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ORGANIZATIONAL ASPECTS OF IRRIGATION MANAGEMENT AT DEWAHUWA TANK DURING YALA 1986

by

Ratnasiri Ekanayake

and

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INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE

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BACKGROUND TO THE STUDY

Field research on water flows and agricultural production at Dewahuwa was initiated by IIMI staff in mid-1985 during the yala (dry) season. The primary focus was to understand the effects of irrigation management practices on crop diversification from *paddy* to other food crops (OFCs) such as chilli, lentil, soybean, and onion. In October 1985 the scope of the research was expanded to include a component focussing on organizational aspects of irrigation management. Research results of this component from the 1985/86 maha (wet) season were reported in **IIMI Working Paper No, 1.**[1] Results of the organizational component for the 1986 yala season *are* reported in this paper. The results of the overall study on irrigation management for crop diversification are currently in preparation by IIMI staff (S. M. Miranda, G. R. Panabokke, and others) and will be published in this same series of Working Papers.

Rationale and Objectives

The concept of an irrigation "system" refers not only to physical aspects -- irrigation channels, control structures, etc -- but also the management structure which plans, designs, constructs, and operates the physical system, The two aspects, the physical and the managerial, are interdependent in their functions, and need to be understood as a whole: The choice of technology, the layout of the canals, and cropping patterns all constrain the *way* the physical system can be managed, and the management skills of agency officials and farmers constrain the kinds of physical system which is feasible. This paper discusses institutional aspects of irrigation management in one irrigation scheme, Dewahuwa, which serves as a (relatively small) example of major tank schemes managed by the Department of Irrigation,

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 project management might address the constraints.

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The specific objectives of the social science component during the two seasons reported here were to:

- Document farmers' management practices in water distribution and maintenance;
- Document the role of farmer representatives 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 fanner representatives;
- Identify possible improvements to the existing institutional arrangements which could lead to more effective irrigation management.

History and Physical Layout

Dating to the 3rd Century AD, the ancient tank of Dewahuwa had been abandoned for centuries when it was reconstructed in the 1950s. Farmers from the reservoir area, from surrounding villages, and from more distant regions were allotted 2 ha parcels of irrigated land plus 1.2 ha "highland" plots near the c o m d area. By 1970, the new system had fallen into a state of disrepair and was rehabilitated under a Japanese aid project. Today the designed command area has been expanded nearly 20% by unauthorized encroachments; the original families allotted land have subdivided several times. While most household economies remain primarily agricultural, many of the second and third generations rely on rainfed agriculture outside the scheme, supplemented by off-farm employment. Land tenure is fluid, with more than half the operators farming land which they do not own, Some non-owners are family members who may someday inherit the land they now lease; others who are classified as owners have taken mortgages and are actually tenants on their own land. Hidden tenancies are common, since land transfers through either lease or sale are prohibited by law.

The physical layout of the scheme comprises a large tank with a single main canal from which distributary channels take off on one side, to serve the command area. The highland residential area extends along the right side of the canal.. Each take-off point from the main channel to a distributary, or from a distributary to a field channel (F-Channel), is controlled by a turnout gate which is the responsibility of the Irrigation Department to open or close. Distribution of water below the turnout, which may serve between 1 and 15 allotments (or up to 50 operators), is the responsibility of the farmers themselves. The system is divided into 9 Tracts based on hydrology, which correspond roughly to the major distributaries (see Map 1).

Methodology

During both the maha 1985/86 and yala 1986 research seasons, social research focussed on Tract 5, which was selected because of its manageable size for studying social dynamics, while *being* fairly representative of the scheme as a whole. During the maha season, a census was conducted of the residential units in Tract 5, and then a sample of farmers was drawn from the

Tract 5 command area and interviewed about their irrigation practices. In yala 1986, a subset of that sample was interviewed concerning irrigation practices, and an additional sample of farmers in Tracts 3-6 was also taken,

The data gathering techniques employed included both formal questionnaires, informal interviews with farmers and officers, and observations of meetings and farming practices. Participant observation was used, with the Research Assistant residing in the home of a farm family, and interacting informally with the village residents on a day-to-day basis. In addition to recording data on questionnaires, daily notes were kept, from which biweekly reports were written. The Research Associate also conducted informal interviews, which have been incorporated into the report of the maha 1985/86 season (see Footnote 1). Data gathered by the Staff Scientist consisted of infrequent interviews, and discussions with the Research Assistant.

During the 1986 yala season, one of the F-channels from the previous season (FC-6) was retained and another F-channel (FC-2) was added, to comprise an "intensive" sample which included all operators (n=60) in 14 allotments. In addition, an "extensive" sample of 97 operators was taken from 50 allotments scattered over Tracts 3, 4, 5, and 6. 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] The allotments were selected on a semi-random basis, with preference given to allotments included in the maha 1985/86 sample, for the sake of data continuity. Because a 50% bethma () land division was practiced during the yala 1986 season, a simple continuation of the previous season's sample was not practical. Within the sample allotments, two (and in some cases, three) operators were selected, with at least one from the bethma portion and one from the owners' portion. A single questionnaire form was administered to all operators in both the intensive and extensive samples. Interview and observational data collected followed the same topics as during the previous season, with the addition of more detailed questions about credit, O&M fees, and bethma practices.

ORGANIZATIONAL STRUCTURE OF DEWAHUWA SCHEME

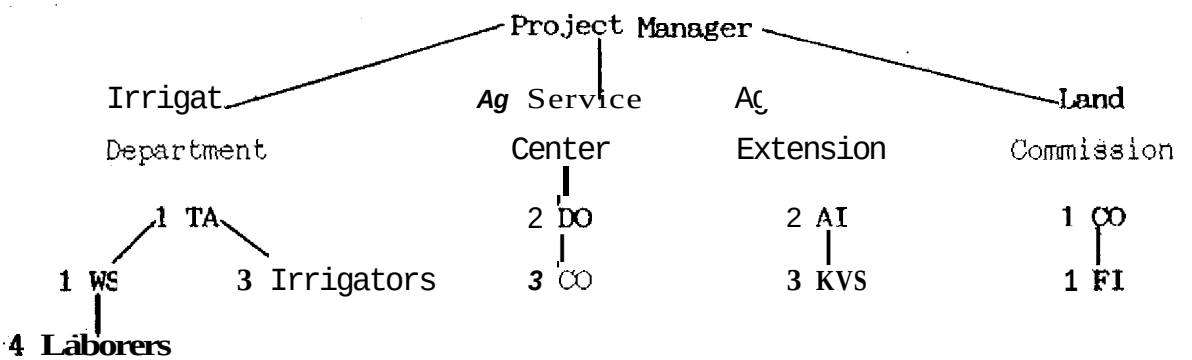
Dewahuwa scheme comes under the administrative districts of Matale and Anuradhapura. Consequently, many government officers have responsibilities both within the scheme as well as outside it.. The departments of Irrigation, Agriculture (Extension), Agrarian Services, and the Land Commission are the main government agencies involved in managing the scheme. Linkages between the irrigation and agriculture sectors are effected through the INMAS[3] system; a Project Manager is expected to coordinate the work of the officers of the above-mentioned agencies, but without supervisory power over them.

Although the size of Dewahuwa's command area is less than the area of a normal Agrarian Services division, the scheme falls under two Agrarian Services centers, each responsible for different parts of the scheme. The result is that the scheme has two divisional officers, along with their subordinates. For example, there are three cultivation officers responsible for the command area, all of whose jurisdictions extend beyond the scheme

boundaries. Until recently, there were two colonization officers responsible for different parts of the scheme (but working from the same office). At present there is only one colonization officer, but he also has jurisdiction over areas outside the scheme.

The organization of the Irrigation Department entails still mother set of administrative boundaries. The irrigation activities of the whole scheme are under the supervision of one Technical Assistant (TA). However, he also is responsible for several minor irrigation tanks outside Dewahuwa scheme. Figure 1 shows the relationships between the project manager and key officers having responsibility over aspects of Dewahuwa scheme.

Figure 1. Organizational links between the Project Manager and officers from other agencies working in Dewahuwa.



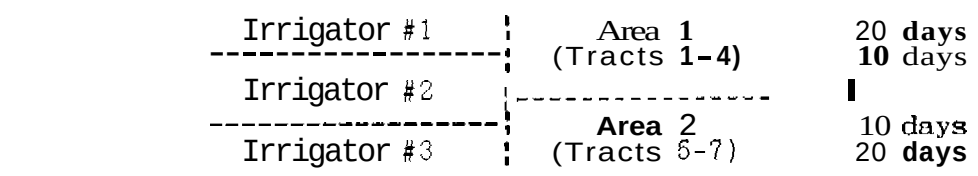
Structure and Function of Major Agencies

Irrigation Department, The TA plays the key role in operation and maintenance (O&M) activities of the scheme, Under him are one work supervisor, three field irrigators and four permanent irrigation laborers. In addition, casual laborers are hired as needed. The major task of the work supervisor is in maintenance work rather than water delivery.

