Institutions Under Stress and People in Distress: Institution-Building and Drought in a New Settlement Scheme

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Summary: This paper analyzes irrigation operational problems, and their institutional causes, on a new irrigation system in southern Sri Lanka, based on research during a disastrous drought. The authors offer a number of *suggestions* for improving the management of this system.

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Foreword

THIS PAPER REPORTS on one Season of research in a newly commissioned irrigation system, the Kirindi Oya Irrigation and Settlement Project, in southern Sri Lanka. The work was carried out by a research officer trained in the social sciences, supervised by a social scientist on the senior staff of IIMI. The paper is therefore not an interdisciplinary study, and does not claim to be a complete report on all aspects of irrigation system performance. For example, we have no reliable measures of actual water deliveries, which would be required to evaluate the actual performance of the system.

The season of the study, *maha* (wet season) 1986/1987, was also a very unusual and unfortunate one for the farmers. Maha is normally the wet season, with heavy rains expected during the first half of the season, which runs from about October/November to March/April. However, in much of the country, including southern Sri Lanka, the rains failed, or were way below normal for the season. As the managers of the Kirindi Oya system had chosen to start the season with a low reservoir, on the assumption that normal rains would come later, this severe drought led to a disaster for the cultivators. On much of the newly settled part of the system, the crop completely failed.

This failure could potentially have a severe impact on the confidence of the cultivators in the system, since most were cultivating for only the second or even first time (the previous *dry* season, *yala* 1986, had been the first season of

water issues in the new settlement areas). At the beginning of the season, we were documenting the management capacity at the level both of the newly established farmers' organizations and of the various government agencies involved in the project. There were clearly some serious problems at all levels, with poor communication between agency officials and farmers, and among officials, conflicts among both farmers and some agency officials, weak farmers' organizations, and poor coordination at all levels emerging very clearly.

With the realization that the reservoir would not fill up, and that most settlers' crops would fail, even more serious institutional problems emerged. For the settlers the crop failure brought disaster: loss of their investment, loss of badly needed income, poverty, hunger, hopelessness, and anger. Rightly or wrongly, many blamed the government agencies for the disaster. Many were forced to leave the area and return to their home villages to survive. Some government officials blamed others, perhaps to deflect any blame that would have been directed at themselves.

This report documents a range of views, observations, perceptions, and accusations of various people, including farmers and their leaders, and officials. In some cases the criticisms expressed by our informants may appear somewhat extreme (the most severe criticisms and accusations have in fact not been included here). The authors do *not endorse any particular accusations and nothing in this report should be mistaken as criticisms of* individuals.

As social scientists, our focus is on the organizations through which people manage the system, at both the government and farmer levels. It is very clear from our study that during the planning and construction phase of the project, too little attention was paid to developing the management system required for effective operation of the system. We make this statement even though we realize that the Kirindi Oya Irrigation and Settlement Project was intended to be innovative in terms of settlement and management policy. These problems have been major factors complicating further the various start-up problems one normally expects when *initiating* a new irrigation system.

The purpose of documenting the problems at Kirindi Oya is not to cast blame, but to identify the problems that need to be addressed if the project is going to meet the high expectations that settlers, donors, and government naturally hold. We do not claim to have all the answers. IIMI has initiated several, more comprehensive, research activities *since* this study was completed, in collaboration with the relevant government agencies, and with financial

support from the *Asian* Development Bank and others. Thus the conclusions reached in *this* report should be understood as tentative, subject to further research; but *preliminary* results *from this* further work strongly support our conclusions.

Based on the research in maha 1986/1987, plus what the more recent research data show, we do not hesitate in urging that *far more attention* be paid to strengthening the government agencies, and the cooperation among them at the project level, and that serious attention be paid to building stronger farmer organizations to work as partners with the government in managing the irrigation system. The concluding chapter makes some specific (tentative) suggestions in this regard.

Despite the serious problems discussed in this report, and the rather strong negative feelings generated among many settlers as a result of the failure of their crops, we are confident that these problems *can* be overcome, and that the farmers and government officials can cooperate to develop the Kirindi Oya scheme to achieve its potential.

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We are also grateful to the farmers, particularly in Hamlet 11, who patiently answered questions and extended their hospitality even when they were facing severe crises.

An earlier draft of this paper was circulated among key agency staff for their review, a process that took two months. We visited many of them to discuss the findings in detail. For their comments and suggestions, we wish to thank the following persons: Mr. E.P. Wimalabandu, Senior Deputy Director (Major Construction) of the Irrigation Department; Mr. D.G. Premachandra, Director, Irrigation Management Division and Additional Secretary, Ministry of Lands and Land Development; Mr. Chandra Ranasinghe, Project Manager

(Settlement); and Mr. Sena Jayasuriya, Assistant Project Manager (Settlement). At IIMI, we thank Dr. P.S. Rao, Dr. Pamela Stanbury, Dr. C.R. Panabokke, and Mr. Charles Nijman for helpful critical reviews.

Though a couple of reviewers were strongly critical, we were pleased that our research -- itself rather critical -- has been appreciated by key officials and has already stimulated some rethinking of the management of the Project

The authors alone are responsible for the contents of this study.

Executive Summary

THIS PAPER REPORTS on research carried out in the Kirindi Oya Irrigation and Settlement Project, southern Sri Lanka, during one season, *maha* (wet season) 1986/1987. This particular season the rains failed, causing a severe drought, leading to crop failure in most of the newly settled parts of the scheme. The impact of this disaster was compounded by the fact that this was a new scheme, and for farmers in the newly settled areas, this was only the first or second cultivation season. We report in some detail the seasonal planning process, the operation of the irrigation season with particular reference to one sample distributary, the organizational structure of the Project at field and project levels, and the views expressed by both farmers and officials of the various departments. A first draft of the paper was sent to key officials for comments, and we have revised the paper based on the very useful suggestions we received.

We analyze the irrigation operational problems that characterized the early part of the season, and attribute them to certain organizational and management weaknesses. We also analyze the response of the various institutions and participants in the system to the drought, and the impact, particularly on the credibility of institutions. of the drought and the way it was handled. We suggest that in addition to the real poverty, anger, feelings of helplessness, and general distress of the new settlers, the drought further weakened the fragile

new farmers' organizations, and led to a loss of faith in the official management organizations, and officials themselves.

We identify a number of specific organizational weaknesses at both farmers' and project level which our observations suggest have contributed to the severe difficulties faced during this season. One reason for the problems identified is that the process of shifting from implementing a construction and setdement project, to actually managing the new system to serve the farmer clients seems not to have been as well managed as it might have been.

This report is based on only one season of research. The results are therefore necessarily somewhat tentative; but further research since maha 1986/1987 has tended to support the findings, In the Conclusion, we therefore tentatively suggest some specific management innovations that may improve the development process and overall performance of the Project. Briefly, these suggestions include:

* Establish clearer lines of authority, including one senior overall project manager, to eliminate the present fragmentation of authority.

* Limit the function of the present Project Coordinating Committee to overseeing construction in Phase II.

* Strengthen the Irrigation Management Division-sponsored Project Committee, to convert it into a "Kirindi Oya Project Management Committee," as a vehicle for setting overall operational policy and as a forum for discussing and solving important management problems. The Committee should include farmers' representatives as well as highlevel government officials.

* Clarify and strengthen the Irrigation Department's mandate and capability for effective system management in partnership with farmers' groups, including holding regular staff meetings to improve internal communications, and incentives and training for better system management.

* Strengthen the role of the Irrigation Management Division through more participation by its senior officials at Kirindi Oya Project meetings, and improved guidance and support for its Project Managers.

* Use the resources for promoting and strengthening farmers' organizations more effectively, by experimenting with using existing field staff from the Land Commissioner's Department in the role of institutional organizers, after providing effective training and guidance to them; and rectify anomalies created by establishing distributary organizations on a hamlet basis.

Successful development of a major irrigated scheme is a very complex and time-consuming process. Because Kirindi Oya is a new scheme, it presents an opportunity to avoid problems found on older schemes by paying greater attention at this stage to developing effective institutions. We offer this study as a contribution toward achieving this objective.

