnout 1 in D4, Block 306 followed a pattern of 12-hour rotations for two allotments, but there was no formal method from head to tail or vice versa. According to their need for water, farmers had their turns. At times, according to the situation of the field channels, (distance of the channels, number of allotments, and the number of branch channels) farmers followed various other patterns of rotation. While the longer part of the turnout 4 of D4/305 operated a 6-hour rotation, the shorter part of the channel did not follow rotations. While one part of turnout 5/D4/305 was operating rotations, the other parts got water continuously, Turnout 7/D3/306 operated rotations among the branch channels within the turnout, but the time for issuing water to each branch was not fixed, When one operator in one branch needed water, he closed the other branch.

Responses to the question of how many allotments were receiving water at the same time (the question was put to the extensive sample with reference to the previous issue), revealed great differences among different turnouts. Thus, 3 of 4 operators in turnout 8/D3/305 responded that all allotments were receiving water at the same time. A majority of operators in other turnouts of this same distributary responded that only one allotment was receiving water at a time (see Table 5).

Table 5. Percentage of allotments within the same turnout irrigating simultaneously, yala 1986.

Number of allotments receiving water simultaneously	Intensive n=29	Extensive n=100
1	24	39
2	17	11
3	10	13
4	3	13
5	3	1
6	-	2
7	-	4
Cannot recall	41	14
No response	-	3
	98[a]	100

[a] Does not add up to 100 because of rounding.

Water distribution within turnouts of D4. Beginning with the third rotational water issue, the DC-Rep, who belongs to turnout 2, and the other farmers of turnout 2, decided to operate 6-hour rotations within the field channel, as they had followed during the previous maha, and which was required according to the agreement of the cultivation meeting. Allotment 532 (the head-end allotment of turnout 2) started to get water at 10:30h and allowed the water to flow to allotment number 524 at 16:30h on the same day. Farmers did not follow the rotational pattern strictly during the issue, since some fields did not require a full irrigation due to residual moisture from recent rains; other farmers made arrangements among themselves to trade their turns for a time that was mutually convenient.

Turnout 5 of D4 adopted a system of 12-hour rotations for two allotments simultaneously, The system was put into effect with the third water issue, and was a direct result of channel cleaning on 16-17 June. During this work to meet the deadline, fanners found themselves in their fields at the same time and were thus literally forced into discussion (since the unit manager had threatened to cut off water if the field channels were not cleaned). The farmers of TO 5 decided to adopt the *same* rotational pattern they had used (infrequently) during the previous maha. However, they did not follow the system entirely, as some of them were not in need of water. On the morning of 21 June, they had all finished irrigating rotationally and water was flowing only to rice fields. Later observations (3 July, during the fifth water issue) revealed that farmers of one branch field channel of To 5, which serves three allotments, did not follow the rotational pattern; when one farmer wanted water, he simply closed the other two outlets.

Turnout 4 of D4 adopted a system of 6-hour rotations, with water flowing first to the tail, and then working up to the head allotments. This system was not put into effect until the sixth water issue. Because of differential flows reaching the two branches of the turnout, however, tail-end farmers of the longer branch were able to obtain adequate supplies of water only by closing all the upstream allotments in their own branch, and by blocking the other branch. Farmers in the shorter branch agreed to this arrangement, but in practice, most of the rice cultivators (who were at the tail end of each branch, where the soils were heavier) obtained water during the night when water flows were higher, and allowed the upstream chili cultivators to irrigate during the day.

Farmers in the tail-end turnout (TO 3) of D4 decided on 12-hour rotations (two allotments at a time). The turnout leader and the unit manager together decided who should take water in what order. The schedule was complicated by an additional water source in this turnout; a small anicut carries drainage water from the adjacent distributary command area and joins the D4 channel just above TO 3, thus supplementing the water available in that turnout. A few allotments can take water directly from the anicut, as well as from To 3, and these farmers tended to ignore the rotational pattern. Partly because of this anomaly (and also because of a dispute over whether a farmer who has encroached and is taking water from To 3 should be accorded a rotational turn or not), the system of rotations broke down by the middle of July. In other ways, however, TO 3 exhibited a stronger internal

organization than other turnouts. When farmers experienced water scarcity during the third issue, for example, seven farmers went to see the unit manager and asked for more water, By closing the head-end turnouts towards the end of the water issue, some extra water was delivered.

Water distribution in turnout 2, D4. The pattern of water distribution in turnout 2 followed a 6-hour schedule, but with many deviations. The farmers started the 6-hour rotation in the middle of the season (18 June) when they experienced water scarcity. At times, however, two allotments took water simultaneously for 12 hours and in other cases farmers took water whenever they could. Normally allotments 524 and 526 obtained water at the same time, as the two operators had exchanged half of their lands to grow chili and rice. Allotments 527 and 528 took water at the same time as they were cultivated by the same operator. Allotment number 522 at times gave daytime water to one woman operator in 513 who was scheduled to receive water at night.

Not only the pattern but the duration of receiving water also varied according to the condition of the lands and for other reasons. Plot numbers 513 and 514 received water for more than' 6 hours as a result of the sandy soil. Allotment number 522 also took more than 6 hours in order to provide some water to the woman operator of 513. During the 10th water issue 522 started to get water at 09:45h and stopped receiving water at 18:00h. Only 6 of the 16 allotments followed a 6-hour rotation during the 10th issue. One allotment received water continuously for 24 hours.