The three irrigators are responsible for water distribution in certain channel areas. When there is no water issue they are expected to clean the main canal within their areas. Unlike other permanent irrigation employees, the irrigators are from the Dewahuwa area, Two of them are sons of original land holders and the other is a land holder of the "lift irrigation area. After the maha season, when the entire command area was cultivated, the working areas of these irrigators were changed in response to the 50% bethma land division of the 1986 yala season. The command area was divided into two sections, and to provide work for all three irrigators equally, 20 working days per month were given to each. As a result, one of the irrigators had to work in two different areas within his 20 working days (Figure 2).

Irrigators receive instructions directly from the TA, who inspects the field periodically. Irrigators are supposed to meet at the TA's office weekly and to co-operate with the farmer representatives (FRs) during the water

Figure 2. Work distribution for three irrigators.



issues. [The interaction between FRs the irrigators is discussed in a later section of this report.] The four permanent irrigation laborers are not originally from the scheme, and live in Irrigation Department quarters. Unlike the irrigators, who are hired on a casual basis for daily wages, the permanent laborers are paid a monthly salary and do not work on government holidays. They are assigned certain channels to maintain and their work is supervised by the work supervisor, They are not involved in water distribution activities and they have little contact with the irrigators.

Agricultural Extension, There are two agriculture instructors (AIs) working in the scheme. The AI responsible for Tracts 1-3 (plus some areas outside the scheme) is attached to the Galewela division, Matale district. The second AI operates from the newly opened Agriculture Center in Tract 3, but has responsibility for Tracts 4-9, There are also three extension workers (KVSs) working in the scheme. They are responsible for conducting training programs, and meeting farmers according to the "contact, farmer" system (a variant of the Training and Visit system), arranging for demonstration plots of new agricultural technologies, and providing seasonal cropping plans.

Department of Agrarian Services. Two Agrarian Services Centers, at Galewela and Andiyagala, cover parts of Dewahuwa scheme, and the area of each Center extends to other areas also. Three cultivation officers (COs) work in the scheme areas, and again, the area of each extends beyond the boundaries of Dewahuwa (e.g., small tanks and rainfed cultivation areas). The major activities of the COs within the scheme is to oversee the cleaning of F-channels and distributaries, enforce regulations against stray cattle, and help farmers obtain necessary agricultural inputs.

Land Commissioner's Department. At present there is a colonization officer (CLO) and a field instructor (his subordinate) working in the scheme. Their responsibilities include settling land disputes and taking legal action against those who misuse government land or damage the irrigation structures, Recently, the collection of O&M fees has also been handled by the CLO. The field instructor works at the field level attending to land disputes and helping collect the O&M fees, When farmers face a problem in dividing bethma land portions, the CLO plays a significant role.

The Irrigation Management Division (IMD): The Project Manager (PM) is responsible for coordinating the work of the other agencies for purposes of improved irrigation management. A major function of the PM is to facilitate the development of farmer organizations which can take over some additional irrigation management functions. The PM has been at his post since 1984, and prior to that served as a colonization officer. The PM organizes farmer

meetings for the three Tract Committees (described in a later section) and also arranges farmer training programs.

Interaction of officers and farmers. Interaction between farmers and officers is mostly confined to the fortnightly tract committee meetings, and the mnthly project-level committee meetings. Interaction among officers (e.g., AI, colonization officer, TA, and project manager) takes place frequently through informal meetings at the project office (located just below the main sluice; see Map 1). Water issues and other irrigation plans are arranged through informal discussion between the project manager and the TA.

Field level officers are noticeably less visible than their superiors, both in the field and at meetings. Among Irrigation Department field officers, Irrigators and the Work Supervisor rarely attend Tract Committee meetings, but the former can normally be found in the field, Of the Agricultural field officers, Cultivation Officers are seldom seen either in meetings or in the field; the KVSs, however, regularly contact with farmers, In the eyes of farmers, the Irrigator is the most accessible of the field level officers, with the KVSs in second place, and Cultivation Officers a distant third. Of the project level officers, the TA is the best known, particularly among the original allottees with whom he has worked for 15 years, The Project Manager, who occupies a new post, is becoming well known, The Colonization Officer (position previously held by the Project Manager) has close contact with farmers because of his involvement with land matters.

Of 40 farmers in Tract 5 who responded to the question, only 26% could recall meeting the TA (Table 1) at least once during the past two seasons, while 76% had met the Irrigator (Table 2). The comparative figures from the extensive sample are significantly higher (50% for the TA and 83% for the Irrigator), reflecting the influence of tenurial status on the level of interaction with these officers. As is pointed out in Table 16, the composition of the Extensive sample includes a higher proportion of owner cultivators, and these tend to interact more closely with Irrigation officers.

Table 1. Occasions when farmers have met the TA.

REASON GIVEN	Intensive N=60	(%)	Extensive N=97	(%)
He come to inspect the field	8	16	14	17
Regarding a water problem	1	2	9	11
Regarding a need of maintenance	-	0	6	7
During a meeting	1	2	6	7
Friendly matters	1	2	4	5
Regarding an official matter	2	4	1	1
Regarding a personal	-	-	1	1
Have met the TA	13	26	41	50
Have not met the TA	37	74	41	50
(No information)	(10)	-	(15)	-

Table 2. Occasions when farmers have met the Irrigator.

REASON FOR MEETING	Intensive n=60	(%)	Extensive n=97	(%)
Friendly	9	2	32	33
During the water issue	24	4	20	21
Regarding a water problem	5	8	7	7
Regarding maintenance	-		1	1
Have met the Irrigator	38	76	60	83
Have not met Irrigator	12	24	12	17
Missing information	10	-	25	-

Structure and Function of Farmer Organizations

The command area of Dewahuwa Tank consists of 465 paddy allotments, each of 5 acres, which *were* allotted to individual families in the original land settlement of the 1950s.[5] These allotments have been divided into 9 Tracts which in turn have been divided into a total of 28 "turnout groups." The definition of turnout groups is based only partly on hydrological boundaries, since allotments take water not only through outlets along the F-channels, but also, in some cases, directly from a distributary or the main canal. For example, in Tract 5 there are 65 allotments which receive water from 25 turnout gates. Five of the turnouts take off directly from the main canal; the other twenty are served by the distributary, *and* of these, fourteen provide water to single allotments *(see* Map 2). The number of allotments served by each turnout varies from one (n=15) to twelve (n=1) with a mean of 2.6. For each turnout group there is a farmer representative *(F'R).* In Tract 5 there are 4 FRs each of whom is responsible fur between five to eight turnouts, the majority of which serve only a one or two allotments *(see* Table 3).

Table 3. Number of turnouts covered by each farmer rep by number of allotments served, Dewahuwa, tract 5.

	FR-1	FR-2	FR-3	FR-4	TOTAL
1 Allotment	5	7	2	1	15
2-5 Allotments	2	-	2	3	7
6-12 "	-	1	1	1	3
TOTAL	7	8	5	5	25

Farmer Reps are selected in a meeting of farmers from the respective turnout area; some were also nominated by the Project Manager when positions were vacant. Appointments are made according to standard IMD policies[6] and are given the same legal authority as Vel Vidane under the 1979 Agrarian

Service Act; thus they are entitled to collect "salaries" in kind [see below for a discussion of payments],

Many FRs are original allottees and previously served in some official capacity such as vel vidane, members of the "Govi Karaka Sabha", and members of the productivity committees. In tract 5, for example, one FR is the former Secretary of the Productivity Committee (1970-77) and another FR was an irrigation agent under the Productivity Committee. A third FR has been a vel vidane since the inception of the Scheme in the 1950s. Although farmers often prefer to select relatively *young* FRs, many of these young farmers do not have a legal right to the land; however, the Project Manager can nominate them when positions fall vacant. For example, in Tract 8 two such *young* farmers were appointed by the PM, and in Tract 5, of three new FRs who were appointed, one was a *young* second generation farmer.

Tract Committees and the Project Committee. The 28 turnout group which form the 9 Tracts of Dewahuwa Scheme, are grouped into three "tract committees" composed of the concerned FRs and the field level officers, The three committees are: (1) Tracts 1-4, (2) Tracts 5-7, and (3) Tracts *8-9*. From these three committees, a Project Cornittee is farmed, *composed* of 12 FRs plus project-level officers (the TA, DO, AI, and COL) under the coordination of the Project Manager. In practice, the two head-end Tract Committees (Tracts 1-4 and Tracts 5-7) meet together, while the tail-end tract committee [Tracts 8-9) meets separately. The Tract 8-9 Committee has more of an active farmer organization created more by an energetic monk, than a result of the INMAS program. *[This* issue is discussed in a later section.]

The Tract Committees meet every fortnight and the Project Cornittee every month, to allow the FRs to meet farmers before and after the Tract meetings and feed back their comments to the Project Committee. But generally the FRs do not consider that feed back from farmers is needed. Farmers can attend Tract Cornittee meetings if they wish, but their participation is rare. During one Tract Committee Meeting in yala 1986, a farmer from tract 5 requested a change in the date of the next water issue. After discussing the issue with project officers, the change he requested was accepted. Apart from this particular incident the participation of general farmers at Tract Committee meetings is generally confined to periods of critical decisions such as deciding the start of the next season's water issues, or after the announcement of a new program such as a credit scheme.