Chapter 1

Introduction

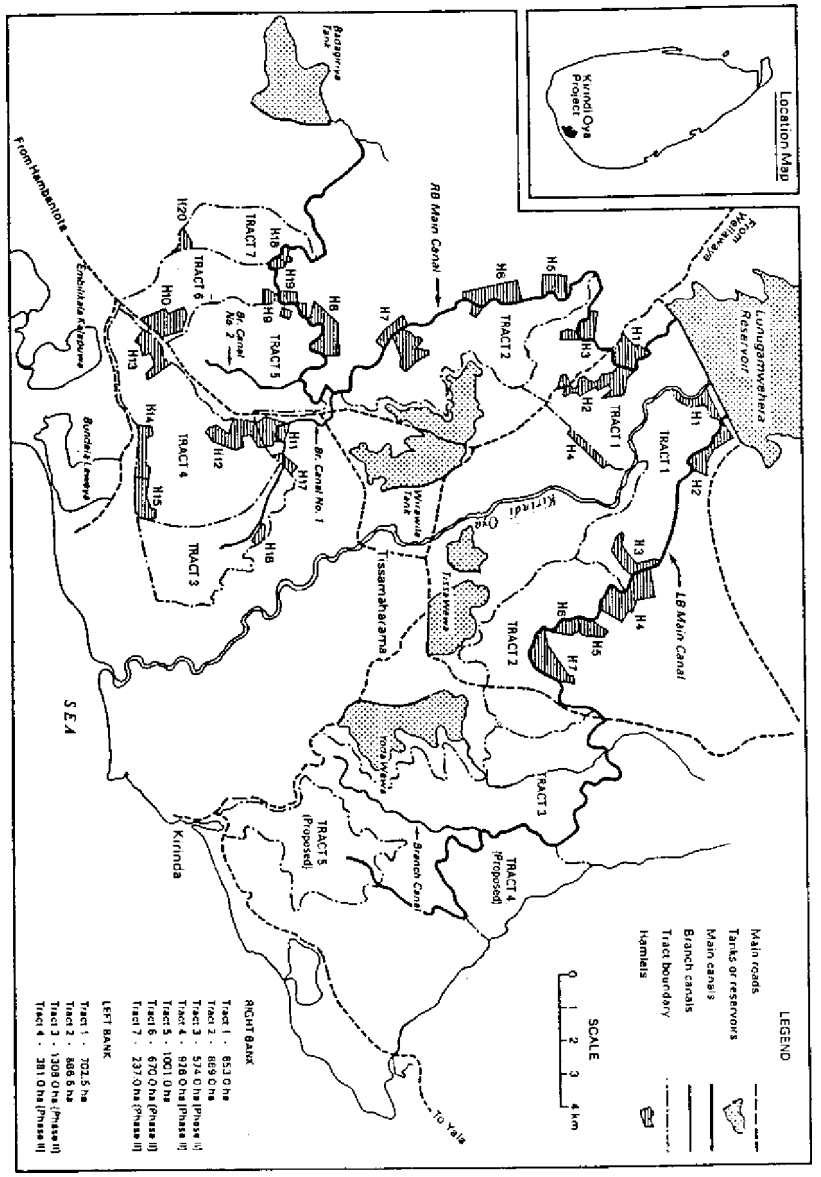
LAND DEVELOPMENT IN the *dry* zone through irrigated land settlement schemes has been the main rural development strategy of the Government of Sri Lanka for over five decades. Improving agricultural production, creating employment, settling people, and generating foreign exchange savings, the primary objectives of such schemes, contribute to achieving the government's major economic and social goals.

The Kirindi Oya Irrigation and Settlement Project is a new major irrigation settlement scheme. The main reservoir, Lunugamvehera, with an active storage capacity of 210 million cubic meters[1] (Asian Development Bank 1986: Appendix 5), was completed in 1985, and the first rice crop irrigated in 1986. Construction is still underway in parts of the system, The scheme is situated in the southern *dry* zone (southeast quadrant of the island) on the coastal main highway about 260 kilometers (km) from Colombo. From Hambantota it starts midway on the Hambantota-Kataragama road and on the east on *the* Wellawaya-Kataragama road. The service area of the scheme falls within Hambantota District, while the dam and the reservoir are located on the boundary of Hambantota and Moneragala Districts (Figure 1).

This paper is based on research carried out in the Project during one season, *maha* (wet season) 1986/1987. The 1986/1987 rains failed in this region of the country. Because the 1986 *yala (dry* season) had been the first season of operation on the newly settled lands of Kirindi Oya, farmers were cultivating for the first or second time. Our field research focused on a particular

[1] A sign m the office of the Resident Engineer (Headworks) gives an active storage capacity of 160,500 acre-feet (198 million cubic maters), and dead storage capacity of an additional 22,000 acre-feet (27 million cubic meters).

Figure 1. Map of Kirindi Oya Irrigation and Settlement Project



distributary channel located towards the tail of the area irrigated that season (although it will be a middle area when the scheme is completed). The work was carried out by one of the authors, a Research Officer at IIMI, under the supervision of the senior author.

The research focused on the planning of the season, and the operation of the new irrigation system, as viewed by both farmers in the sample area, and officials from various departments at field and middle levels of their agencies. Not surprisingly, since this is a new scheme. there were operational problems from the beginning. These are described and the organizational and management weaknesses underlying them are analyzed. About six weeks into the season, it became clear that the anticipated rains had failed, and the reservoir was emptying rapidly. We analyze the response of the various institutions and participants in the system to the drought, and the impact of the eventual crop failure. The stresses created by the water shortages revealed rather starkly certain fundamental institutional weaknesses that need attention by higher-level officials. The impact of the crop failure was disaster -- in the short term, at least, further impoverishment of already rather poor settlers; and in the long run, a potential loss of faith in the institutions and officials that will make future improvement of the system more difficult.

The paper is organized as follows: the rest of Chapter 1 provides background information on the Project, its planning and development, physical features, and institutional structure, and describes the sample area and research methods. Chapter 2 discusses what happened during maha 1986/1987, from the planning phase to the failure of the crop, and its impact on the settlers. Chapter 3 analyzes the institutional response and roots of the problem. Chapter 4, recapitulates the connections between the problems and distress people faced and the institutional stresses, and identifies some steps that could be taken, as well as future research needs.

PLANNING AND FINANCING OF THE PROJECT

The planning of the new scheme began in the 1950s, originating with the drawing up of a tentative plan for developing the water resources of eight major river basins, including the Kirindi Oya. A reconnaissance report on the natural

resources of Kirindi Oya Basin was done in 1956. Following this the Irrigation Department (ID) did further studies from 1961-1975, including a survey of the area in 1973 by the Survey Department.

The Asian Development Bank (ADB) got involved in the scheme in March 1976, when the government requested assistance for what was then known as the Lunugamvehera Reservoir Irrigation and Agricultural Development Project. Subsequent visits by the Bank in May and July 1976 identified the project as suitable for bank assistance. The Bank approved US$49,000 for further investigation and technical assistance. In 1977, a Bank appraisal mission visited the project. Based on its findings in the field, feasibility reports, and discussions with the government, the Bank approved a loan of US$24 million to finance the entire foreign exchange cost.

The involvement of other donors for co-financing started in April 1978 and September 1979, resulting in the reduction of the Asian Development Bank loan to US$20 million. The International Fund for Agricultural Development contributed US$12.0 million, and *Kreditanstalt fur Wiederaufbau* contributed US$13.3 million (Asian Development Bank 1986).

Various factors, including a high inflation rate, shortage of skilled labor, and a delay in *finalizing* the contract delayed starting dam construction until September 1980, one and a half years behind schedule. The estimated cost of the Project increased owing to these factors. A review of the cost estimate in December 1980 revealed a cost overrun of about 105 percent of the total cost estimated in August 1977.

This prompted the government to request *the* Bank and the co-financiers to provide supplementary financing. In response, the Bank *carried* out or financed comprehensive reviews and studies reassessing the technical viability of the Project. In order to narrow the gap between available finances and *the* updated cost estimates, possible modifications of the scope and phasing of the Project were considered, keeping in mind the technical and economic viability of modified proposals published in November 1982. The International Fund for Agricultural Development and Kreditanstalt fur Wiederaufbau also joined in the investigations. This review led to *the* phasing of the scheme. Phase I, which included construction of the *reservoir* and part of the new system, and rehabilitation of the old areas, was to be financed by the funds provided for the original Kirindi Oya Irrigation Settlement Project together with supplementary financing. The estimated cost of Phase I was US$79.9 million, of which US$68.9 million would be provided by the donors. Construction in some of the proposed new settlement areas was postponed to Phase II.

DEVELOPMENT AND BASIC FEATURES OF THE PROJECT

The Kirindi Oya Irrigation System has been designed to incorporate six existing tanks and a new irrigated settlement area. The system includes four subsystems:

1. The Ellegala System, tapping Kirindi Oya with five tanks which have been in existence for many years (the "old" system), supplemented from the new left-bank main canal;

2. The right-bank main canal system, with three new irrigation tracts in Phase I and four in Phase II.

3. The left-bank main canal system with two new irrigation tracts in each phase.

4. The Badagiriya System on the Malala Oya, also a pre-existing system, with supplementary water to be provided from the right-bank canal.[2]

The objective of the Project is to develop approximately 13,000 hectares (ha) of land, including 5,870 ha in the new area of the right bank, 2,560 ha of new land on the left bank, and 4,584 ha of existing irrigated land (Table 1). In the new area, 5,151 ha are classified as well-drained soils, not suitable for flood irrigation, 1,908 ha as lowland, suitable for rice, and the remaining 1,371 as intermediate lands (Asian Development Bank 1982:7). An important rationale for the integration of the existing old system with the new system was to raise the annual cropping intensity of the older system from 139 to 200 percent (i.e., full cropping in both yala and maha).

[2]This was supposed to be included under Phase II, but the Central coordinating Commitee recently decided to exclude it *because* of shortage of water.