In order to take the full discharge of the Pield channel, some farmers had to cut the field channel bund, since the outlet sizes are designed for 12-hour rotations (although the size of the outlets varies from plot to plot), Since the cultivation meeting prescribed the 6-hour rotation, this action had to be permitted. In receiving water to each allotment, whether they follow formal or informal rotations, each operator has to do certain activities to get water into his allotment. All but one of the 29 operators in TO 2 stated that they have to open the outlet, block the channel, and close the outlets above to get water into their allotments.

Summary: water distribution in turnouts of D4. Of the five turnouts in D4, only one (TO 1) never followed a rotational pattern. This turnout is the smallest, with only 7 allotments, and is also at the head end. Water was generally in adequate supply, and farmers could easily make informal arrangements among themselves if more than one farmer wanted to irrigate at the same time. The other four turnouts followed rotations fairly regularly, though with considerable flexibility. Turnout 2 had the most consistent rotational practice, partly because it is the largest turnout (17 allotments) and partly because the DC-Rep has land here and serves as the de facto turnout leader (there was also a separate leader who played no significant role). However, even in TO 2, there was considerable deviance from the schedule, in order to accommodate individual needs. The number of allotments receiving water at any given time varied from 1-4. There were no sanctions against informal arrangements which went against the formal rules; rather, farmers and field officers alike considered the rules to be a very general guide, to be enforced strictly only if disputes arose.

Water Distribution within the Allotments

Allotments are subdivided into liyaddas (small, level basins) by making ridges between the basins. Normally for upland crops liyaddas are subdivided into small slightly raised beds, and ditches are used to separate these beds. These small ditches are used to convey water through the beds, and thereafter to send away the excess water of the liyaddas. But for rice, farmers cover the entire liyaddawith water. Farmers often convey water from the upper liyaddas to the next lower liyaddas through an opening in the bunds, after flooding the entire liyaddas. This process is repeated until all the liyaddas are flooded, Chili cultivators often irrigate with buckets or with their hands when water is flawing along the ditches. This technique prevents standing water (which *can* waterlog the plants) and allows irrigation af high areas.

Although there was no bethma this season, there were several operators in many of the allotments, requiring some system to divide the water flaw among the operators. The most common method involved separates ditches for each section. When water enters the allotment through the field channel outlet, the operator who needs water closes the other operators' ditches by using earth or grass. When he finishes irrigating, the next one uses the same method. However, some farmers give water to each section simultaneously using two field channel outlets (one pipe outlet and one cut in the bund) and opening all the ditches within the allotment.

Division of water between operators in one allotment depends upon both physical factors (soil types and crops *grown)* and social factors (priority for owners). Slightly less than half the respondents in situations where two, three, or four farmers shared an allotment took water when mutually convenient, rather than in regular turns. Most others took water simultaneously in some fashion, either by constructing two outlets from the F-channel, or using field ditches, Because of seepage, a few farmers did not need to irrigate their fields directly, but relied on their uphill neighbors to provide water indirectly.

Even when there is only a single operator, there are often several crops which have different water requirements, and operators need separate ditches for each crop area. When they irrigate for one crop, they close the ditches for the other crops. Normally, operators irrigate the upland crops first and then the rice. When irrigating different crops, some operators used separate outlets for each crop, For instance, in the intensive sample, one operator used one outlet for rice and another outlet for upland crops. The operator of another allotment took water for chili from one branch of the field channel, and for rice he used an outlet on the other branch by cutting the channel bend.

Wight Irrigation

Night irrigation is generally avoided during yala, as it is difficult to irrigate upland crops at night. For proper irrigation, farmers have to stay in the field all the time to check that there is enough water to cover all the liyaddas and then to avoid standing water after irrigation. For this

reason, night irrigation is most often practiced by rice farmers, who face little competition from non-rice cultivators at night. Indeed, non-rice farmers often trade times with rice cultivators, so that the former can irrigate during the day, and the latter, at night. For example, all the rice cultivators in the shorter part of turnout 4 of D4/305 took water at night, in exchange for their scheduled times during the day.

Women operators, whether they have cultivated rice or other highland crops, tend to avoid irrigating at night for reasons of convenience as well as safety. For example, the woman operator of allotment 513 of turnout 2/D4/305 who had her turn at night, used to request water from the other operators who had their turn during the day. On the other hand, some operators take water exclusively at night as they can obtain the whole water flow easily, and as it does not interfere with other work. One operator who cultivated 2 plots in turnout 2 of D3/305 never irrigated during the day; he came at night from Kurunegala, his home town, on the 3rd day of each water issue.

Water is obtained at night both legally and illegally. The DC-Rep of D4/305 stated that he had to come at night to open one turnout gate which was regularly closed by the tail-enders so that they could steal water at night. Not only turnouts, but also distributary channel gates were opened on some occasions by the farmers. When farmers were asked whether they irrigated at night, 11 operators from the intensive sample and 60 operators from the extensive sample stated that they did so. The following table shows the number of operators belonging to both extensive and intensive samples who were involved in night irrigation.

Table 6. Frequency of night irrigation (%).