Both Tract Committees meet on Fridays, the market day at Makulugaswawa, so the members of the Committees (the FRs) can attend en route to or from this weekly market. As a consequence the FRs are sometimes accompanied by friends they have encountered in the market. A similar dynamic is observed at the Project Committee meetings, where farmers may attend as observers; they *may* have a particular interest in the proceedings, or the meeting m y simply be an adjunct to their day at the market. *This* situation appears to generate interest among general farmers in becoming a FR and serves to broaden the base of the farmer organization.

At the Project Committee meeting, the Project Manager gives a briefing of the previous meetings, and then makes announcements or opens discussion of

any problems presented by the FRs. The priority matters to he discussed depend on the the cultivation cycle and the requirements of the farmers. At the beginning of the season credit is important; during harvest, marketing is important, However, during most of the yala 1986 meetings, irrigation problems were the major issue.

Relationship between farmer reps and farmers. The relationship between the FRs and farmers depends very much on the individuals concerned. Generally the FRs keep contact with the allotment owners whether or not they are the actual operators. However, in drawing up the cultivation plan, there is an attempt to meet all cultivators, irrespective of their tenurial status, The authority of the FR in dealing with non-owners stems from his personal relationship with them, and in a sense of mutual interest. In tract 5 an FR asked certain leasee farmers to clean their channel sections and the work was done; later he attempted to help them with a water problem.

Farmers do not meet as a group with their FR; rather, the FR attends to the problem of individual farmers upon an individual request, e.g., to intercede with the TA to ask for more water. In some cases the FR can take direct action by closing head-end outlets along the F-channel to allow water to flow to the tail, or by adjusting the Turnout gate. For problems of water scarcity in the distributary or main canal he would need to seek help from the Irrigator or (usually) the TA. However, for most water problems at the level of the F-channel, farmers do not *go* to their FR, but make their own arrangements. [These practices are described in the section on Water Distribution.]

Selection of farmer reps. The selection of FRs is supposed to be carried out every three years through majority election by the legal fanners of the turnout groups. A representative from the Department of Agrarian Services (DAS) must be present at the election meeting, since the FRs are entitled to "salaries" only if duly registered according to the Agrarian Services Act. The Project Manager plays the major role at these meetings and explains the functions of the FR. Usually the Project Manager has an idea concerning who should be selected, based on his own knowledge of the farmers, arid in most, but not all cases this would be the person elected.

Selection of FRs for three turnout groups in tract 5 was conducted in a joint meeting without the participation of the Project Manager; the Cultivation Officer was the DAS representative, Of 49 legal land owners about half of them were present. Each turnout group elected its own FR. In one group, only 5 of 14 legal farmers were present; they elected a young second generation farmer who had no legal land rights. In the second group 8 of 14 farmers were present; they elected an original allottee who had never before held an office, but who had been vocal in complaining about the responsiveness of the officers. His land is located along the only F-chnnnel in this turnout group. The third group elected an FR who purchased an allotment from an original allottee 17 years ago. This land is served by a direct issue from the distributary. For the last turnout group in tract 5, which consists of 16 allotments, the former farmer rep was reappointed. This meeting took place separately with 14 farmers present.

Payment for the farmer rep. Payments to the FRs for their work is made in kind. In accordance with the Agrarian Services Act, farmers generally pay 1/4 bushel per acre per season. In Dewahuwa, since the cultivation in two seasons is uncertain, an arrangement was made to pay 1/2 bushel per acre each maha season. During the 1986 yala kanna meeting, the project officials suggested an extra cash payment for yala, but it was not accepted by the farmers. Payment is the responsibility of the land owner; in the case of leasees, an arrangement is generally made with the owner who makes the payment. When land is mortgaged, it becomes much more difficult for the FR to obtain payment from the owner, although in many cases the FR is successful in persuading the operator to pay at least a portion of the salary.

On the average, FRs receive about 75% of their entitled payments. The FR of the tail-end turnout group in Tract 5 received 28 bushels of paddy and Rs. 125 in cash (one farmer paid in cash) from 16 allotments (80 acres). Three farmers did not pay at all and 3 other farmers paid only part of the amount. One FR having two turnout areas (In the middle and tail-end portion of Tract 5 only one FR was handling two positions as a temporary measure) reported that he received a total of 60 bushels of paddy from 36 allotments (180 acres); only 7 farmers did not pay at least something. The FR of the head-end turnout group received salaries from 13 farmers; only one farmer, a mortgagee, did not pay at least something.

Farmers' relationship with the farmer rep. Only 12% of the farmers in the Intensive sample reported that they had received help from their FR. The percentage in the Extensive sample is much higher (26%) reflecting the differences in tenurial status of the samples, and the effect of tenure on the farmer-FR relationship. Nearly all farmers were able to identify their FR by name (Intensive sample, 97% and Extensive sample, 99%). Knowledge of how the FR was selected was less widespread; 62% of the Intensive sample and only 51% of the Extensive sample were aware of the selection process for their FR. However, farmers were clearly of the opinion that the FR play a useful role: 88% of the Intensive sample and 72% of the Extensive sample felt that the position of the FR is needed.

Whether or not farmers seek help from their FR, or go to other source as assistance (either to farmers or field officers), depends as much on the status of the farmer as on the nature of the problem. Leasees often feel that they do not have the right to approach officers directly, but instead inform their land owners or the FR. Other farmers go directly to the Irrigator or the TA, bypassing the FR. Of the 55 respondents in the Intensive sample, 45% said they seek help directly from officers (usually the Irrigator) for water problems, while 55% said they first go to the FR. In the Extensive sample, only 33% appeal directly to an officer; 66% first try the FR.

Informal Interaction Among Farmers within the Turnout

Except for meetings to select the FR (every 3 years), there are no regular meetings of farmers at the turnout level. The relationships that develop among farmers follow the logic of informal social ties and mutual economic advantage, rather than that of a formal organizational structure. According to topography, some allotments within a single Turnout Group may receive

water from different channel sources, For example in tract 5, the head end turnout group consists of 14 allotments, of which 5 take water directly from the distributary, while the others take water from two F-channels. In taking water the direct issue holders and those from the F-channels do not necessarily have to cooperate.

Among farmers taking water from the same F-channel, cooperation becomes more of an issue. No formal rotation system is practiced within the F-channel; all farmers usually try to take water simultaneously. When water flows are low, tail-enders can get water only by closing the outlets along the head-end of the F-channel. Normally this is done without the knowledge of the head-end farmers, either at night or when the head-enders are not present. However, on some occasions head-end farmers voluntarily closed their outlets after they had taken what they considered an adequate amount, to allow water to flow to the tail.

A group of tail-end farmers in F-Channel 6 (which itself is the tail-end F-channel on the Tract 5 distributary) carried out both channel cleaning and water distribution activities on a cooperative basis during yala 1986, *This* group of farmers from 5 different allotments stands as the lone example of an informal organization observed during the study. This particular group consisted of leasees, mortgagees and family tenure cultivators. One leasee farmer initiated the activities which centered around getting water to the tail-end of the F-channel both through cleaning the channel very thoroughly, and by closing head-end outlet along the F-channel, as well as head end turnout *gates* and direct outlets along the distributary during the night, This group was first observed during maha 1985/86, and although the members of the group changed when bethma farmers were assigned to these allotments for the yala season, the group continued to work together effectively.

The meeting center for the group was a temporary hut where one of the leasees lived during the cultivation season. His continual presence was especially useful in arranging night irrigation. Another factor underlying the success of this group was the cooperation of the Irrigator, who was on friendly terms with the group and sometimes helped them by closing head-end pipe outlets (along the F-channel), direct issues (along the distributary), and adjusting head-end turnout gates. During maha 1985/86 a few members of this group cooperated in other cultivation activities in addition to water. *One* of the group owned a tractor which he provided to the others on credit, and also provided no-interest financing for other inputs.

Other Organizations in Dewahuwa

In addition to the ubiquitous death donation societies there are also various small rural development societies. One quite active rural development society is located just outside the scheme in Watakoluwawa but has many members from within Dewahuwa. There are also some village level organizations connected with Sarvodaya.

The Dewahuwa Development Society functions under the supervision of the project manager. This society was established when JICA donated a number of two wheel tractors during the 1983 yala season, but it did not become active

until maha 1985. There are 70 members who have paid the Rs 150 membership fee. Members are entitled to hire the tractors for Rs 400/acre which is 20% lower than the market price. Most of the members are from the head end tracts where JICA introduced land consolidation to facilitate mechanization. Farmers serve as officers in the society, though most of the financing activities are supervised by the Project Wager, Meetings are held monthly.

The Budugehinna farmer Organization established in 1983 under the leadership of the Nayaka Thero of Budugehinna temple, is the most active farmer organization in Dewahuwa. Its membership is about 70-80 farmers, most of whom are from Tracts 7-9 at the tail end area of the scheme. The Nayaka Thero is the president of the organization. Other posts are held by the farmer members. The organization *is* linked with the Agrarian Services Department under the Small-Farmer Organization project.