Table 1. Area irrigated, in hectares. under Kirindi Oya Scheme

Source of irrigation	New area	Old area	Total
Lunugamvehera			
Right bank	5050		5050
Left bank	3275		3275
Existing tanks		4584	4584
Total	8325	4584	12909
Percentage	65	35	100

Irrigation System Layout

The right-bank main canal, when completed, will be 33 km long, terminating at the Badagiriya Tank (Figure 1). Ultimately it is to serve 5.869 ha as well as supplement the Badagiriya System. The design capacity varies from 13.0 cubic meters per second (m^3/sec) at the head reach, to 2.0 m^3/sec at the tail. It is equipped with 15 gated regulators in the first 20 km to maintain water levels. The first 20 km pass through Tracts 1, 2, and 5 (Phase-I Tracts) and the remainder through Tracts 3, 4, 6, and 7. The distribution system of the right-bank main canal includes a branch canal about 4 km long, 45 km of distributaries, and about 153 km of field channels.

The left-bank main canal takes off from the downstream end of the left-bank sluice outlet and runs south for 14 km. A feeder canal from the left-bank main canal returns to the original river bed to supply water to the Ellegala System. The Weerawila and Pannagamuwa tanks are fed from a right-bank inlet from the river bed while the Debarawewa, Tissa, and Yoda tanks are fed from the left-bank inlet. The left-bank main canal serves Tracts 1 and 2 in Phase I and Tracts 3 and 4 in Phase II.

The Organizational Structure of the Project

The organizational structure for development and management of the Project is described and analyzed in detail in Chapter 3. The two major implementing agencies of project development during the planning and construction phase have been the ID and the Land Commissioner's Department, both within the Ministry of Lands and Land Development. The ID is responsible for planning and design and construction of the irrigation infrastructure and other capital investments, while the Land Commissioner's Department is responsible for layout and development of settlements. selecting settlers. and assisting settlers in adapting to their new environment. Because the Project has moved into an operational phase, the importance of other departments, particularly the Department of Agriculture, Department of Agrarian Services. and more recently the Irrigation Management Division (IMD) of the Ministry of Lands and Land Development have become increasingly important.

The main project-level decision-making body is the Project Coordinating Committee (Figure 2). This is chaired by the Government Agent, Hambantota. Members include the senior executives of the various departments involved: the Chief Resident Engineer and three Resident Engineers of ID, the Project Manager (Settlement) from the Land Commissioner's Department, the Assistant Commissioner of Agrarian Services, the Assistant Director (Agriculture) and the Agriculture Officer of the Project, the two Project Managers of the IMD, and representatives of other government departments and semigovernment bodies in the Project area.

Settlement of Cultivators on the Right Bank

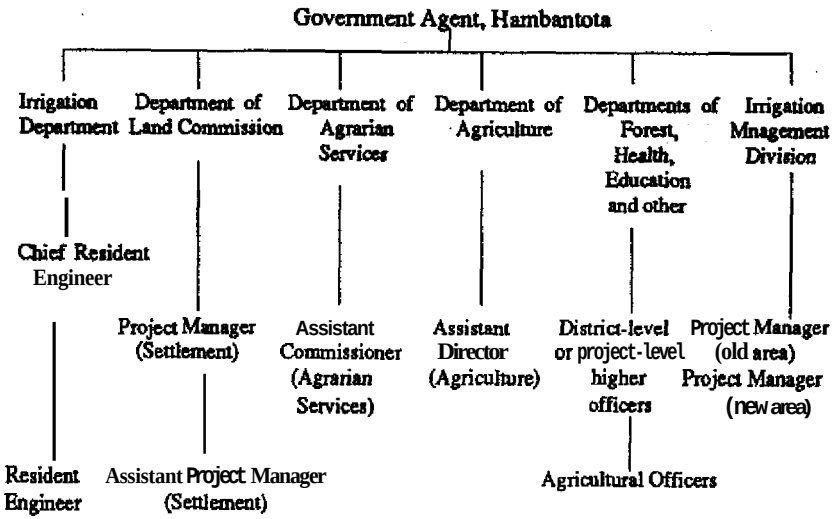
During Phase I, 2,713 families were to be settled in 11 "hamlets" on the right bank; "hamlet" is the term used to refer to villages, which are numbered and not named. By late 1986, 2,429 families (90 percent of the target) had been settled. The distribution among right-bank tracts is shown in Table 2.

Table 2. Distribution of hamlets by tract, and number of families settled,

Area, right bank	Number of hamlets	To be settled	Actually settled
Tract 1	4	851	803
2	3	857	768
SA	2	448	322
5B	2	557	536
Total	11	2713	2429

Source: Land Commissioner's Department

Figure 2. Project Coordinating Committee



Notes:
1. Additional Commissioner (Land) attends this meeting as representative from the Land Commissioner's Department.
2. District Minister attends meetings when important issues are discussed,

Prior to 1970, settlement in irrigation schemes followed a linear spatial form along the canals. It was felt, however, that this was detrimental to developing social cohesion and made providing centralized *services* difficult. Therefore, in planning Mahaweli settlements, it was decided to establish hamlets of not more than 100-125 settlers in clusters and close proximity. It was hoped this would lead to closer cooperation and cohesion by allowing for primary contacts. Later, with the first accelerated Mahaweli System (System C), this was enlarged to 200-250 families to broaden the social relationships *being* established to reduce the costs of providing services. Thus the Kirindi Oya settlement pattern reflects the current settlement planning procedures (Stanbury 1988:22-23).

In a farming community like Kirindi Oya a farmer should be able to travel quickly and easily to his farm. In earlier schemes this was not possible because homesteads were separately located on the unirrigable highlands, often far

from the irrigated land. This "socio-agro distance" was shortened in the Mahaweli scheme from 1.6-2.4 km to 0.8 km by locating irrigable area close to the homesteads (Bulankulame 1986:4). In Kirindi Oya, in some cases this criterion of socio-agro distance is not met.

For irrigation and water management the layout of the irrigation system may faciliate or constrain the development of farmer participation and the formation of user groups for irrigation management at the tertiary and secondary levels. Therefore placement of farmers who use a common water course or outlet in one hamlet develops common interests and a sense of belonging. Amunugama (1965:146), writing on Chandrikawewa, says:

> The nearest approximation to the "jural integrity" of the village that obtains in a colonization scheme is the solidarity of the colonists living along a distributary channel...There is a community of interests in that the cultivations of all the colonists in that group depend on the flow of water along that particular canal.

The Kirindi Oya situation approximates but does not achieve this standard; Table 3 shows that in several cases farmers on the same distributary channel are split between two hamlets. Because distributary-channel organizations were initially organized by hamlet, this has led to some difficulties, as is discussed in Chapter 3,

Table 3. Correspondence of residential area and distributary.

Main and secondary system	Residential area
Branch Canal-12 - Distributary Channel-2	Hamlet 11
Branch Canal-12 - Distributary Channel-3	Hamlet 10 and 11
Branch Canal-12 - Distributary Channel-4	Hamlet 10
Branch Canal-12 - Distributary Channel-5	Hamlet 10
Branch Canal-12 - Distributary Channel-6	Hamlet 10
Branch Canal-12 - Distributary Channel-7	Hamlet 10 and 11
Branch Canal-12 - Distributary Channel-8	Hamlet 8 and 11

Source: IIMI field survey.

LOCATION OF THE RESEARCH: THE SAMPLE AREA

Irrigation System Layout and Allotments

The area studied during maha 1986/1987 is located in Tract 5B, under the right-bank main canal. This area was chosen with a view to the longer-term research planned in Kirindi Oya.[3] It is located in an area that is presently near the tail of the system. but will be in the middle after Phase II is constructed; it is on Branch Canal-2 so that the performance of a moderate-sized subsystem can be studied in the future; and it contains both poorly drained and well-drained soils, which will facilitate work on irrigation management for crop diversification in the future.

Branch Canal-2 is equipped with single-gated underflow-type regulators. Water is conveyed to the fields through distributary channels and field channels equipped with gated offtakes. Distributary channels originate from the right-bank main canal as well as from Branch Canal-2. Though direct field channels originating from Branch Canal-! are common, direct field channels from the the right-bank main canal are rare. Sub-distributary channels and sub-field channels are also common. Water is supplied to each allotments by field or sub-field channels which have concrete farm outlets with removable wooden gates.

The sample area consisted of all the land irrigated by Distributary Channel-2 of Branch Canal-2, in Tract 5. All the field channels (Table 4 and Figure 3) on this distributary were studied. In addition. 10 allotments (11.5 percent of the total) were chosen from the head, middle, and tail of Distributary Channel-2 from three field channels to observe agricultural behavior. The three field channels were numbers 10, 13, and 14.

Distributary Channel-2 irrigates 87 official 1-ha allotments. There are 7 field channels, giving an average of about 12 allotments per field channel, The irrigated area is 87 ha. Field Channel-9 has the smallest number of allotments (5), while Field Channel-13 has the most (19). All the allotments are

[3] This longer-term research was initiated in February 1988, with funding assistance from the Asian Development Bank.

served by field channels and there are no direct farm turnouts from main canals, branch canals, or distributary channels, in contrast with older Sri Lankan systems. The distributary and field channels are equipped with gates which can be locked for rotational issues.