	Intensive n=29	Extensive n=100
Last or previous irrigation at night	38	60
Have not irrigated at night	59	39
No response	3	1
	100	100

CLEANING AND MAINTENANCE

The distributary channel and gates are maintained by the Mahaweli management. Routine maintenance of field channels (cleaning and desilting) and farm roads (normally channel-bunds are used as farm roads) is the responsibility of farmers.

Cleaning and Maintenance of Distributary Channels

Cleaning and maintenance of the distributary channel is done by registered contractors who tender through the Mahaweli Authority. The contractors clean and desilt distributary channels twice during each season: before the start of the season and in mid-season.

Table 7. Who cleaned the distributary channel, yala 1986 (%).

	Intensive n=24	Extensive n=97
Contractors	--	10
Mahaweli Authority	--	--
Members of the distributary channel organization	--	12
Laborers	66	56
Members of Death Donation Society	--	12
No response	33	9
	100	100

Contractors often used outside laborers who would finish the cleaning work within one or two days, There was little incentive to do a thorough job, and the work was sometimes limited to cutting grass along the channel.. Farmers in the tail end who faced difficulty in conveying water to their turnout had to clean the distributary channel themselves in order to 'irrigate. One group of farmers in D2/305 organized a shramadana (voluntary work done, usually, by a group for the benefit of a community) to clean their distributary channel. Seeing the good results, the unit manager helped the Farmers arrange to clean the channel on a contract basis. This group proved quite successful as an entrepreneurial team, taking contracts for several nonirrigation purposes (e.g., bulk purchase of hoe handles) as well. Although limited to 17 farmers (from nearly 100 in the distributary channel), this group served as a stimulus for giving contracts to farmer groups at the distributary channel level.

Midway through yala, a decision was taken by Mahaweli management to offer cleaning contracts to DC-Reps, as compensation for their work as farmer leaders. Thus, the contract of cleaning two channels (D4/305 and D3/308-unit 3) was given to DC-Reps; a contract for D3/305 was given to a farmer after the distributary channel leader declined to take on the contract. The DC-Rep of D4/305 started his cleaning in September (before maha 1986/87) and used this opportunity to earn extra income for his family; he cleaned the entire channel with the help of his own family members. In the case of D3/305, the contractor was unable to make a profit from cleaning because he hired laborers; when given another opportunity, he refused to continue the contract, and the unit manager had difficulty in finding another contractor for the channel. In D2, the same group of farmers formed a distributary channel organization and then took a new contract for cleaning. The other

two distributary channels belonging to the extensive sample were also cleaned by the farmers of these channels. The contract for cleaning D2/309 was given to the Death Donation Society which was formed by the farmers of that distributary channel. The contract for D4/306 was given to the DC-Rep.

Cleaning and Maintenance of Field Channels

Following the cultivation meeting, it was decided to clean all the field channels of D4/305 within two days, just before the first water issue on 1 April. Allocation of field channel sections for each farmer to clean was the responsibility of the turnout leaders with the help of the farmers. In certain cases the leaders were assisted by the unit manager's field assistant.

When preparing the water distribution plan for D4/305, the unit manager requested the leader of TO 3 to get assistance from the field assistant to allocate sections of the field channels for each farmer, due to lack of co-operation among the farmers in TO 3. The farmers of TO 3 did not feel responsible for cleaning the concrete-lined anicut channel which takes drainage water into TO 3 (see Map 2). As a result, the channel was filled with silt and covered with grass; water overflowed 'the bank of the channel and entered the turnout leader's own fields whenever tail-end farmers opened the gate of the drainage channel, usually at night. When the leader complained about this at a meeting on 27 March, the unit manager tasked him to organize the cleaning of the drainage channel among the farmers. The unit manager indicated that no water would be issued to the turnout until the cleaning was completed.

When the yala season 'started, most farmers had not cleaned their portions of the field channels. At the beginning of the 3rd water issue, all three distributary channels in unit 3 (D3/305, D4/305, and D3/308) were closed by the unit manager for two days (16-17 June) in order to clean the field channels. Nearly all the fanners helped with the cleaning at this point. Some operators who were not owners did not participate in cleaning (see Table 8).

Table 8. Who cleaned field channels, yala 1986 (%).

	Intensive n=29	Extensive n=100
Operator and/or family members	59	74
Operator and laborers	10	7
Operator and owner	-	4
Laborers only	10	8
Owner	14	5
Tenant	3	
No response	3	2
	99[a]	100

[a] Does not add up to 100 because of rounding.

In cleaning thechasmel there was no formal mechanism of organization other than the authority to the turnout leader, DC-Rep, and/or the unit manager. The cleaning of the channel entailed cutting grass, and not desilting. When fanners were asked who organized field channel cleaning, 45 percent of the intensive Sample and 16 percent of the extensive Sample stated that no one organized it. Others stated that the DC-Rep or the turnout leaders took the initiative (see Table 9).

Table 9. Who organized D-channel cleaning, yala 1986 (%).

	Intensive n=29	Extensive n=100
Turnout leader	3	35
DC-Rep	17	--
Unit manager	3	41
No one organized	45	16
Does not know	28	6
No response	3	2
	99[a]	100

[a] Does not add up to 100 because of rounding.