According to the pioneer members of the society, it was established as a response to the difficulty of acquiring water in the tail end of the canal system. A number of farmers gathered at the temple to discuss the matter with the Thero, Later, along with the farmers, he met the AGA who arranged a meeting with the TA and Project Manager. *The* TA agreed to provide water to the tail-end on a rotational basis so the flow would be enhanced. Following this initial success, the fanners met regularly with the Thero at the temple on Poya days. The Thero suggested that they register their group as a Small-Farmer Organization in order to obtain low-interest credit on agricultural inputs The organization was registered in early 1984 and the members were able to get fertilizer on credit in maha 1984, At this stage the membership increased and in 1985 and 1986 they received more inputs on credit after repaying the earlier loans, For yala 1986 the organization was able to obtain credit from the regional branch of the Central Bank.

The founding of this organization was an expression of dissatisfaction with existing management arrangements in the scheme; relations with the IMD structure were initially somewhat antagonistic. On the occasion of the cultivation ceremony (Aluth Sahal Mangallaya), the Project Manager wanted to celebrate it an a project level, but the members of this organization wanted to do it separately. During yala 1986 the Thero requested that the new organization be empowered to take maintenance contracts for their own area, but this was rejected by the District Minister. Gradually a more cooperative relationship has emerged between the project management and this organization. At the beginning of maha 1986/87, the members of this organization organized co-operative channel cleaning, which was appreciated by the project management. By the end of that season the Budugenhinna Farmer Organization joined with the Tract Committee for Tract 8-9 to form a single organization.

IRRIGATION PRACTICES

Water distribution from the tank sluice, along the main canal, through distributary gates and down to the F-channel turnout gates, are the responsibility of the Irrigation Department. Within the F-channel farmers are left to make their own arrangements for water distribution, although they can seek help from the FR.

A plan for cultivation and water issues is established at the pre-season kanna meeting, normally held one or two months before the first water issue. In this section, the planning process is outlined with particular reference to the organizational aspects of reconciling the individual demands with the interests of the whole scheme. Following this is a discussion of water distribution practices, cleaning and maintenance, and payment of O&M fees.

The Planning Process

In February 1986 the cultivation plans for the yala season were presented to the farmers in a "pre-kanna" meeting, and then ratified (with some modifications) at the regular kanna meeting. As is the normal practice in Dewahuwa for the yala season, a project-level bethma land division was instituted, by which only that proportion of land that can be securely irrigated for the entire season is included in the bethma area.

Bethma land division. Based on tank volume and expectations of rain, it was decided to cultivate *50%* of the total command area: all of Tracts 1-2 and 4-6, roughly hnlf of Tract 3, part of Tract 7, and nothing in Tracts 8-9. The exact proportion of land to be included was proposed by the TA and Project Manager, and then ratified by those farmers attending the pre-kanna meeting (and later re-ratified in the official kanna meeting), The areas to be served was the topic for a great deal more give and take, to accommodate the exigencies of water conveyance and regulation, and farmers' preferences.

The major issue for yala 1986 was whether to irrigate Tract 7 (towards the tail end) or Tract 3 (towards the head). The TA wished to avoid Tract 7, as water could be lost through the long conveyance along the main canal. Farmers whose residences were near the tail, however, preferred to cultivate near their homes. The compromise reached was to irrigate only 12 allotments in Tract 7 (20% of the total area) and about *50%* of Tract 3. A list of allotments to be irrigated, and allocation of bethma farmers, was drawn up by the project management. Bethma farmers were asked to visit their allocated lands on a certain day, and FRs were asked to be present to assist in dividing individual allotments into an "owner" portion (although the actual cultivator(s) are often not owners) and a "bethma" portion, The actual division of allotments took place on various days, according to the availability of all parties: owners, bethma partners, FRs, and project officers. In cases where the bethma partners leased out their land portions, the leasees usually took the responsibility of being present for the actual land division. Table 4 lists those present during the bethma division, Many of those cultivators who were not present for the bethma divisions were leasees who arranged the lease with the bethma owner after the division was made. The bethma Owner who did not intend to cultivate himself, did not concern 'himselfwith being present for the division.

During the Project Level committee meeting where bethma arrangements were discussed, the officers asked owner farmers to divide the bethma and owner portions perpendicular to the F-channel, in order to share equitably in the different soils found on the plot (e.g., well-drained soils near the channel, and more poorly-drained soils further down the allotment). This suggestion was generally followed, However, in certain parts of Tracts 2-4,

Table 4. Percentage breakdown of who was present for bethma division in Dewahuwa, yala 1986.

	Intensive (n=60)	Extensive (n=97)
Owner only	23	27
Owner & bethma partner	27	36
Owner & bethma leasee	2	13
Bethma owner & owner leasee	3	4
Bethma leasee & owner leasee	12	3
Owner leasee only	5	2
Farmer Rep was present	-	2
Colonization Officer was present	-	3
Allotment was not divided	8	2
Missing information	20	8

where JICA land consolidation had taken place, farmers found it easier to make parallel divisions in pairs, so that the bethma partner was given two different portions: one at the upper end of the allotment and one at the lower end. In *many cases* the "owner" farmer (who may be a leasee) purchased the right to cultivate the bethma portion as well,' In the intensive sample, only 32% of the farmers were bethma partners.

Cropping decisions. Some farmers made a decision about which yala season crops they would grow even before the maha season was over; these "early-deciders" included *many* of the owner cultivators and some leases who had made yala land arrangements with the owners. Bethma farmers could not make a firm decision since they did not know the type of land they would be given. The physical constraints influencing crop choice include both soil type and availability of water. However, even here farmers have some recourse; One bethma farmer allocated a tail-end plot in Tract 5 leased it out and rented a plot in another area of the same tract where he could cultivate chilli.

Owners have the advantage of knowing what type of land they have to work with, and to some extent the availability of water, but a final decision on the crop type also *hinges* on other factors such as input costs, availability of labor, financing, and marketing expectations. Before the yala arrangements were finalized at the kanna meeting in February, *many* farmers speculated on *the* area that would come under bethma and made arrangements before the yala season, by paying deposits to the land owners. As an example, a leasee in Tract 5 made a commitment during the maha season to cultivate that same plot during the yala. He had cultivated a short-term paddy variety during maha, hoping to cultivate chilli early in yala in order to keep the chilli crop for a longer period for greater income. Another Tract 5 leasee made an arrangement with an owner to begin cultivation before the first yala issue and was able to cultivate green gram twice during the season.

During the maha season the agricultural officers asked farmers about the kinds and quantity *of* seed they required, but they did not devise estimates by turnout. At the kanna meeting Project Officials encouraged farmers to plant soybean rather then chil i, in order to limit the duration of the yala

season. Based on the experience of the previous yala, farmers expected a high market price for chilli of as much as Rs 40/kg a few months after harvest. For soybean they thought that the market price would be low since it had been cultivated in nearby chena areas during maha. However, the Oils and Fats Coorporation agreed to purchase soybean at Rs 7/kg which resulted in many farmers choosing soybean as their primary yala crop. Another reason for growing at least some soybean was to produce seeds for use in next maha's chena cultivation. With the exception of soybean, most farmers did not have a clear idea as to where they would sell their crop. Some made informal arrangements with mudalalis to obtain inputs on credit in return for selling their crop at harvest,

Water issue plans. The plan presented at the kanna meeting was to issue water from 1-15 May for land preparation, with rotational issues beginning from 25 Play. Water issues would be for 2 days' duration every 10 days. Because of rains, the time of land preparation was advanced and land preparation issues began nearly a month earlier, on 4 April. Water issues were interrupted on 3rd May as a result of damage to the control gates constructed at tract 7 (the boundary of the bethma area), and then continued to 15 May.

Within certain distributaries, including Tract 5, a rotation was planned to divide the head-end portion from the tail-end and deliver water at separate times. According to the plan for Tract 5, the head-end turnouts were to be closed during the first day of water issue to allow water to flow to the tail, and would then reopen on the second day, There was no plan for the third day which was considered an "off" day, since the sluice was closed. However, because of the time lag in water conveyance, and variations in the exact time the sluice was closed, water normally flowed in the distributary on the third day, Within the turnouts, no rotations were planned; farmers were expected to take water continuously, or to work out ad hoc arrangements for sharing the flow.

Water Distribution

During the period of land preparation there were no rotations within the distributaries. In Tract 5 water wastage was observed as channels over-flowed their banks in several places. Control of the turnout gates was effectively (though not legally) in the hands of the farmers. During much of the time there was excess water in the head end and scarcity of water in the tail end. However on certain days during land preparation issues when the head-enders had too much water, they would close their om intakes and let the water flow to the tail, giving those fanners more water than they could use, and rendering it impossible to prepare the land for OFCs. As *a* result, some tail end farmers intervened at the head end by reopening the head end gates -- the opposite of their normal practice. On mother occasion when not enough water was flowing to the tail (also during the land preparation issue) a farmer adjusted the distributary gate (the offtake from the main canal) to bring more water to the tail..