Table 4. Field channels of Distributary Channel-2, with number of allotments.

Field channels	Number of allotments	Number of sample allotments	Location
Field Channel- 9	05		Head
Field Channel-10	15	03	Head
Field Channel-11	09		Head
Field Channel-12	16		Middle
Field Channel-I3	19	04	Tail
Field Channel-14	16	*03*	Middle
Field Channel-15	07		Head
Total	87	10.0	
Percentage	100	11.5	

Source: Household survey of Hamlet 11 and Distributary Channel-2, maha 1986/1987

Land tenure is an important factor affecting irrigation management. We found 89 operators, though there are only 87 allotments; this is not due to land fragmentation but to 2 encroachers residing in and cultivating 0.2 ha each, in 2 allotments allocated to 2 settlers.

Social Characteristics of the Settlers

Out of the 93 household heads in the Distributary Channel-2 sample area only 89 were operators. The involvement of 93 persons in 87 allotments is shown in Table 5.

Figure 3. Blocking-out plan for Distributary Channel-2, Branch Canal-2 of Kirindi Oya Right Bank.

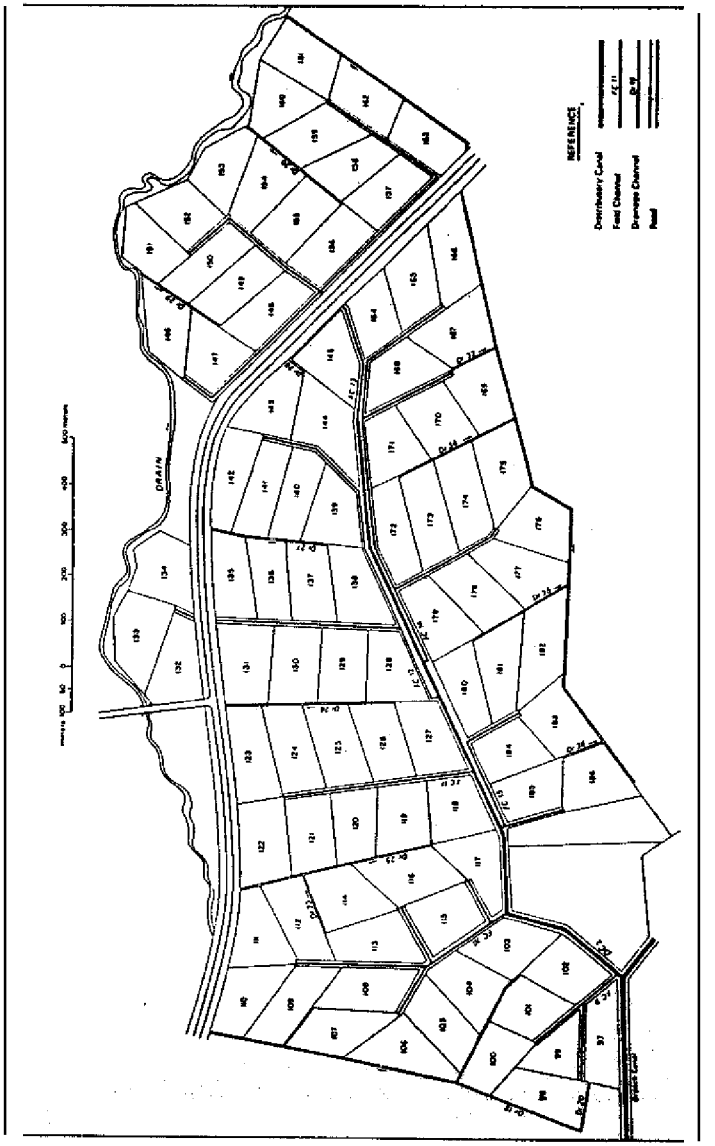


Table 5. Legal status of household heads in sample area.

Status	Number of persons	Residence
Legal settlers Operating	84	Hamlet 11
Legal settlers deprived of land by original inhabitants claiming the land as their freehold	02	Hamlet 11
Legal settler (leased out)	01	Hamlet 11
Others		
Encroachers cultivating a portion of settlers' land	02[a]	Adalla. in the field
Encroachers residing in the field but not cultivating	01[a]	Adalla, in the field
Leased-in farmer (government servant)	01	Hamlet 11
Two original inhabitants cultivating lands allocated to settlers claiming it as their freehold	02	Adalla and Uduwila
Total	93	

[a]Evicted from land two months after the commencement of cultivation by Project authorities.

Source: Household survey, maha 1986/1987.

The 87 allottees with rights to land in Distributary Channel-2 live in Hamlet 11. With the exception of three farmers (two under Field Channel-10 and one under Field Channel-13), all have been settled in Hamlet 11 so that those who share water from a common field channel would be neighbors. The three exceptions, though living in Hamlet 11, are not neighbors of others sharing water from their field channels. This has happened because they had exchanged the original allotments given to them for new ones. Out of the 87 allottees, 3 are not actual operators: 2 because the freehold for their lands has been claimed by original inhabitants and 1 because his allotment has been leased out to a government official.

The other five household heads in the household survey are not settlers. The two who claim lands allocated to settlers as their freehold live in Adalla and Uduwila, *purana* (preexisting) villages near Hamlet 11. The other three are encroachers residing in the Adalla field area, two cultivating a portion of land held by two legal settlers and one residing in a small portion of land cultivated by a settler.

It should be noted that there is no basis for claiming that settlers of Hamlet 11 are in any statistical sense representative of the larger scheme. It has been mentioned to us that this hamlet includes relatively more wealthy people who are not as serious about cultivation as others, but we have no basis for evaluating this claim. In general, however, contacts with settlers from other hamlets strongly suggest that Hamlet 11 is not unique or unusual in any significant way.

All the household heads in our sample are Sinhala Buddhists from southern Sri Lanka. The majority of settlers in Distributary Channel-2 are from Hakmana and Deniyaya electorates in the Matara District. Of the four from Tissamaharama, two are relocatees who previously had irrigated land under Lassanawewa, a small old tank which was breached in order to be included in the command area. The other two are encroachers in the area which came under the scheme.

The population includes three different caste groups, *Govigama, Vahumpura,* and *Rada*. The majority in Distributary Channel-2 are of Govigama caste, but all the farmers on two particular field channels are of Vahumpura caste. We could not observe in detail the impact of caste differences on behavior in their face-to-face interaction in daily life,

Except for the 9 households from Tissamaharama and 1 from Ratgama (6 out of these 10 are not legal allottees), all the settlers moved into the scheme in 1985 and 1986. Although settled officially in the hamlet, 13 of these families do not reside there permanently. Even those who are settled permanently make regular visits to their original villages in the Matara District to see the family members who remained in the villages. The lack of facilities such as

drinking water, health, and education are the main reasons for the delay in bringing family members to the settlement.

The first water issue to Distributary *channel-2* was made nearly one year after people were settled in Hamlet 11. They were given free food rations through *the* World Food Program during this period. Because the land development and other work in the area, however, were done by contractors who preferred to hire their own men, there was no possibility for the settlers to work as wage laborers. Out of the 87 allottees in the sample only 4 had employment as casual *wage* laborers in infrastructural development work in the Project.

The settlers brought with them to the settlement building materials to build temporary houses for shelter, pots and pans to cook, some furniture, money to buy essential items, bicycles, and radios. The authorities give Rs 1,500 (US$50) to each settler who builds his house to official specifications. Settlers who do not adhere to the specification do not receive this allowance. We have no data on how many people in Hamlet 11 actually received the allowance.

Out of the 93 household heads in *our* sample, *89* were males and 4 were females. The 4 female and 71 male households heads were married while 18 males were bachelors. Eighty-eight household heads migrated to the settlement area from the Matara District where education facilities are available, There were 2 graduates, 34 qualified at GCE (Advanced Level) (senor secondary), 26 with secondary education, and 27 with primary education among the 93 settlers. Those who have senior secondary and higher-level educational qualifications said that when they met their Members of Parliament with the hope of getting employment they were given land instead. The educated settlers seemed to prefer employment to farming. The use of *wage* laborers from their original villages by these educated young farmers was observed during maha 1986/1987. Some were even reluctant to do manual work in *the* field.

RESEARCH METHODS

This research was planned to focus on the institutional *aspects* of irrigation system management in a new settlement scheme. *As* mentioned above, the sample area was chosen with longer-term research objectives in mind. A research officer was assigned to the sample area to begin the research in October 1986. In order to become acquainted with the area, settlers, and officials, the research officer spent the first month establishing rapport. During this period he met many people informally to explain the research and to get to know people. He also obtained official data about the system and sample area such as maps, household lists, water-issue schedules, and organizational charts of *the* agencies.

After this first month, the research officer concentrated on gathering data by participant observation and informal interviewing of key informants, officials, and settlers, Because he arrived at the *start* of maha 1986/1987, he focused on systematic recording *of* irrigation and agricultural behavior; interviews and observation of agency officials' behavior, and activities (meetings, water deliveries, etc); interviews with farmers; and observation of farmers' organization meetings and farmers' meetings with officials.