O&M Fees

Operation and Maintenance (O&M) fees have been imposed on farmers by the Mahaweli Authority since 1984. Fee collection in each unit is the responsibility of the unit manager. He issues a receipt for the money and hands it over to the land officer in the block office. The fixed fee for the 2.5 acre (1.012 ha) irrigated plots for 1984 was Rs 200 which was increased to Rs 250 for 1985 and Rs 300 for 1986.6 According to the unit manager's record of unit 3 in Kalankuttiya Block, as of August 1986, 73 percent of eligible farmers (i.e., landowners) had paid fees for 1984; 40 percent had paid for 1985, and 34 percent had paid for 1986.

According to our research data 32 percent of the fanners of the intensive sample and 73 percent of the farmers from the extensive sample had paid the irrigation fees. The following table shows the status of the farmers and payment of 'irrigation fees of the sample area.

Of 12 nonowners who paid for tenant land in the extensive sample, 6 are family tenant farmers; the other 6 are tenant fanners - 2 who have effectively purchased the plot from the original Owner, 2 lessees, 1 mortgagee and 1 ande farmer (share cropper). One of the two purchasers pointed out that paying the irrigation fee will help him make a legal claim for outright ownership. Two lessees and one mortgagee had paid the fees

[6] US$1 = Rs 27.44 and Rs 28.20 in January 1985 and 1986, respectively.

because the real owners could not pay. The technically illegal (encroaching) cultivators felt that they could enhance their rights to irrigation water by paying the fee. In return for paying the irrigation fee, the mortgagee had the right to cultivate the land during yala; otherwise, this was not normally part of a mortgage contract. In the intensive sample area, all the nonowners who paid the irrigation fee were family tenants.

Table 10. Payment of irrigation O&M fees, yala 1986 (%).

	Intensive n=24	Extensive n=97
Owner, paid	8	52
Owner, did not pay	4	5
Tenant, paid (as part of the rent)	20	12
Tenant, did not pay	62	25
De facto, but not legal owner, paid	4	6
	98[a]	100

[a] Does not add up to 100 because of rounding.

Whether or not they had actually paid the fees, a clear majority of farmers in both the intensive sample (75%) and the extensive sample (70%) indicated that the fees are basically a good thing, Farmers who had paid gave a number of reasons for complying with the request for paying the fee, including (percentages from extensive sample): a direct request from the unit manager (46%), need to get a recommendation for a cultivation loan (9%), it is the law (4%), and the money is used to maintain the channel (28%).

THE AGRICULTURAL ECONOMY

Land Tenure

The settlement of farmers in the study area began in 1976 and 1977. Each settler was allocated 1 ha of rice, and 0.2 hectares of homestead. However, only 10 percent of the cultivators in the intensive study area and 54 percent of the cultivators in the extensive sample were legal owners during yala 1986.[7] Thus, although the general policy of settlement schemes is that allotments cannot be leased, mortgaged or sold, in addition to the legal allottees, there are several categories of cultivators to be

[7] The difference in proportion of owners in the two samples points to the different origin of drawing the samples. The extensive sample is biased towards farmers who were included in the previous samples (for purposes of continuity of data), and these were originally included on the basis of landowning size (a preference for larger scale farmers within the allotment); The intensive sample comprised all cultivators within a single turnout.

considered. The following tables (11 and 12) show the tenurial conditions in the study area.

The main reasons for lose of land tenure by original allottees are financial difficulties and personal distress. An additional reason was that some land owners reside in other areas where they also have property and/or are employed in other jobs. The loss of land in all three allotments which were mortgaged, and in parts of four other allotments which were leased out, was due to financial problems. Three other allotments were leased out because the owners do not reside in the area.

Table 11. Pattern of land tenure in Kalankuttiya, yala 1986 (percentage).

	Intensive n=29	Extensive n=100
Original allottees	10	54
Family tenant	34	15
Lessees	28	10
Mortgagees	14	7
Exchange operator	7	1
Ande	3	8
Others (encroachers, buyers, and caretakers)	--	5
	96a	100

aDoes not add up to 100 because of rounding.

Credit

Credit is one of the most important inputs for farmers in the Mahaweli areas, especially for chili cultivators who require large capital outlays. A subsidized loan scheme was introduced through government banks, For yala 1986, the standard loan offered by the bank for unmilled rice and chili was Rs 6,300 and Rs 11,225 per hectare, respectively, at 9 percent interest per season. The loan was released in several installments to original allottees as certified by the unit managers. However, relatively few farmers in the sample area used bank loans. Of those who reported taking some type of loan (12 of 29 in the intensive sample, and 59 of 100 in the extensive sample) only 8 percent of the farmers in the intensive sample and 35 percent of the farmers in the extensive sample area had obtained credit from the bank for the yala season. Table 13 summarizes the source of credit.

Table 12. Pattern of land tenure in turnout 2 (intensive sample area).

No. of allotment / Status of operators	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	532	Total
Original allottee											1	1					1	3
Lessees	2	1	1				1		1		1				1	1		9
Mortgagees	2			1													1	4
Family tenant		1	1		1			1	1	1			3	1				10
Exchange operator												1		1				2
Ande						1												1
TOTAL	4	2	2	1	1	1	1	1	2	1	2	2	3	2	1	1	2	29

Table 13. Sources of credit (percentage).