In the Intensive sample 44% of the farmers said that whenever there was water in the F-channel they could get water to their allotments. Nearly one-third (29%) of the farmers in the Intensive sample said that they had to

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Tail end farmers relied more on the second (and sometimes third) day of the water issue than on the first day, which was their official "due day." To get water into the tail-end of their tail-end F-channel (FC 6), the farmers would close the head-end pipe outlets within the F-channel, and the upstream turnout gates along the distributary. In addition to taking direct action, the farmers sought the help of the Irrigator, who sometimes closed head-end turnouts at their request, even on the "due day" of the head-end.

Water distribution in other tracts. Water rotations in Tract 3 were the responsibility of the Irrigator. According to the TA's instruction, the irrigator should close the turnout gate of FC1 during the first day of the rotation, and let water flow to the tail-end (FC5) first. In practice, however, this pattern was not followed. During certain water issues, FC1 was closed on the first day; during other *issues* it was closed on the second day, and during some water issues it was not closed at all. One complicating factor in Tract 3 was that half the tract was outside the officially recognized command area for the yala season. However, some farmers owning land in this "non-bethma" area attempted (successfully) to cultivate using drainage water; they would increase their water supply by closing the head-end FCs to let water flow into their areas.

In Tract 6, rotations among F-channels were practiced on certain occasions. When there was a water shortage in the tail-end, the Irrigator would close the direct issue gates along the head-end of the distributary, rather than closing the F-channel turnout gates, However, during the night, tail-end farmers tended to close the F-channel turnout gates to get water to their tail-end allotments. The duration of one water issue in June was reduced without the knowledge of the farmers and as a result, one F-channel could not get water at all. This matter was discussed at the Tract Committee Meeting, *and* was attributed to bad communication. During part of the season a rotation within DC 2 (Tract 6) was carried out by the FR of the area. The FR would block the tail-end of the distributary during the first day of the water issue using rice straw and a wooden plank. However, night irrigation by tail-end farmers and the unreliability of the duration of the water issues made it impossible to continue the rotations on a regular basis.

Water distribution within the allotment. The most significant division within the allotment was the boundary between the bethma portion and the owner's portion. Although there were many cultivators in each allotment (an average of 4.3 in the Tract 5 Intensive sample area), cultivation rarely crossed the bethma boundary. The soil types available to cultivators in both the owner and bethma portions were usually divided equitably by dividing the allotment perpendicular to the F-channel. However, access to the single outlet from the F-channel was usually controlled by the cultivator on the owner side of the divide. Apart from these constraints, some allotments were arranged to get water simultaneously by making field ditches.

Mutual arrangements to share water during the issue took into account not only the lay of the land, but the distance the cultivator would have to travel from his residence. Bethma partners residing in distant tracts (e.g., Tracts 8-9) would sometimes be given preference by the land owner for irrigating when convenient. More often the bethma cultivators would not try to

compete with the owner for water on the first day of issue, but would wait until the second day to come to the fields. Some of these intra-allotment arrangements were carried out in conflict with the pattern of water distribution within the distributary,

Some farmers reported that they did not need to actively irrigate at all for *many* water issues because their fields are irrigated from the drainage and seepage from adjacent fields within the allotment. One farmer in Tract 8, who cultivates soybean, prepared basin plots to catch the run-off from adjacent fields, Table 6 gives farmers' responses regarding water distribution within the allotment.

Table 5. Percentage breakdown of water distribution within allotment.

Pattern	Intensive (n=60)	Extensive (n=97)
Take water simultaneously	32	19
Owner portion first	22	40
Bethma portion first	10	11
Share water as needed	16	23
First come, first served	18	4
Use drainage/seepage water	2	3

Night irrigation. Night irrigation is practiced not only because of intense water demand during the day, but also because of perceived crop water requirements and informal rotational arrangements among operators. One head-end direct issue holder in Tract 5 reported that he irrigated at night so that bethma cultivators (within the same allotment) would have time to take water after he finished. Farmers cultivating OFCs prefer to irrigate their entire area in one heavy dose and then let the water drain off, to avoid waterlogging the plane. Since day-time flows tend to be more erratic and unreliable (because of heavy demand), than night flows, they sometimes prefer to irrigate at night. However, the majority of night irrigators were tail enders who were unable to irrigate during the day-time. Some tail enders used to stay on the field throughout the night waiting until the head end farmers leave their fields, so they can close the head end gates.

Cleaning and Maintenance

As a general rule, cleaning F-channels and certain distributaries is the domain of farmers; cleaning the main canal and some distributaries, plus maintaining all channels, is the responsibility of the Irrigation Department.

Cleaning activities. Channel cleaning by the Irrigation Department is done by the Irrigation Laborers under the supervision of the TA and the Work Supervisor, The four laborers and three irrigators are each assisted by additional casual workers as needed. In Tract 5 (the Intensive sample), farmers were responsible for cleaning the distributary; In some of the distributaries covered by the Extensive sample, the Irrigation Department took care

of cleaning most or all of the channel. Table 6 presents data on who cleaned the distributaries during yala 1986 as well as the two previous seasons. Table 7 presents farmers' knowledge of who organized the cleaning. In many cases farmers were unaware of both who did the cleaning and who organized it; these were generally leasee farmers who were not present when cleaning was carried out towards the beginning of the season.

Table 6. Percentage breakdown showing who cleaned the distributary, Dewahuwa, yala (Y) 1985 and 86, and maha (M) 1985-86.

	Intensive (n=60)			Extensive (n=97)		
	Y 86	M 85/6	Y 85	Y 86	M 85/6	Y 85
Cleaned by the farmer	72	55	55	41	27	27
Cleaned by the Irrigator	--	--	--	30	28	28
Do not know who cleaned	28	28	28	29	43	43
Was not cleaned	--	--	--	--	01	01
Missing Information	--	17	17	--	01	01

Table 7. Percentage breakdown showing who organized distributary cleaning, Dewahuwa, yala 1986.

	Intensive (n=60)	Extensive (n=97)
Done individually	50	52
Organized by ID officers	--	38
Organized by PM	3	5
Organized by the FR	8	10
Do not know	34	35
Missing information	5	--

The plan for the cleaning F-channels was presented at the Kanna Meeting; in addition, it was discussed in Tract Committee and Project-level meetings both before and after the Kanna Meeting. According to the cultivation plan, the F-channels and distributaries should be cleaned twice during the season. The final dates for cleaning were April 20 and June 10. The farmers who failed to clean the channels by these date would be fined for 5/= per meter of uncleaned section. In addition if more than one third of an area (or F-channel) were not cleaned, water would not be issued for that area.

According to project officials only 5% of the farmers had cleaned their sections by the first deadline (April 20) for the first channel cleaning. The Project Manager made arrangements for various field-level officers to inspect the channels and report on uncleaned channel sections. At a monthly Project Meeting, discussions were held about taking action against the farmers who had not cleaned their channels. The FRs were asked to produce a list of farmers who failed to clean the channels. To take action under the Agrarian Services Act, the Cultivation Officer should certify the same. But

prepration of the list was not followed as planned, since many FRs as well as the Cultivation Officers were reluctant to take action against their fellow farmers. Finally the date of June 10 was fixed for the project officers to inspect the channels. This date was the deadline originally set for the second cleaning of the channel. A number of officers participated in the inspection and according to the calculation of the Project Manager, the channel cleaning by that date was roughly 75% completed.

Cleaning of channel sections is supposed to be done by both the owner farmers as well as the bethma farmers in each cultivated allotment. While both participated in cleaning, the operators in the owner's portion tended to *do* the major share of cleaning, since bethma farmers do not have the *same stake* in neighborly relations as do the more permanent cultivators. Within the F-channels, cleaning was usually done individually, or organized in very small groups. In such cases, *the* organizing was more often done by the farmers themselves than by the FR (Table 8).

Table *8.* Percentage breakdown showing who organized F-Channel cleaning, Dewahuwa, yala 1986,

Who Organized	Intensive (n=60)	Extensive (n=97)
Organized by the farmer rep	18	20
Organized by the owner cultivator	0	8
Done individually	65	61
Do not know who organized	17	6
Not applicable (direct issues)	-	5

Maintenance activities. Usually just before the season starts, the Irrigation Department officers ask the FRs about any urgent needs for maintenance work. During June and July (1986) the TA and the Project Manager paid a visit to the field to inspect maintenance needs, *according* to a plan outlined in a Project Meeting. Farmers and FRs in each turnout area were asked to present their suggestions for maintenance work. During the visit of the officers, the farmers' participation was poor. In some cases the FRs had not notified the farmers to be present, and other farmers who had been notified failed to come.

Nonetheless, the extent of the work for each turnout group was finalized through an agreement with the FRs, considering the amount of O&M fees collected from the area and the priority of the work. Finally an estimate was prepared (by the TA) for each turnout group and presented to the Deputy Director of the Irrigation Department. The final estimate was presented in the Committee Meeting on the 1st of August. For Tract *5*, the amounts in Table 9 were proposed.