We began gathering quantitative data after having established some rapport with farmers. These included a household survey of the sample area and recording of agricultural and irrigation activities. The primary focus, however, was on collecting qualitative data on peoples' behavior and perceptions, values, and interpretations. As the season progressed, and there *was* a shift from struggling with water distribution problems to drought -- total lack of water -- the research focus also shifted to the response of both settlers and officials to the crisis at hand

Chapter 2

Water Management in Maha 1986/1987

WATER MANAGEMENT AT THE SYSTEM LEVEL

Planning Procedures

THE PLANNING PROCESS for the Season depends largely on the availability of water in the reservoir. The Project Coordinating Committee. of the scheme, which consists of higher-level project officers and some district-level officers of the line agencies, meets monthly under the chairmanship of the Government Agent, Hambantota. This committee evaluates project performance during the previous months. Issues relating to agricultural programming for the corning season are also discussed at these meetings. The water Level in the reservoir is also reviewed.

Before the beginning of a season, if the water level is at 33 percent or more of the total capacity, a decision to commence the cultivation season can be made. The dates are officially fixed at *kanna* (cultivation) meetings after discussing the relevant issues with farmers in detail at "pre-kanna" meetings. Issues such as the extent of the area to be cultivated for the season, the areas to be given priority, and crops or seed varieties are also discussed at the Project Coordinating Committee meetings, to reach a consensus among officials before the pre-kanna and kanna meetings. The District Minister, Hambantota, attends project coordinating committee meetings when important issues are discussed. The Project Coordinating Committee plays the policy-making role usually played by the District Agricultural Committee.

Pre-kanna meetings for the season were held in mid-October, nearly one month prior to the first water issue. Kanna meetings were held one week later.

These meetings, held at each tract (1 to 7) to enable farmers in all the tracts to participate, are preparatory meetings for the kanna meetings, and are attended by higher-level project officers, middle- and field-level officers of line agencies such as the Departments of Irrigation, Agriculture, Agrarian Services, Irrigation Management Division (IMD), *banks.* and the Agricultural Insurance Board. The meetings were organized by inviting farmers through two agencies, the Land Commissioner's Department through colonization officers and the IMD through elected field-channel leaders.

In Kirindi Oya the pre-kanna meetings were chaired by the Project Manager (Settlement) or his deputy. The purpose of the meetings is *to* explain the proposed agricultural program for the season to the farmers and get their approval, However, the 1986 pre-kanna meetings were used by farmers to present their grievances to project-level higher officers and discuss the problems encountered in the previous season, which in their view occurred because of the negligence of officials. Though the officials attending the meeting cannot find immediate solutions to some of these problems, the farmers are allowed to express themselves in order to avoid a tense situation at the kanna meeting itself.

In this sense, the pre-kanna meeting fits well into Sri Lankan culture. A good comparison would be *Ankeliya*, a traditional drama performed in southern Sri Lanka in the worship of Goddess Pattini. In this drama erotic and aggressive impulses are expressed overtly in symbolic form in order to create a harmonious and peaceful social environment, Similarly. pre-kanna meetings provide a forum for arguments and disscussion -- expression of conflicts and tensions -- which lead to agreement between farmers and official. As a result, kanna meetings normally end harmoniously, usually with the farmers consenting to the official agricultural program for the season.

The kanna meeting is held under the provisions of the Irrigation Act and is presided over by the Government Agent or an officer representing him. The meetings is attended by project-level officers, middle- and field-level officers of line agencies, and in some *cases* district-level officers of these agencies. The decisions taken at the pre-kanna meeting are usually officially confirmed at the kanna meeting.

At the kanna meeting held in Hamlet 11 for the Tract-5 irrigation area, the plans for water *issues* and cultivation presented to farmers at the pre-kanna meeting were ratified. The decisions made at the meeting were:

completion of canal cleaning work before 30 October 1986,
commencement of water issue on *05* November 1989,
completion of sowing by 05 December 1986,
cultivation of three-to three-and-a-half-month rice varieties,
stoppage of water issues on 05 March *1987*, and
commencement of harvesting from 20 March 1987.

The Irrigation Engineer (Bight Bank), who represented the Irrigation Department (ID), made additional comments regarding the date of *commencement* of water issue. He explained to the farmers that the Department had to reduce the water level in the reservoir to repair the spillway gates. Be expressed hope that the repairs would be completed by the end of October and the water level in the reservoir, which was 50 meters above mean sea level (MSL) on the day of the meeting, would rise to 51.8 meters above MSL, the minimum required to commence water issues. In addition he remarked that water-distribution problems would crop up because 4,247 ha are to be cultivated during this season instead of 1,162 ha cultivated in the previous season (the system's first season).

Though damage to crops by stray cattle was a major issue at the meeting, no proper plan to protect the crop was presented. The only solution was for the farmers to build fences around their fields, according to the Assistant Commissioner, Agrarian Services. But farmers requested the Additional Government Agent, who represented the Government Agent, to issue gun licenses to shoot stray cattle. The farmers claimed that when the *crop* is damaged, the cultivation officers to whom the farmers complain invariably take the side of cattle owners, a powerful land-holding gentry known locally as *gambaraya.*

Operating Procedures

Operation of sluice gates, gated regulators, turnout gates along main canals, branch canals, and distributary canals down to the field-channel turnouts is done by the ID. The highest project-level ID officer is the Chief Residential Engineer, who is assisted by the Senior Irrigation Engineer (Water Management), and the Resident Engineers and (Right Bank, Left Bank, and Head Works). Each Resident Engineer has an irrigation engineer to assist him in operation and maintenance functions.

The actual operation is done by "irrigators" (*jalapalaka kamkaru*) on the instructions of technical assistants. The technial assistants are assisted in their work by Work Supervisors, who are supposed to make regular field visits. Before commencement of the water issue for the season, the technical assistant is expected collect data on land use under distributary channels and those field channels receiving direct issues from main canals or branch canals and submit data to the irrigation engineers of the respective areas in the right or left bank; in reality the design assumptions are used. The irrigation engineers with the assistance of the technical assistants calculate water requirements for their irrigation areas based on crop water requirement tables. A copy of the water requirement schedule is sent to the Senior Irrigation Engineer for water management. The water-issues down to the field channel turnouts are supposed to be made according to these water requirement schedules. Releasing water from the reservoir in terms of these schedules is done on the instructions of the resident engineer in charge of the respective main canal. When the implementation of a rotational issue is necessary, water-issue timetables should be prepared by technical assistants for the areas under their charge, supervised by the irrigation engineer.

The technical assistants in charge of particular irrigation areas are responsible for the operation of the gated regulators on main canals and branch canals in their areas, in addition to distributary- and field-channel turnout operation for the distribution of water, These gated regulators are operated in such a way that while various discharges are made, the water level in the main and branch canals should remain the same.

Water distribution in turnout areas is supposed to be handled by farmers organized into turnout groups. Field-channel leaders are elected by the farmers under the guidance of the project manager. The technical assistants had handed over the wooden farm turnout gates to field-channel leaders to enable them to implement rotations.

Irrigation Behavior

Water issues for the season started with the arrangements described above. The water level in the reservoir was 50 meters above mean sea level (MSL) on the day of water issue from the reservoir; below the established level of 51.8

above MSL required for starting deliveries. Water issues to the five tanks under the Ellegala System had been done sometime earlier when water stored in the reservoir was released to facilitate repair of the spillway gates. The water issues were done on a rotational basis for which a very complicated water issue timetable had been prepared (see Appendix). It involved rotations both among and within field channels. In fact, there was a constant flow in the main and branch canals, and a constant but reduced flow in distributary channels throughout the period of water issue.

Operation down to the field-channel turnout was done by irrigators, who were very busy in the field. Work supervisors made regular inspections. Technical assistants made field visits in order to give further instructions regarding water distribution. When field-channel leaders or farmers complained about their problems to irrigation engineers, technical assistants were directed to take appropriate action. Sometimes farmers met the technical assistants themselves in the field or in the office to find solutions for their problems. On occasions when farmers felt that appropriate action was not taken, they complained to the IMD Project Manager, who consulted the respective resident engineers to solve such problems. Irrigation engineers and resident engineers themselves monitored main canals to check whether appropriate water levels were being maintained in main and branch canals.

Despite these efforts by the ID, there was one occasion when the water level in the right-bank canal rose alarmingly during the night. Though the reasons for this are still a mystery, on the following day we observed that entire fields in Tract 5 were full of water, and water had overflowed onto the Hambantota-Wellawaya road in several places. According to reliable sources the technical assistants themselves had to do manual operation of the gated regulators on the right-bank main canal in order to prevent bund erosion.