	Intensive n=12	Extensive n=59
Relatives	17	8
Friends	14	8
Traders	3	6
Money lenders	-	6
Bank	7	31
No loan reported	59	41
	100	100

Farmers often begin cultivation using their own funds from the previous season, and when loans are needed they borrow from relatives, friends, money lenders, or traders. In many cases, the operator's own funds are either insufficient, or scarce, and land preparation is begun on credit, hiring buffaloes or a tractor on direct credit, to be paid in-kind at the end of the season. Most farmers cannot obtain cultivation loans from banks due to previous defaults; instead they take credit from private sources at interest rates of 10-20 times the institutional rate. In addition to problems of default, operators are not eligible for loans if they are not the legal land owners of the plots they are cultivating (since land leasing is illegal). Other credit constraints include difficult loan application procedure and unavailability of loans at critical times.

Many of the settlers in Mawattegama and Namalgamuwa (residence areas associated with D4) have been ineligible for cultivation loans because of previous loan defaults due to the drought in yala 1983, Of 40 households interviewed in October 1985, 18 had defaulted on previous loans. Some lands are now cultivated by the second generation as the original allottees are old and disabled. These farmers cannot take their old parents to the banks, yet it is only the legal allottees who are eligible for. loans. One operator stated that he could not get a cultivation loan, as his land was legally owned by his mother, who is unable to go to the bank. One woman in Mawattegama was unable to obtain a cultivation loan since her husband could not walk. Some farmers stated that they could not find witnesses; other farmers stated that they did not like to get money from banks, as they had to go all the way to the bank several times for one loan.

In borrowing from money lenders and mudalalis (proprietors of shops) farmers normally pay 20 percent interest per month. A common practice is to get goods on credit at no interest, provided they repay the credit at the end of the season; however, various forms of hidden interest operate in such cases. When farmers pay credit in-kind they have to pay interest. One woman in Namalgamuwa who took goods from a shop in Kutiyawa on credit had to pay 2.5 bushels of unmilled rice per Rs 100 to pay back the credit. Another farmer in Mawattegama who repaid his loans was paid Rs 40 per bushel by a shop owner in Kutiyawa. One mudalali stopped giving goods on credit due to the difficulties in collecting money at the end of the season. A reputed mudalali in Kalankuttiya stated that he had to buy an oversupply of chili which farmers had brought to repay their loans.

The money lenders who give money at monthly interest of 20 percent are mostly residents of purana (preexisting) villages who owned a number of acres of rice fields and buffaloes, before the Mahaweli Project encompassed this area. These people give not only money but also unmilled rice on credit and would also provide buffaloes for land preparation on credit. One young farmer in Kuratiyawa receives about 75 bushels of paddy rice for one season by giving buffaloes for land preparation on credit. Another young money lender stated that he had to stop lending money due to the difficulties of collecting money at the end of the season. The problem of collecting money is viewed as the justification for the high rate of interest.

Due to a scarcity of money lenders in Kalankuttiya Block, some farmers borrow money from money lenders outside System W, through their relatives. One farmer in Mawattegama borrowed money from one of the money lenders in Kagama where the interest rate is generally lower than that of the money lenders in Kalankuttiya. During yala 1985 this farmer repaid Rs 760 for Rs 500 which he had borrowed two and a half months earlier. Some Kalankuttiya money lenders have become cash poor by spending their money in buying tractors, rice mills and land. But even so, they are able to get new loans by borrowing cash from their relatives in other areas. One woman in Kalankuttiya lends money at 20 percent monthly interest by borrowing money, at 15 percent, from one of her relatives in Ambanpola.

The present trend among the money lenders is to advance money in exchange for land (mortgages), since Mahaweli farmers are land rich, relatively

speaking, and cash poor. In many cases, farmers unable to repay the loan will forfeit their land. One woman in Namalgamuwa had to turn over half her irrigated allotment (0.25 ac) to an outside money lender from whom she had taken Rs 6000, which she was unable to repay, With only half her allotment to cultivate, the prospects of earning enough profit to ever repay the loan are dim.

To obtain money for cultivation some farmers pawn their jewelry. One farmer had pawned his daughter's wrist-watch to a shop Owner in Kutiyawa to get money to hire labor for transplanting. Other farmers borrow money on interest from relatives and friends, who may also be moneylenders, in which case there are often arrangements to pay hidden interest. One farmer in turnout 2/D4 borrowed money from one of his friends with the understanding that he would sell him his harvested crop at the price pertaining at the time of harvest, The friend, a money lender and businessman, stores chili in order to sell when prices go up. Another farmer, who came originally from Mahawa, gave coconuts as interest for a loan he took, since he had access to coconuts in his village, Finally, another strategy farmers adopted was to go into temporary partnership with wealthier farmers or businessmen, who can finance cultivation in exchange for.a share of the harvest.

Crop *Decisions*

Cultivation of non-rice crops such as chili, onion, and pulses during yala has been promoted by the Mahaweli Authority for a number of years, Based on their experience of the past several yala seasons, farmers have generally found that they earn better profits from chili cultivation than from other crops. In yala 1986, the management decided to increase the area of subsidiary crops up to 70 percent and reduce the area of rice lands to 30 percent. Farmers were advised to cultivate other subsidiary crops such as onions, soybeans, cowpea, green gram, and vegetables rather than chili, partly to avoid risk of disease, since there was only one variety of chili.