The FRs were asked to organize the work, and to get the participation of farmers who had paid the maintenance fee. As a payment for organizing work the FRs were authorized to retain Rs.10/= per cube of soil.' Since the tota

costs was estimated at Rs.45/= per cube, it was later decided that the FR

Table 9. Cost estimates for field channel maintenance, yala 1986

FR	Tract	TO Group	Amount	Earth CU
A	5	10	4350.00	93
B	5	11	3900.00	--
B	5	12	5280.00	--
C	5	13	6332.50	136

should retain only Rs.5/= from each cube. Maintenance work began in mid-August, with most of the labor comprising local farmers and their children, but without considering whether or not they had paid their O&M fees. Some of the work carried out went beyond, or around, the terms of the estimate, For example, in the head-end turnout of Tract 5, the estimate called for filling certain sections of two field channels. Instead, one field channel was partly filled and most of the labor was spent to clean the distributary which should be cleaned by the farmers seasonally (and at no pay).

This work was the first use of the O & M fees which had been collected since 1984 (see following section). As discussed in the Committee Meeting, a major objective of the work was to demonstrate some positive activity to the farmers as an incentive to those who have not yet paid their fees.

Operation and Maintenance (O&M) Fees

O&M fees have been collected in Dewahuwa, with varying success, since 1984. The amount collected dropped dramatically after the first year and then recovered slightly during 1986 due to the threat of legal action. In Tract 5 which consists of 65 allotments (approximately 325 acres), the amount collected as of August 1986 was Rs 19862.50. It was approximately 30.5% of the total amount that should have been paid by the farmers for the two years. Including the amount due for 1986 the percentage collected is about 20% the total amount due. Collection the fee is handled by officers of the Land Commission who are given a commission of 5%. In Dewahuwa the Colonization Officer and Field Inspector are collecting it, Collection rates from the four turnout groups within Tract 5 are given in Table 10.

Table 10. O&M collection rates in Tract 5.

TO Group No	% for 3 years
10	22
11	18
12	15
13	26

The last turnout group (TO 13) is comprised predominantly of Muslim farmers from large families who have subdivided their lands among family members (and which *are* generally leased out on ande basis). Because of their pooling of family resources, the percentage of those paying the O&M fee *is* comparatively higher than in other groups,

Only owners are required to pay the O&M fee, although in some cases the owners have passed on this burden to their tenants, In the Intensive sample, *only* 12% of the cultivators were legal owners, although another 37% were close relations of the owners with access to the land either as their birthright or through formal or informal rents considerably less than market value. The remaining cultivators were tenants *(see* Table 16). *As* a result of the land tenure status of the operators, the owners who are required to pay the fee are not readily accessible to the fee collectors.

The small number of owners in the sample does not provide a statistically valid characterization of owners' payment behavior, but it does corroborate the Tract wise data presented above. Of *6* owners *in* the Intensive sample, only two had paid fees for at least one year; in the Extensive sample 18 of 29 owners had paid. The following tables describe the characteristics of these farmers who paid and did not pay (Table 11).[8]

Table 11. Numbers of farmers who paid or did not pay O&M fees in Tract 6, Intensive sample, Dewahuwa 1984-1986.

	Intensive (n=60)			Extensive (n=97)		
	Legal owners	Non owners	Total	Legal owners	Non owners	Total
Paid	2	7	9	18	23	41
Not Paid	4	37	41	11	44	55
(No Data)	-	10	10	--	01	1
Total	6	54	60	29	68	97

Table 12. Years farmers paid fee, Tract 5 Intensive sample.

Paid	Intensive		Extensive	
	No	%	No	%
1984 only	4	44	22	54
1984-1985 only	5	56	15	--
1984-1986	-	--	4	10
TOTAL	9	100	41	100

Interviews with farmers revealed a poor understanding of what happened to the fees after they were collected. A clear majority of operators in both samples did not know who controlled the funds (Table 13), nor what the funds had not been used for (Table 14). Rather surprisingly, given the level of payment, the vast majority of sample farmers felt that the O&M fee is basically a good idea (Intensive sample: 58%; Extensive sample: 72%); only 5% of the Intensive sample and 7% of the Extensive sample felt strongly that O&M fees should not be levied (Table 15).

Table 13. Number of paying farmers who knew who controls the collected O&M fees, Dewahuwa, yala 1986.

	Intensive	Extensive
The GA	1	8
Agrarian Services	-	2
The Project Manager	-	1
Do not know	8	28
TOTAL	9	41

Table 14. Number of paying farmers' who knew how fees have been used, Dewahuwa, yala 1986.

	Intensive	Extensive
Have not been used	1	22
Channel maintenance	3	2
Do not know	5	17
TOTAL	9	41

Table 15. Farmers' views on the O&M fee, Dewahuwa, yafa 1986.

	Intensive		Extensive	
	No	%	No	%
A good idea	35	58	70	72
Not a good idea	3	5	7	7
No opinion	12	20	20	21
(Missing data)	10	17	-	-
	60	100	97	100

FARMERS' ECONOMIC CONTEXT

Most of the residents of Dewahuwa scheme are farmers, the sons and daughters of original allottees whose families (or spouse's family) settled in the scheme during the 1950s. The farmers of Dewahuwa who comprise the research samples do not represent a statistically representative cross-section of Dewahuwa society, since non-farmers have been deliberately excluded. While agriculture is by far the major economic activity within the scheme, there are other sources of income which some residents pursue full-time, and which many more farmers pursue part-time. In this section, a brief sketch is presented of the economic context of farmers from the Intensive sample (n=60) in Tract 5, recognizing that the economic importance of off-farm work is under-represented in this sketch.

Land Tenure

Most farmers in the sample are non-owner cultivators, Only 12% of cultivators in the Intensive sample were legal owners. When family-tenure cultivators (children or relations of the land owner) the figure rises to 48%. The tenurial arrangements are outlined in Table 16.9

Table 16. Percentage breakdown of tenurial arrangements in Dewahuwa, yala 1986.

Tenurial arrangement	Intensive (n=60)	Extensive (n=97)
Owners	12	32
Family tenure	37	25
Leasees	37	29
Partnership	7	6
Ande	7	6
Care taker	2	2

Farming is the main source of income even for families with no land of their own, either through renting or encroaching irrigated land, or through highland cultivation. The 3 acre residential plots in Dewahuwa offer economic opportunities for many families, in spite of the subdivisions that have taken place over the years. Some second and third generation families own portions of a highland plot, but no land within the irrigated command. More commonly, land-poor households seek their agricultural livlihoods outside the scheme boundaries on encroached land officially classified as forest reserve.

Highland agriculture, whether in residential plots or encroached areas, is rainfed during maha, but generally requires supplementary irrigation during yala. Tobacco is popular, as it requires little water and does well in this area; other crops include chilli, green gram, and sesame. Irrigation water is generally pumped from wells or from drainages, depending upon the location. Those who can afford to purchase or rent pumps can cultivate more

land. During the yala season, cultivating in the non-bethma areas of the command area is common, wherever a water source can be tapped by a plastic pipe, Some tail end farmers in Tracts 7 and 8 were able to cultivate the major portions of their own allotments, leased out their bethma sections and used the income to finance their non-bethma cultivation.

Credit and Finance

To finance their yala cultivation, most farmers used their income from the previous maha season. These who did not have adequate income, or who had to pay off accumulated debts, resorted to private sources of credit. The number of farmers utilizing institutional (bank) credit is almost nil: 2% and 6% in the Intensive and Extensive samples, respectively. The sources of finance are given in Table 17.

Table 17. Percentage breakdown showing sources of finance for farmers in Dewahuwa, yala 1986

	Intensive		Extensive	
	No	%	No	%
Maha income	22	37	43	44
Informal-sources (credit)	19	32	19	19
Formal (bank)	1	2	6	6
Financed by a second person	8	13	11	11
Chena Income	1	1	3	3
Self-employment	-	-	4	4
Salary	7	12	6	6
Other	2	3	5	5
TOTALS	60	100	97	100

Some farmers in Tracts 7-9 were able to obtain agricultural credit under the Central Bank's Regional Development Project, through their membership in the Budugehinne Farmers' Organization. For other farmers, renting out a part of their land was a common means of financing the cultivation in the remaining portion, or in encroached areas. The land prices for upland (light soils) areas was higher than the prices of poorly drained land; thus, some farmers leased out their own land or their bethma section in the higher, head-end areas and cultivated their OFCs (mostly chilli) illegally in the non-bethma area by either pumping or diverting water from the drainages.