From the following day onwards the water level in the right-bank main canal went down drastically, creating a scarcity of water in the right-bank area. The reason for this was the main canal bund erosion near the syphon between Tracts 1 and 2. Irrigation officials explained this as having resulted from a water block inside the syphon. Rightly or wrongly, however, many farmers and officials of other departments claimed the cause was management inefficiency on the part of the ID. The ID placed night watchers on duty at gated regulators after this incident. No water issues were made to the right-bank main canal for about one week following this incident, until the canal bund was repaired,

On another occasion during land preparation, the water level in the right-bank canal went down drastically following a short spell of rain. It was evident

that water issues to the canal were reduced on the rainy days on the instructions of the resident engineer. When the rain was over and farmers were in need of water, an inadequate amount of water was apparently released. It appears that water issues were not made because the engineer in charge was on leave on those days. An adequate amount of water was released only after his return.

There was another occasion of acute shortage of water to the Branch Canal-2 area following bund erosion of the branch canal. As a result, water issues could not be made to Branch Canal-2 for two days. With the exception of these incidents, normal water issues were made to the right-bank area during the early part of the season.

From the farmers' perspective, the "normal supply" issued by the ID seemed insufficient for land preparation. The farmers argued that four-hour water-issues to each allotment twice a week were not sufficient because they could not retain water in the fields. They preferred to have a constant flow during the land preparation period. Therefore, farmers refused to follow the water-issue timetable and adhered to simultaneous water sharing. The technique of simultaneous water sharing took different forms from one field channel to another, depending on the field conditions, the characteristics of the farmer population, and the participation of field-channel leaders. This is discussed further in the latter part of this chapter, It was somewhat difficult to practice simultaneous water sharing because the ID implemented a rotation down to the field channels, which tended to disrupt farmers' attempts to share water simultaneously.

Simultaneous water sharing in turnout areas under a rotational issue at the system level had serious consequences for most of the tail enders. There was a chaotic situation during the first week of water issues in turnout areas. Water stealing and illegal tapping of field channels were very common during this period. This tense situation, however, improved after a short while when tail enders could use seepage and drainage water. The tail-end farmers of long field channels and tail-end field channels of distributary channels who did not have access to drainage or seepage water, however, had tremendous difficulties in irrigating their allotments.

In addition, the farmers complained of defective canals, farm turnouts and other irrigation structures which resulted in shortages of water to their allotments. Some complained of unsatisfactory land leveling and ridge construction by contractors which made it impossible to irrigate their allotments. Though we could not observe all these defects at the system level, we heard farmers complaining to irrigation officials of such defects at almost every distributary channel-organization meeting in the right bank area.

The system-level problems in Kirindi Oya during this season were overshadowed by the scarcity of water in the reservoir. It is true that if there had been sufficient water in the reservoir, some problems could have been avoided or their effect could have been minimized. Yet solutions for other problems would still have been needed to save water and get maximum benefit out of it.

Shortage of water and irregular supply were the major problems encountered by farmers during the land preparation period. Because the ID staff had apparently been provided theoretical and not actual water requirement tables, their water requirement calculations might have been far from reality. Some irrigation officers were of the view *that* the shortage of water *daring* land preparation could have been avoided by making constant issues to all the field channels, and overloading them, given the lack of actual water requirement data. But this could not be done because of the scarcity of water in the reservoir.

Another reason for the shortage of water to tail enders was lack of active participation by field-channel leaders -- allottees elected by farmers with legal rights *to* land and water from that field channel -- in the water distribution. Except for a few rare cases in Tract 1, we did not observe or hear about active participation by these leaders in the water distribution. This is mainly because the farmers' organizations were in a formative stage, and also owing to the defects in farmer organizations. The defects in farmer organizations are discussed in the next chapter.

The irregular supply was also caused by bund erosion of canals and management problems over a period of 14 days of acute water shortage *to* the Branch Canal-2 area and 2 days' shortage of water to the entire right-bank area during the land-preparation period.

THE DROUGHT AND ITS IMPACT

Water issues for the season were made with the expectation of heavy rains from November to January, as is normal for this period. Instead, the rains failed and there was a severe drought. The water level in the reservoir, which had dropped to 49.5 meters above MSL on the day water issues to the right-bank began, fell below dead level to 46.8 meters above MSL by 1 January 1987. Data available in the office of the Resident Engineer (Headworks) show that water issues from

the right- and left-bank sluices began declining drastically in early January 1987. Discharges into the right-bank main canal, which had ranged between 2.83 and 5.04 m^3/sec in November and December, dropped to 2.7m^3/sec on 8 January, and to 0.7 m^3/sec by 13 January. Thereafter, the range for the remainder of maha 1986/1987 was 0.7-1.1m^3/sec. As a result, water levels in the main canals could not be maintained to issue water to downstream tracts.

In addition, water levels in the five tanks under the Ellegala system had by this time also declined alarmingly. There was a demand by the farmers in those areas for water from the Lunugamvehera Reservoir. At the establishment of the settlement project, these farmers been granted priority rights to the water.

The Project Coordinating Committee held a special meeting in early January and reviewed the situation. It took a decision to retain the Tract-1 areas under the right- and left-bank systems and the old area under the Ellegala System. The tail-end parts of Yoda and Weerawila Tanks (under Ellegala), where cultivation had started almost a month late, were doomed to fail because of lack of water.

The overall result of the season as reported by the water management consultants working in Kirindi Oya is shown in Table 6.

Table 6. Cropped areas in hectares, maha 1986/1987.

	Developed	Planted	Saved
New area			
Tract 1	1347	1115	647
Tract 2	1747	1332	0
Tract 5	990	771	0
Old area			
Ellegala	3712	3600	3400
Badagiriya	850	0	0
TOTAL	8646	6818	4047

In late January, even the cultivation under Tract 1 on the right-bank was on the verge of complete failure as a result of scarcity of water. At this stage field-channel leaders organized a *shramadana* (cooperative labor campaign) under the guidance of the Project Manager (IMD) to dig a canal inside the reservoir to bring the remaining dead storage water to the right-bank sluice gate. With the heavy equipment provided by the Chief Resident Engineer and free manual labor from the farmers in Tract-1 area, work was completed within a short period. The IMD Project Committee met in late January and decided to approach the farmers of the right-bank Tract-1 area to appeal to them to try to save only the crop which can survive with the application of water once in a two- to three-week period. As most of the field channel tail-end allotments were cultivated two to three weeks late. they could not be retained because of the scarcity of water. The field-channel leaders agreed to suggest this proposal to the Tract-1 farmers.

The agricultural instructor in Weerawila Division, who was the secretary of the Project Committee, walked from one field channel to another in the Tract-1 area with field-channel leaders to sort out the allotments that could be saved and to explain impending danger of the drought to the farmers. Several meetings were also held in Tract I, organized by the respective distributary channel-level organizations, to explain the proposal of the Froject Committee to farmers. Though some farmers agreed to it, many opposed the idea with the remark that if disaster strikes, everybody should die, not just a selected few.

There was great resentment among the farmers in Tracts 2 and 5 and tail enders of Weerawila and Yoda Tanks over the crop failure. Many who were solely dependent on cultivation were desperate. Poverty and hopelessness generated in them an anger against government agencies, which they viewed as responsible for crop failure. In the days of severe scarcity, they searched €or clues to put the responsibility for failure on the organization involved in water management and decision making regarding the cultivation season,

The major "cause" of the crop failure, in many farmers' eyes, was the reduction of water levels in the reservoir to complete the construction of the spillway gates. This was begun sometime prior to the first water issue for the season. There had been some delays on the part of the contractor in construction of the spillway gates. The ID was asked to fill the reservoir for its ceremonial inauguration before the gates had been completed. According to ID officials, it was therefore necessary to complete the installation of the spillway gates while the reservoir was low, and before heavy rains were anticipated.

Unfortunately, perhaps due to inadequate internal communications, the ID officers who participated in kanna meetings informed the farmers that the ongoing "repairs", (i.e., completion of the spillway gates), was one reason for the delay in issuing water for the season. They also mentioned as other factors the scarcity of water that resulted from reducing the water level for the repair, and the delay in the northeast monsoon rains.

According to the kanna meeting reports published by the Government Agent, Hambantota (1986/1987), ID officials had made specific remarks about the quantity of water released for the repair. At the Tract-5 kanna meeting where we were present, the Irrigation Engineer (Right Bank) mentioned the reduction in storage but was not specific about the quantity. But the reports of the Tract-2 kanna meeting quote the Resident Engineer (Right Bank) as saying that the reservoir was "emptied" (*sampurnayen hiskala*) for repair. We were not present at the meeting and do not know if this is correctly reported. The impact of the reports, however, on the general opinion of the farmers and other agency officials was apparent. They quoted these reports at a later stage and remarked that the cultivation down to the end of Tract 2 could have been easily retained if not for this "mistimed" repair.

Farmer representatives of the old area claimed they had witnessed, over a period of two months, water flowing along the river as if it were a time of flood, during the period of repairs to the spillway gate. Their main accusation was that water was released to Kirindi Oya without filling the five tanks under the Ellegala System.