Although the management's crop decisions for yala were announced and discussed at the cultivation meeting towards the end of maha, farmers were unable to make their individual crop decisions at that time due to a variety of unknowns, including finances, labor, water, and other inputs. Some of the factors which farmers need to consider in deciding what crops they will grow are outlined below.

Finances. To cultivate chili, farmers have to spend nearly Rs 10,000 for one ha), including land preparation, cultivation, and harvesting. "his amount is far greater than that required for rice, and finding the funds is a major problem for most farmers. Income from the maha harvest is generally committed in advance to repay bank and/or private loans. Another portion of the maha income must go to purchasing clothes, dry coconut leaves for their roofs, and books and other needs of school children. Finally, a portion of the income is needed for the approaching New Year. Credit is the most essential input for cultivation, and farmers must consider their credit before they decide on their crops. Most of the farmers could not expect to receive loans for their cultivation, as they had defaulted on bank loans.

Labor. A single farmer cannot cultivate an acre of chili without the help of others. If there are no other adult family members, the farmer has to take on laborers. Chili cultivation requires much labor for land preparation, planting, weeding, and multiple harvesting. The 1986 yala season was particularly labor short, since there was no bethma system; each farmer could cultivate his full extent. Settlers without irrigated land, working as laborers or encroachers asked for one or two liyaddas from their land-owning friends for chili cultivation, as there was more land than labor.

Water. The limitation of water during yala was another reason not to take early crop decisions. Based on their previous experience they had to think about the water availability for the duration of the season. Chili requires a longer growing period than most other crops, and the longer it can remain in the ground the more profitable it becomes. Thus, not only water availability, but the planned start of the following maha need to be determined before yala crop decisions can be made.

Seeds. Not having good seeds is also a problem for some farmers to make decisians on cultivating chili as some were unable to purchase hybrid seed varieties from the unit manager due to money shortages at the time the unit manager started issuing the seeds,

Other considerations. Some farmers were interested in cultivating subsidiary crops in the same land such as cowpea, green gram, onion, and vegetables for home consumption, in addition to chili, grown primarily for cash. Some farmers wanted to grow rice, in addition to their chili, as they believed buying rice was unbecoming of farmers. Land suitability is another reason farmers cannot make early crop decisions. When there is no bethma[8] farmers with fields having heavy soils cannot cultivate highland crops, They hoped to rent, out land or exchange land with farmers who have suitable land for non-rice crops. Some farmers could not make decisions on crops as they hoped to give part of the land to their children and brothers who have no land to cultivate chili.

Among sample farmers, most grew chili as their primary crop and rice and other non-rice crops as secondary crops. A majority (55% of the intensive sample and 65% of the extensive sample). cultivated more than one crop in their allotments (Table 14).

---

[8] Bethma lands are confined, as far as possible, to those areas having soils suitable for non-rice crops. Thus, during years when bethma is practiced, farmers have a greater likelihood of cultivating soils suitable €or non-rice crops, However, even during bethma years, temporary land trading takes place as farmers seek the right soils for their preferred crops.

Table 14. Number of crops grown in one allotment, yala 1986 (%).

Number of crops grown	Intensive n=29	Extensive n=100
1	45	35
2	21	33
3	14	11
4	14	11
5	7	10
	101[a]	100

[a] Does not add up to 100 because of rounding.

Through informal discussions with selected farmers from both intensive and extensive samples, it was learnt that most of the farmers had originally selected. chili as their main crop before starting the season. Due to a variety of reasons, including plant losses from heavy rain, scarcity of chili plants, excess waterlogging in some plots, finance problems, and illness, they were unable to plant chili early enough to be certain of a full season. Instead, they were compelled to cultivate other crops.with shorter growing seasons and/or lower input costs, such as cowpea, green gram, red onions, and vegetables. An additional factor for some farmers was that they needed to cultivate fast-growing crops to meet their daily expenses.

Finally, farmers generally prefer to grow crops with which they have some previous experience, Table 15 shows the cropping pattern of selected farmers who were interviewed on their cropping history. The table covers four years (1983 - 1986) with eight seasons.

Marketing

In providing marketing facilities to farmers in the Mahaweli areas to sell their farm products, the Mahaweli Authority has introduced government sponsored marketing programs such as the Co-operative Wholesale Establishment (CWE) and the Paddy Marketing Board. While the Board purchases unmilled rice, the CWE purchases only dry chili at a guaranteed price. Although the Mahaweli Authority has taken many steps to help farmers get maximum profit from their products, the government marketing services were not widely used by farmers; instead, they sold their products to private traders.

The main reason for farmers' preference for private traders was that they were willing to bear transport and processing costs, and did not adhere to strict quality control. Farmers who wished to market their produce in government sponsored centers had to hire vehicles to carry those products. It is a significant cost, especially for rice farmers as they cannot carry their unmilled rice on bicycles or on their heads as chili cultivators do.

Table 15. Cropping pattern of selected farmers during 1983-1986.