Credit from money lenders has an interest rate of about 20% per month, though the exact amount varies according to the relationship with the farmer. In addition to direct payments of interest there were other arrangements with the money lenders such as repaying the amount in kind. During the period of cultivation, the farmer takes a loan at no interest, but with the promise to give paddy for the value of Rs. 35-40 per bushel during the harvest (when the market price would be Rs 75-85). This system is more widespread during the

maha season, when paddy is the predominant crop. Huwever, some farmers stated that they could sell their crops at the market price, even at harvest. From these same traders, farmers also obtain other inputs as well as domestic goods on a credit basis, A rough estimate (since these data are difficult to collect with accuracy) is that 80% of farm families get goods on credit,

Farmers claimed they do not repay interest to friends and relatives. However, there are some forms of informal repayment which are not explicitly considered as such (i.e., giving 3 or 4 bags of chilli during harvest,

Off-Farm Employment

Employment off-farm is a strategy of necessity for many second and third generation households, but it is also a strategy of choice for many traders, who choose to lease out their irrigated land to give full attention to business. A few people, find agricultural wage work in surrounding areas, particularly Mahaweli H area, less than 1 hour to the north, by bus. However, most agricultural work is confined within the scheme, or in highland cultivation adjacent to the scheme. If workers look beyond the boundaries of Dewahuwa, it is more lucrative non-agricultural work that they seek.

Non-agricultural employment within the scheme centers on carpentry, construction, and boutiques. Carpentry is more important to the economic life of Tract 5 than is reflected in the Intensive sample of farmers. Furniture is manufactured from timber supplied through both legal and illegal means. Another employment strategy practiced by *young* women is to work as housemaids in the Middle East, staying for several years, and providing remittances that help their families finance cultivation. Traders and boutique owners are centered along the bazaar in the predominantly Muslim community of Bulanawawa in Tract 5, which is the largest market in the scheme.

Table 18. Occupations among household members of Dewahuwa Intensive sample (n=60), yala 1986

Occupation	No	%
Farming	135	66
Labor	8	3
Students	9	4
House Work	28	13
Carpenters	4	2
Teacher	3	1
Trader	2	1
Other	4	1
Disabled/Retired	9	4
No occupation	3	1
Missing Data	1	1
	206	100

Table 18 presents data on the primary and secondary occupations from the Intensive sample farmers and their households. All members of the farmer's household (defined as sharing the same physical residence) aged 14 or older, are included. The 60 farmers in the Intensive sample belonged to 56 different households with an average size of 5.7 members (all ages). The average number of people who can be considered of working age (age 14 and above is 3.7 per household. Of the 206 people in the 56 households, two-thirds are farmers; only 16% reported a secondary occupation.

SUMMARY AND CONCLUSIONS

This report has documented the irrigation management practices of farmers and agency field staff in one irrigation scheme. Although limited in the sense of constituting a single, perhaps not representative case, the study pints to a number of problems common to other irrigation schemes in the country.

Organizational Structure

One obstacle to the coordinated management of the Dewahuwa irrigation system has been the cross-cutting jurisdictions of different line agencies (e.g., Agrarian Services, the Department of Agriculture, and the Irrigation Department) and administrative divisions (e.g., Matale and Anuradhapura districts). Since this study was conducted, there has been a re-alignment of some domains, notably the jurisdiction of the KVS (Agriculture Department) and the Colonization Officer,

Farmer organizations have been instituted in Dewahuwa at the level of the project and the subproject, but not at the distributary or field-channel levels. Both the project committee and the two committees at the tract level (Tracts 1-7 and Tracts 8-9 which meet together) appear to provide effective interaction among Farmer Reps, and between the Farmer Reps and project officials, particularly the TA and the Project Manager. The role of the Farmer Rep is recognized both legally, through the Agrarian Services Act, and practically, as evidenced by the level of payment (roughly 75%) of owner fanners to their respective FRs. However, the effectiveness of FRs varies a great deal depending upon their individual leadership abilities and their dedication to their poorly paid positions.

A major constraint to the FR's management effectiveness is the high proportion of cultivators who have a temporary relationship with the landowner through a lease, mortgage, or ande agreement. These cultivators tend to feel they do not have a right to seek help from the FR; in the Intensive sample, only 12% of all farmers had received the FR's assistance during the season.

The farmers in one "turnout group" under the guidance of one FR, do not necessarily comprise a hydrological unit; rather, the boundaries of turnout groups are defined as spatial subsections of the total system, which may include part or all of one or more F-channels, as well as direct-issue turnouts from the distributary, or even the main canal. Farmers within a single F-channel have no designated leader other than the FR, who may have

obligations in other F-channels as well. As a result, farmers are more or less on their own to distribute water within the turnout. No formal arrangements for water distribution were observed within the turnout; rather, farmere took water as *they* could, with tail-end farmers often resorting to night irrigation.

Irrigation Practices

Plans for yafa water issues, rotations, and bethma divisions begin at the end of the preceeding maha season, with the pre-kanna meeting. Farmer Reps, but not regular farmers, participate in the Tract Committee and Project Committee meetings that lead up to the pre-kanna meeting. Any farmer *can* participate in the pre-kanna and kanna meetings. Although the project officials have a definite plan which they take to the farmers at the pre-kanna meeting, there is scope for revision. The yala 1986 water plan which finally emerged reflected some compromises regarding the bethma divisions (e.g., extending the irrigated area into Tract 7, to reduce the distance between tail end farmers and their bethma allotments),

Plans for the start of water issues were not adhered to, because of early rains. The issue date for land preparation was advanced from May 1 to 4 April, which unfortunately coincided with New Year festivities. Plans were made for water rotations within some distributaries (during the growing season), but for various reasons were not implemented successfully.

Water distribution practices revealed conflicts of jurisdiction between the Irrigator (an employee of the Irrigation Department) and the Farmer Reps. In general, the Irrigator has greater authority than the Farmer Reps, but does not have any direct control over them. In addition, the two Irrigators who alternated responsibility for Tract 5 had varying standards which they applied for adjusting turnout gates. Within F-channels, fanners were on their own, with only sporadic assistance from Farmer Reps. In spite of the absence of any formal organization at the F-channel level, farmers were successful in obtaining water either through passive acceptance of what was available to them, or through direct action during the night, as in the case of tail-end farmers of FC 6 in Tract 5. Within the allotment, the cultivators of the owner's portion generally had priority over the bethma partners; again, these arrangements were worked out individually.

Cleaning of the distributaries was done either by the Irrigation Department directly or by the farmers, at the behest of project officials. Cleaning F-channels was carried out individually, with some input from FRs. In neither case were organized work groups formed to clean at the same time; the tradition of shramadana is not applied to channel maintenance at Dewahuwa.

Payment of O&M fees, while low, is nonetheless significant. Collection rates are difficult to evaluate because of the way accounting is done: fees collected are credited to the year they were due, rather than to the year *they* were paid. It is therefore difficult to assess whether repayment rates are increasing or decreasing. The total collected ranges from 15-25%. Farmers' ignorance of where their fees go is significant, and suggests the need for better communication about the reasons for fee collection.

Farmers' Economic Context

The high proportion of non-owner cultivators, and more specifically, cultivators who are not related to the owners, stands as the single most significant fact of Dewahuwa's agrarian context. Farmers consistently laid responsibility for lack of channel cleaning and wasteful water use to temporary cultivators who have no permanent stake in the irrigation system. Encroachers are not a major problem in terms of water use. The illegal use of water during yala to irrigate allotments not included in the recognized bethma area is more significant. Land owners who are given bethma portions, but also try to pump drainage water into their own allotments, encourage, and sometimes ensure, extra water *flow* into the drains.

Off-farm employment is a source of financing agricultural activities, *and* helps supports the ever-growing population of the scheme. Since this study is based on a sample of farmers, rather than on all residents, the full range of off-farm activities is under-represented in the sample, Nonetheless, the importance of off-farm employment is evident, particularly as families grow *and* individual landholdings diminish in size,

The cost of credit is prohibitively high for m y farmers who rely instead either on their own savings, or on credit in kind from shop keepers and traders, where the interest rates are disguised through complex arrangements. Institutional credit, while far cheaper in theory than private credit, is generally unavailable to farmers who have previously defaulted on loans.

Finally, the role of upland and chena agriculture, although not specifically a part of this study, is of critical importance to some families, particularly for children of allottees who cannot expect to inherit sizeable portions of irrigated land. The 3 acre highland allotments provided in the original settlement have been subdivided, but still remain large enough to provide many households with significant agricultural production of non-paddy crops. The "chena" is settled, and located just outside the boundaries of the scheme, some of it in land officially termed "forest reserve." Where sources of water can be found -- wells or drainages -- farmers often provide supplemental irrigation to their chena plots, either by hand or by pumps. Irrigation outside of Dewahuwa's official command area would be a useful study in itself,

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In its fourth decade as a settlement scheme, Dewahuwa is undergoing important changes in its organizational structure. The work which the Project Manager has initiated in coordinating the functions of the various line agencies at the field level, and in facilitating the development of farmer organizations, is clearly making headway. The ingredients are in place for further improvements in organizational arrangements that can lead to more productive use of irrigation water, This evolutionary process will be examined further in a future report.

NOTES

1. "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.

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

3. INMAS stands for "Integrated Management System" which was introduced by the newly created Irrigation Management Division (IMD) in 1984. At the time of this study, Dewahuwa was one of 32 schemes included under the INMAS program.

4. The so-called "life irrigation" area is on the left bank of Heyanella Oya (the source of water for Dewahuwa Tank), opposite Tract 3 (see Map 1). As part of the JICA-funded rehabilitation work in the 1970s, a pumping station was constructed to lift water into a storage tank on the adjacent hill slope, with delivery to the fields by open channels. The system has never been used.