The Chief Resident Engineer whom we interviewed on this matter was of the opinion *that* the quantity released during the period of repair was around 8.64 million cubic meters, an "insignificant quantity" which could not contribute much to retaining *the* larger area dried up in the season. The reason this work was necessary after just one cultivation season was unfortunately not explained to farmers, The general rumor among farmers and some agency officials, however, was that water issues for yala 1986 were made without properly completing the spillway gates because of a hasty decision of politicians *or* higher-level officials.

WATER MANAGEMENT AT DISTRIBUTARY LEVEL,

Official Procedures for Water Issues

The first water issue to Distributary Channel-2 for maha 1986/1987 was on 10 November 1986, four days after the head-sluice scheme of the right bank was opened for the season. The water requirements for the channel had been calculated based on ID guidelines by the technical assistants, under the supervision of the irrigation *engineer*. Although the technical assistant was expected to prepare a water-issue timetable for his irrigation area prior to the commencement of water issues, the timetable was not ready on the first day of the water issue. The ID. however, delivered the timetable to the farmer organizations four days later.

The technical assistant is in charge *of water* distribution *down to* the field-channel turnouts. He is assisted by a work supervisor and an irrigator. The water distribution below these turnouts is the responsibility of the field-channel leader. The IMD had by this time *arranged* election of leaders on each field channel where water issues were to be made for the season.

The Water-Issue Timetable: Official Assumptions on Water Distribution

In their *messages* to farmers at meetings held prior to water issues for the season, the ID officials stressed the necessity of adhering to the water-issue timetable of rotation to avoid distribution problems. The emphasis on rotation conveyed the view of the irrigation officials that the Kirindi Oya canal system has been designed for rotational water issues which includes rotations among and within field channels. Therefore, it was understood that any deviation would result in distribution problems. This view was further reiterated by the Irrigation Engineer (Right Bank) at a meeting held *on* the first day of water issue in Hamlet 11, and the official view was expressed by him at this meeting:

> Distributary Channel-2 has been designed to carry six cusecs (170 liters per second), while each field channel carries one cusec (28.3 liters per

second), (there are seven field channels). Therefore. the quantity of water in a field channel at a particular time is not sufficient for all the farmers on that fieldchannelto draw water simultaneously. Any attempt at simultaneoussharing of water would ultimately result in shortage and nonavailability of water to tail-end farmers. It never guarantees an equitable distribution. The water-issue timetable guarantees two water issues for a period of four hours each within the first week, two issues for a period of three hours within the subsequent week, and so on for every allotment until the end of the season. If the farmers strictly adhere to the timetable, water issued during the time specified in the table suffices to irrigate an allotment

Implementation of the Water-Issue Timetable

With the commencement of water issues, we observed the irrigator making regular visits to the Distributary Channl-2 area to implement the field-channel rotation and make necessary adjustments in the turnout gates of the distributary channel to either increase or reduce the water flow in order to maintain appropriate water levels in canals. The work supervisor and the technical assistant made occasional visits to supervise the irrigator and give him further instructions regarding turnout Operation when necessary. I D officials attempted to implement rotational water issues according to the timetable on Distributary Channel-2 throughout the period from 10 November to the end of December 1986. This was interrupted from time to time by management and other defects, which we described in the first part of this chapter, and the rotation finally faded away as a result of severe drought

Water-Distribution Problems: Views of Farmers and Officials

During the period of water issues, Distributary Channel-2 farmers were confronted with such irrigation problems as shortage of water and irregular supply, which were often manifestations of distribution problems. It is true that the farmers did not follow the water-issue timetable recommended by ID

officials. Our field experience, however, suggests that nonadherence to the recommended timetable by the farmers was not the only cause of the distribution problems. In asking why farmers did not adhere to the timetable, the following causes of distribution problems were identified:

* disagreement between officials and farmers over the water-issue timetable;
* defects in the canals and structures, and shortcomings in land leveling;
* the impact of management of the larger system; and
* the ineffectiveness of farmer organizations in their formative stages to take the responsibility for field-channel water management.

Disagreement between officials and farmers over the timetable. The farmers in Distriburary Channel-2 were opposed to rotational water issues during land preparation because of the difficulties encountered in the previous season in retaining water in their allotments after irrigating them. Out of 87 allotments in Distributary Channel-2, 10 were being cultivated for the first time while the other 77 were being cultivated for the second time. Eighty percent of the land in this area has been classified as well-drained, where percolation and seepage is high according to the officers of the Agriculture Department working in the project. We observed that even fields which were full after being irrigated the previous day had gone completely dry on the following day. Because of this, farmers wanted a constant flow during land preparation to keep the soil muddy so they could do the plowing easily and within the time specified in the cropping calendar.

This observation of very high water requirements is consistent with the findings of Franks and Harding (1987), based on research in the Inginimitiy a Scheme, that during the first season, on a new system, individual field- channel commands use twice as much water as forecast at full development. Apparently the ID officials at Kirindi Oya did not take this into account in planning water deliveries.

Farmers also objected to the requirement for night irrigation. They claimed night irrigation is not practical because they cannot find and repair bund leaks at night to reduce water losses. Farmers who were cultivating for the first time also claimed that they could not retain water in their allotments because of the unsatisfactory field-bund construction by contractors. All these reasons finally led to their disregarding the timetable.

The views of irrigation officers regarding distribution problems contrasted with farmers' views. The officials viewed them as having resulted from the simultaneous water sharing by farmers, which they claimed cannot be successful because of the limited capacity of Distributary-Channel-2 and the field channels. The officers, however, seemed unconcerned about the farmers' inability to retain water in the allotments. On the other hand, the officers of the Department of Agriculture were in agreement with the farmers' demand for a constant flow during the land-preparation period. They were frequently in the field during the season and were aware of the farmers' practical problems of cultivation.

The ultimate outcome of this disagreement was the existence of two different water distribution practices on Distributary Channel-2, one by the ID down to the field-channel turnouts in accordance with the timetable, and the other by farmers below the field-channel turnouts, as an adaptation to a timetable which they could not change.

Defects in the canals and structures. The overflow of water in several places along the bund of Distributary Channel-2 was a common incident throughout the period of water issues. As a result, the irrigator had to reduce the water level in Distributary Channel-2 on such occasions. The result was an acute shortage of water far Field Channel 13, the tail-end field channel under Distributary Channel-2. In addition to this there was a large pond-like place by the side of the head end of Field Channel 13; water leaked into this pond, reducing the level in the field channel. Water was available in the field channel on only 30 days out of the 50 on which we made field visits to Field Channel-13. This led to a perception among the farmers under field Channel-13 that Distributary Channel-2 had been designed to issue water only to the first six field channels under it and not to their channel in the tail. They argued that because Distributary Channel-2 can carry only 170 liters per second it can issue water only to six field channels, each with a capacity of 28.3 liters per second.

ID officials agreed that the distributary-channel bund and road needed repairs. They put the blame, however, on the farmers of the head-end field channels for blocking the distributary channel and lifting the gates of field channels, claiming that these are the real causes for shortage of water on the tail-end field channels. Except for one isolated case of illegal tapping of water in Field Channel-13 by a tail-end farmer of Field channel-12, who was warned by the authorities against that practice, our field observations do not substantiate these allegations. Instead we found that the key variable with regard to the availability or nonavailability of water in the tail-end field channels was the water level at the head of Distributary Channel-2.

The tail-end farmers of Field Channel-12 also had difficulties with water, mainly because when an adequate quantity of water was issued to the canal, the area between allotment numbers 138 and 139 tended to erode, creating an acute shortage of water at the tail. We observed the bund erosion of Field Channel-12 once in this season, and the farmers told us that the same thing happened twice in the previous season. The farmers viewed this as resulting from unsatisfactory consauction. The irrigator himself told us that he does not issue as much water to this field channel as to others, on the request of farmers, for fear that it would erode the canal bunds. The technical assistant told us that he cannot comply with the farmers' request for lining a portion of the field channel with concrete slabs in order to prevent erosion, even though such requests have been made by many farmers.

Structural defects and shortcomings in land leveling. Farmers complained about a number of structural defects and shortcomings in land leveling work by contractors, which in their view obstruct equal distribution of water, These are listed in Table 7.

ID officials agreed to repair the defective and broken field turnouts and install new field turnouts in the fields where they were not available. Work on drainage canals was started in February 1987 to solve drainage problems, Land-leveling problems in the Field Channel-13 area also received the attention of officiais who had prepared estimates for the work in the early part of 1987. The problems regarding the allotments in which field turnouts are not within the boundary of the allotments, however, cannot be solved, according to the ID, because they have fixed the field turnouts in the adjoining head-end fields, taking appropriate levels, in order to irrigate the entire allotments.

Table 7. Structural defects as reported by farmers on Distributary Channel-2.

Defect	Field channel number	No. of farmers affected	How affected
Defective field turnouts	10, 14	17	More water flows to th head-end allotments with defective field turnouts
Drop structure broken by a leveling machine	11, 14	3	Difficult to irrigate allotments
Field turnouts not within the boundary of allotments	11	3	Dispute with farmers over sharing water
Field turnouts below field level	11, 13, 15	4	Difficult to irrigate a portion of the field
No Field turnouts	15	2	Difficult to irrigate the field without blocking field channel
No drainage canals	12, 13, 15	8	Excess water damaging the crop
Land not properly leveled	13	9	Difficult to irrigate a portion of the allotment

Source: Household survey 1986/87 maha.