Name of farmer	1983		1984		1985		1986	
	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha
A	Rice Chili	Rice	Chili Rice B.Onion R.Onion	Rice	Chili Rice B.Onion R.Onion	Rice	Chili Rice B.Onion B.Onion Veg[a]	Rice
B	Chili	Rice	Chili Rice	Rice	Chili Rice B.Onion	Rice	Chili Rice Cowpea G.Gram R.Onion	Rice
C	Chili Rice	Rice	Chili Rice	Rice	Chili Rice	Rice	Chili Rice G.Gram Cowpea R.Onion	Rice
D	-	-	-	Rice	Chili	-	Chili G.Gram Soybean	Rice
E	Chili Rice Veg	Rice	Chili Rice Cowpea G.Gram Veg	Rice	Chili Rice Cowpea G.gram B.Onion Veg	Rice	Chili Rice G.gram Cowpea Veg	Rice
F	Rice	Rice	Rice	Rice	Rice Chili	Rice	Rice	Rice
G	Chili Rice	Rice	Chili Rice	Rice	Rice Chili Cowpea	Rice	Chili Rice G.Gram Cowpea Veg	Rice

[a]Vegetables.

And if the farmers' produce does not meet the standards of the percentage of empty seeds and moisture of unmilled rice, or the grading system of chili set by the government marketing program, farmers have to bring back their products incurring additional expense for transport. One woman from the

extensive sample belonging to turnout 3/D4 stated that she preferred to sell her unmilled rice to traders at the farm gate as she need not move the produce. She also noted that there is no big gap between prices offered by the government sponsored purchasers and the private traders. Another farmer stated that although the private traders pay low prices for their products and use weights weighing more than the standard ones, it is more convenient to sell their produce at the farm gate.

The inefficiency of the government sectors is another reason for the lack of farmer participation in government sponsored marketing programs. There was no CWE buying center for purchasing chili in the Kalankuttiya Block until 13 September. However, by the end of July private traders had begun to go from house to house to purchase chili.

Another reason farmers do not sell their products to the government sponsored purchasers at a high price, bypassing traders and boutique owners, is that they are bound to do business with the private traders from whom they have taken loans for cultivation. Some farmers have to pay these loans in cash or in-kind. Farmers who hired buffaloes an credit for land preparation often have to repay in-kind.

Although farmers know they can get more profit by storing and selling when prices are higher, there are some limitations even for fanners who can afford to keep their products without selling immediately after harvesting.[9] Some farmers have to sell their products as soon as they harvest as they need cash immediately to repay loans and to begin the next season. Farmers who obtained cultivation loans from banks have to repay the loans before the start of the next season. One farmer of turnout 4 stated that he needs to sell his harvest as soon as he oollects it as he has to repay the bank loans. Another farmer stated that he needs to sell his harvest to repay the tractor fees, and the traders who gives fertilizers and chemicals on credit..

Some farmers stated that they need to sell their harvest during maha as soon as harvesting is finished as they have to spend money to buy clothes and for celebrating the Sinhala New Year in April. Other farmers who keep their harvest, also have to sell it little by little to meet their daily expenses. Some women take chili or unmilled rice when they go to a shop or to the pola (a fair in a village oF town). One woman shop owner of the area stated that women bring a little chili or rice at the beginning of the harvest.

Some farmers who do not need money immediately also have to sell their harvest after finishing harvesting due to the lack of storage facilities. There is not enough room to store their harvest in their homes. Some fanners have built barns. Sometimes unmilled rice is stolen from the barns

---

9 Normally prices are low during the harvest seasons. The, price for unhusked rice increased during maha 1985/1986 from Rs 2.50 to Rs 3.25 per kilo between the 2nd and 3rd weeks of March, and chili prices during yala 1986 increased from Rs 22 to Rs 28 per kilogram.

at night; one farmer who keeps his unmilled rice harvest in a barn stated that he lost about 35 bushels from the barn at night when he was not at home.

CONCLUSIONS

As one of the oldest sections of Mahaweli System H, Kalankuttiya Block is now entering the stage of maturity in which its permanent features can be said to have taken shape. The intensive inputs of planning and management provided by the Mahaweli Authority, and at the field level, by the Block and Unit offices, have resulted in a fairly smoothly operating irrigation system, along with the diverse support services needed for that irrigation system to be a productive agricultural system. Thus far, however, the organizational structure which makes the system run is controlled by the Mahaweli Authority itself. The development of local-level organizations is still in its infancy.