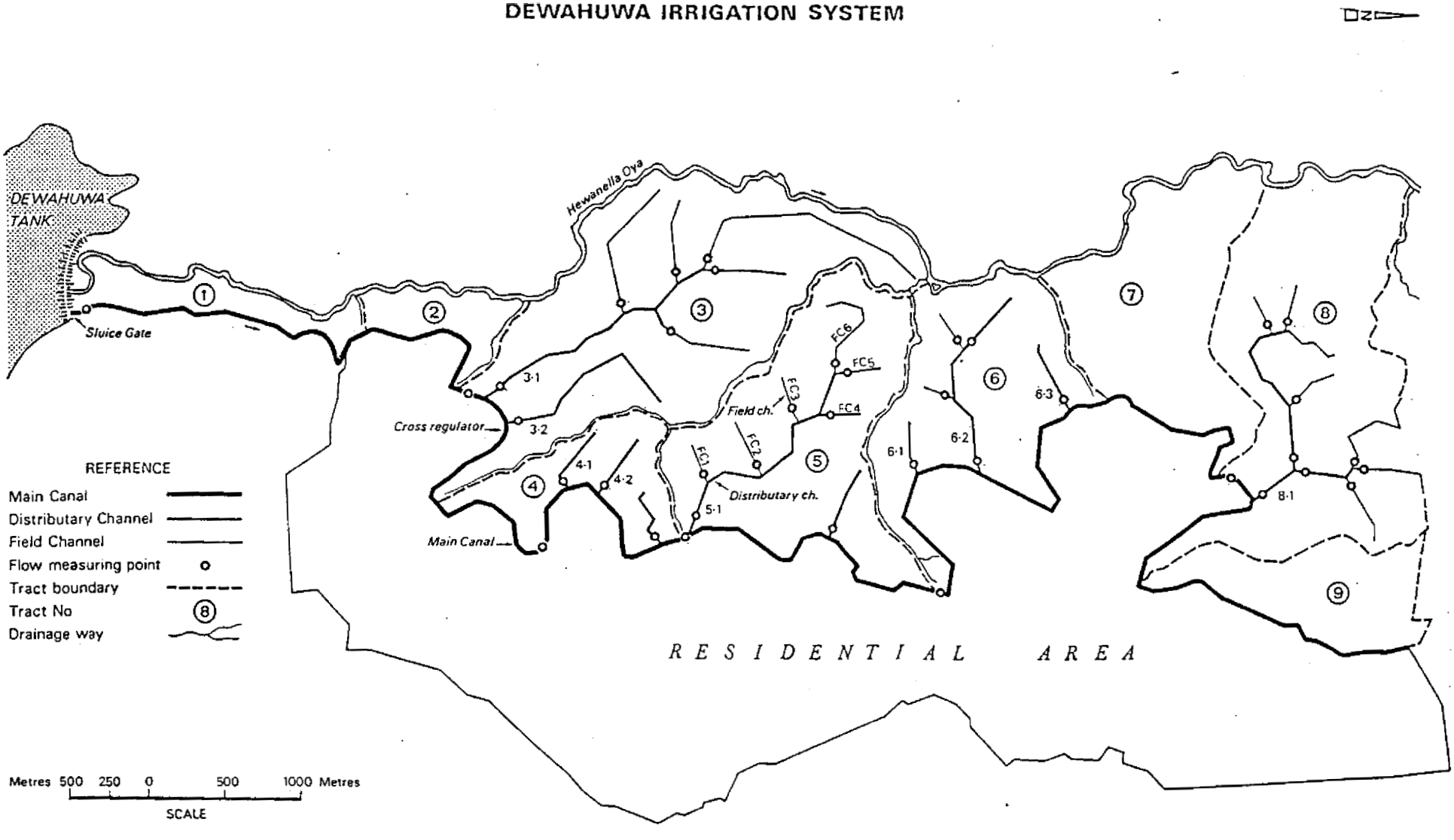
5. Over the years these allotments have become subdivided through fissioning of families, mortagages, leasing, and a few outright sales. In the Tract 5 sample from 1985/86 the average number of operators per 5-acre allotment was 3.6. Only 30% of these operators were original allottees or family members (see Bulankulame), op. cit., pp. 4-6).

6. Selection criteria for Farmer Reps are described in IMD Booklet No. 3, "Handbook on Farmer Organizations in Major Irrigation Schemes".

7. One Cube = 100 cubic feet, normally measured on the ground in sections 10' x 10' x 1"

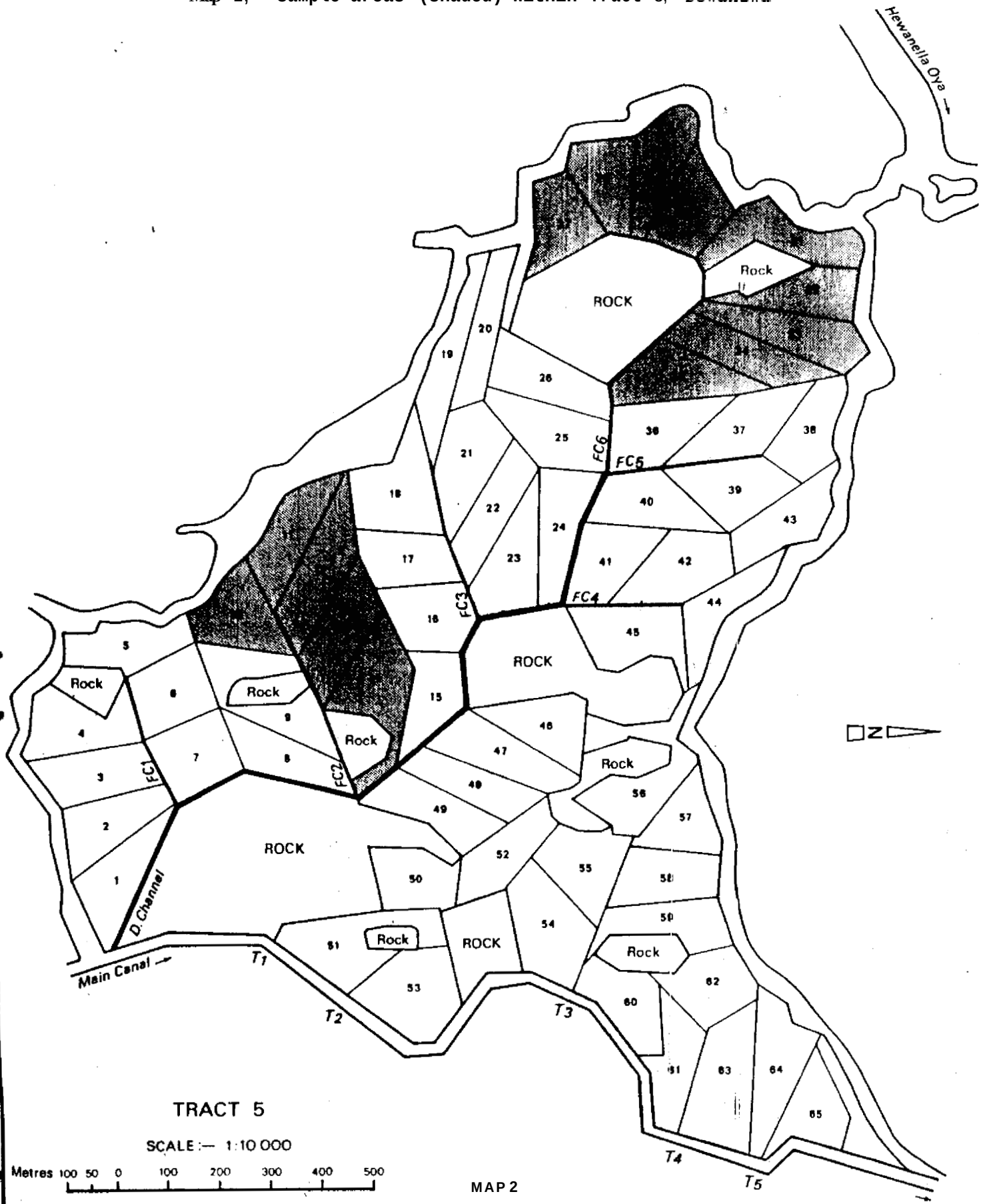
8. Payment of O&M fees in credited to the earliest year's fee still outstanding, Thus, a farmer who paid for the first time in 1986 would be considered to have paid "for" the first year due, which is 1984. The higher proportion of farmers who have paid their 1984 fees do not necessarily mean that the rate of payment is declining (although according to knowledgeable officials, it is).

9. The differences in tenurial composition between the two samples is attributable to the fact that the Extensive sample was intentionally biased towards those farmers cultivating the largest plot within a subdivided allotment, for purposes of the economic analysis of agricultural production. The Intensive sample includes all farmers within two turnouts, regardless of landholding size. Sample selection is discussed in the section on methodology.



Map 1. Dewahuwa Irrigation System

Map 2, Sample areas (shaded) within Tract 5, Dewahuwa



MAP 2