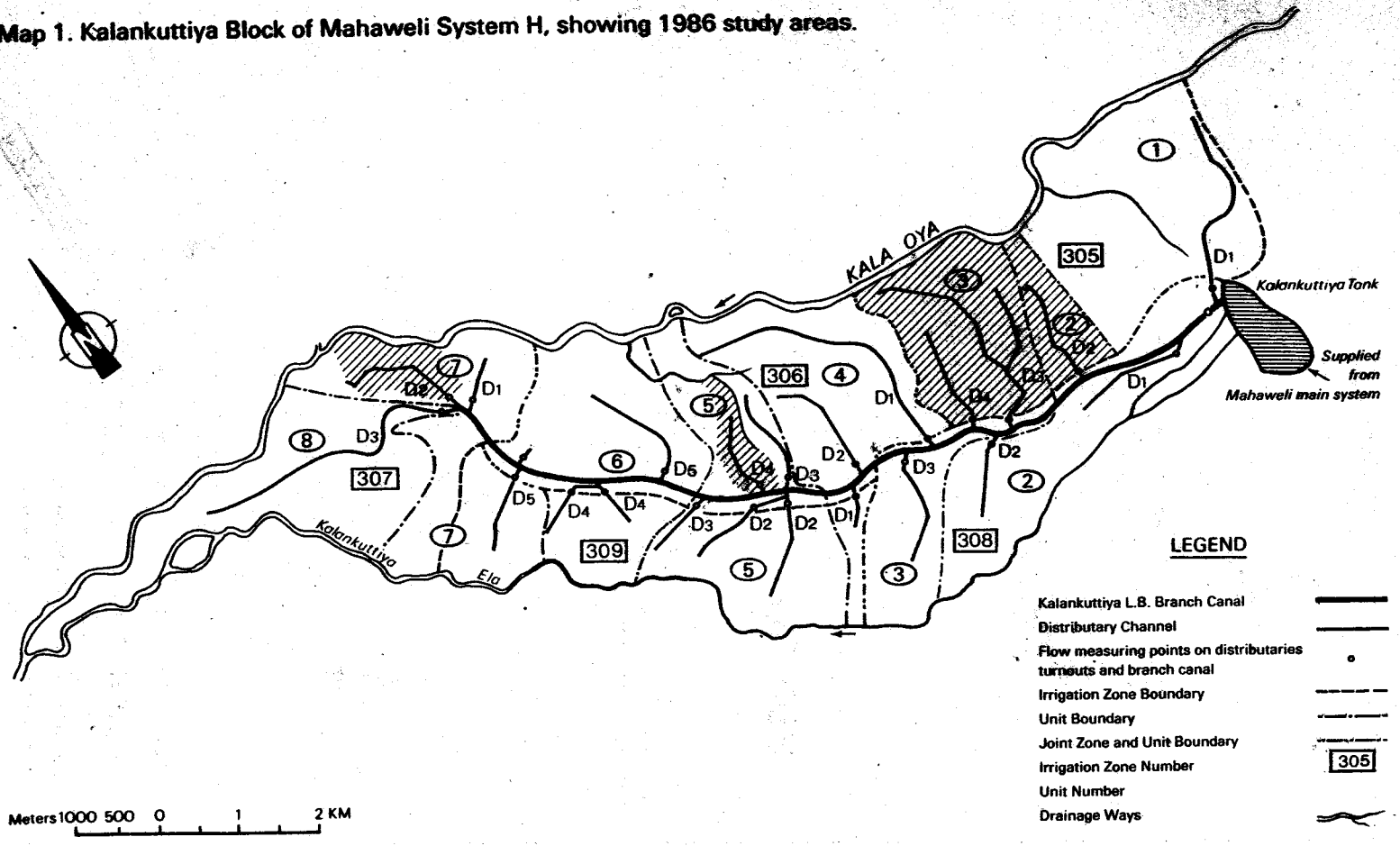
This report has outlined the organizational aspects of irrigation management with particular reference to farmers' organizations at the level of the field channel and distributary channel. While nominal leaders - the Turnout Leader and the DC-Rep - exist for these two levels of organization, there is no actual "group" which those leaders can lead, Rather, the farmer leaders function as individual links between farmers and the Mahaweli management. These positions of leadership, however weak, do have the potential for developing into true farmer organizations, but there is little scope for organizational development in the absence of significant water management functions.

During yala 1986, farmers' responsibilities in irrigation management were confined to water distribution and channel cleaning within the field channel. With rare exceptions, the management of the distributary channel was entirely the responsibility of the Mahaweli management, and particularly of the unit manager. The role of the DC-Rep varied in different locations, but was generally quite weak. This situation has since changed, as will be described in the report of yala 1987; indeed, there appears to be real potential for further development of the DC-Rep position.

One of the significant findings of this study is the high proportion of tenant cultivators, which is linked to credit and indebtedness. Roughly half the cultivators are nonowners and are not related to the owners. The incidence of tenant cultivators is generally higher during yala, but the implications for irrigation management do not charge. The farmers within a given field channel and, to a lesser extent, the distributary channel, will vary from year to year, as tenancy relations change. Developing farmer groups which can absorb changes in membership will require real effort, and place extra demands on farmer leaders. Another implication of the land tenure and credit connection has to do with crop choices. Farmers who have mortgaged their land, or tenants who have only a small plot, are generally unable to cultivate high input OFCs such as chili; their choice is often rice, which they need for subsistence. Non-rice crops have the potential for producing more income with less water, but only with adequate financing.

"his report has documented *some* aspects of irrigation management in one **block** of **System** H. The picture will be rounded **off and** clarified as companion reports are produced documenting actual water use and **cultivation** expenditures and income for the same sample **of** farmers. Reports of yala **1987**, now in preparation, will **show** changes in farmers' management responsibilities and point to a shift towards less intensive management control by the Mahaweli Authority. System H is still evolving, and its evolution will hold lessons for other Mahaweli systems, and for irrigation in other parts of the country,

Map 1. Kalankuttiya Block of Mahaweli System H, showing 1986 study areas.



Map 2. Map showing distributary 4 in block 305. The 17 shaded allotments are those included in the intensive sample in turnout 2.