Impact of the management of the larger system. There were three occasions of acute water shortage to the Distributary Channel-:! area during the land- preparation period, twice owing to the bund erosion of branch canals and the right-bank canal, and once apparently due *to* the failure of a higher-level irrigation official to give timely instructions to "increase" the water flow in the right-bank canal. As discussed below, these incidents had a major impact on water distribution at the distributary-channel level and created an unfriendly attitude towards irrigation officials among farmers, because this was the time when farmers wanted a regular supply as they had brought tractors and wage laborers from their native villages in the Matara District to complete land preparation.

Farmers viewed the erosion of canals as having resulted from unsatisfactory construction, for which they held irrigation officials responsible. The delay on the part of a higher official to give instructions to issue water was also seen by farmers as an unsympathetic gesture towards them.

Ineffectiveness of farmer organizations. The farmer organizations formed by IMD, with leaders elected for each field channel, were supposed to do water management below the field-channel turnouts. Though field-channel leaders had been elected to all the field channels under Distributary Channel-2, Distributary Channel-2 itself did not have a separate farmer organization. The field-channel leaders of Distributary Channel-2 had been incorporated into a hamlet-level farmer organization formed by IMD based on a larger irrigation area. Field-channel leaders were supposed to distribute water equally to farmers of their field channel, and mobilize farmers for cleaning and maintenance. The field-channel leaders in Distributary Channel-2 could not perform these functions effectively, for reasons discussed in the next chapter. The weaknesses of the organizations and leaders are evident from the following observations:

* None of the field channets had been cleaned completely on the day of water issue. Field Channel-9 remained uncleaned during the whole season while Field Channel-10 was cleaned after water issues were made. Only the upper reaches of the other field channels had been cleaned while the tail end remained uncleaned throughout. The total length not cleaned was 60-70 percent.

* Except for one field-channel leader, none of the Distributary Channel-2 leaders knew the dates of water-issues to his field channel and the time allocated to farmers under his field channel to take water, during the first two weeks after water issue. Though the water-issue timetable was available with the president of the hamlet organization, field-channel leaders did not make copies.

* Though almost everybody opposed the rotational issue of water during land preparation, none of the field-channel leaders voiced this opposition at meetings where irrigation officials were present. They could have come to a general agreement with officers if the subject had been discussed at meetings. Farmers apparently avoided discussing this issue because of the common belief that officers would not change their plans even if requested. This, however, suggests a lack of self-confidence on the part of the field-channel leaders and their organization.

* Field-channel leaders were criticized by farmers for such things as not taking part in water distribution, not solving distribution problems within the field channel, unfair distribution based on factional loyalties, and excessive use of water by leaders themselves. It was evident that leaders, who were not trained properly for organizing farmers and had no guidance for doing this, lacked organizing skills and could not win the farmers' trust to do their work.

Attempts to find Solutions

Because the irrigation officials took no action to meet the farmers' demand for a constant flow during land preparation, the farmers developed a water management technique known among them as *samanawa bedaganima*, which means "equal sharing," to ensure a constant flow at least on days the field channels were open. This was an attempt by farmers to overcome the serious problem of inability to retain water in the newly developed land.

Equal sharing is a simultaneous water sharing technique which requires farmers to keep their field turnouts slightly open (about 2.5 centimeters) in order to guarantee a fair distribution to all. It carries with it an ethic that farmers should allow the one who plows on a particular day to take more water on that day by opening his field-turnout fully. The technique would have collapsed if farmers were not associated with this ethic, because irrigating 10-15 fields from a field channel which can carry only 28.3 liters per second is difficult. The farmers of Field Channels 11, 12 13, and 15 followed this and shared water with little difficulty; in Field Channels 11 and 12 this was done with the guidance of field-channel leaders while in Field Channel 13 and 15 it was done by mutual agreement. In Field Channel-14 where tail-end and head-end farmers were divided into two groups based on their place of origin equal time was used by farmers on a group basis, i.e., head-end farmers shared water as a group on days they were entitled to water while tail farmers irrigated on their days. It was observed that the four tail enders could not get enough water to irrigate their allotments by themselves and therefore had problems in getting water until two of them started getting drainage and seepage water.

Farmers in Field Channels 9 and 11 did not use the technique of simultaneous water sharing. With the exception of one farmer out of five in Field Channel 9, the others were in their native villages when water issues arose. They came to the fields one week after the day of water issue to start work, and were seen leaving other farmers' turnouts in order to get water. With the exception of one allotment in the other four allotments in Field Channel 9 were left lands with no problems of water retention. Therefore, farmers under Field Channel-9 did not want to follow the rotational system.

The farmers in Field Channel-10 also did not follow it, not because there was no water-retention problems but because of the lack of effective control of the water. He stored water in his own field, blocking other farmers' field turnouts for his own benefit. This was opposed by the other farmers who tried to share water on a group basis. They, however, in their attempts to do so, and owing to the resultant shortage of water, two farmers could not complete their work with the time specified.

Though the technique of equal water sharing was not perfect, we observed it at its best in the *canals* where it was used in its ideal form, there was not any conflict over water. If water was available in the field channel, and the farmers were bound by the ethic associated with technique, it guaranteed a fair but not perfectly equal distribution. If the irrigation authorities had not imposed a rotational issue on field channels during the land preparation period, this technique might have been even more successful.

A particular field condition facilitated the use of this technique of simultaneous water sharing -- the availability of drainage water to tail-end farmers. It may seem highly improbable that 10-18 allotments could be irrigated from a field channel with a capacity of 28.3 liters per second by simultaneous water sharing, while also giving more water to those who plow on a particular day. It is true that distribution problems were grave on the first seven days after water issues began, but after a week, most of the tail-end farmers had access to drainage water, as shown in Table 8. Thereafter, the shortage of water was a problem of the head enders cultivating on new reddish brown soil.

Table 8. Number of allotments cultivated with drainage water on Distributary Channel-2

Field-channel number	Total allotments under field channel	*Cultivated from drainage water*	
		Number	Percent
9	5	2	40
10	15	5	33
11	9	2	22
12	16	4	25
13	19	7	37
14	16	5	31
15	7	0	0
Total	87	25	29

Source: Household survey, 198611987 maha.

Therefore we should say that this technique was developed and followed in its ideal form by head enders who could not retain water in their newly developed land.

With regard to the structural defects and unsatisfactory land leveling, farmers had been corresponding with ID officials and settlement officials since yala 1986. It was evident from the official documents that the problems presented by individual farmers had not yet received much attention. However, as a result of the representations made by distributary channel-level organizations, and continuous dialogue with field-level irrigation officials at distributary channel-level meetings and IMD Project Committee meetings, the irrigation officials had started work on drainage canals, the Distributary Channel-2 bund, and roads in the early part of 1987. According to the technical assistant in charge, the estimates for the construction of broken field turnouts, other defective field turnouts, and land leveling in the Field Channel-13 area had been sent to the Chief Resident Engineer for his approval by March 1987. These incidents show an improvement in the direction of solving farmer problems.

The IMD Project Manager agrees that involvement of farmer organizations and field-channel leaders in water management was not satisfactory in Distributary Channel-2 because the organization is in its formative stage. He intimated that some leaders elected by farmers lack leadership qualities and requested farmers to change the leadership by electing more suitable persons in some cases. He said that people will develop better leadership qualities in the long run. In addition, the IMD has plans to train field-channel leaders and develop distributary channel-level organizations to enable the leaders to do construction in their area on contract. and thereby take responsibility for carrying out management and maintenance tasks in their distributary channels.

There were only temporary solutions to the distribution problems caused by the defects in the main system such as bund erosion of main and branch canal. Repairs and strengthening work have been done since, but there are no guarantees that they will not erode in future.

Finally, it is important that in future, higher-level irrigation officials delegate authority to their subordinates to enable them to operate the system in their absence.

Impact of the Drought

As a result of the severe drought prevailing throughout the maha season the water level in the reservoir dropped almost to dead storage-level by mid-Jaunary. Hence the water issues from the right-bank sluice automatically fell to about one-third of previous issues. The water level in the right-bank canal therefore went down drastically. The last water issue to Distributary Channel-2 was made on 2 January 1987, after which water issues along the right-bank canal were confined only to Tract 1. Because of the scattered rain experienced in the area, in mid-January, however, the rice plants in Distributary Channel-2 were able to stand severe drought for another two or three weeks, to die and wither away m the early part of February.

The farmers in Distributary Channel-2 had invested heavily on their irrigated allotments, around which their future life centered. They had been in the settlement since 1985, depending on food provided by the World Food Program and the savings made prior to migration to the settlement. During the period from 1985 to yala 1986 many of them did not have earnings other than an insignificant amount from cash crops grown in their highland allotments.

The heavy investment on land development for cultivation in yala 1986 had reduced their savings. Except for a few well-to-do people, many of the Distributary Channel-2 farmers were in debt by the end of yala 1986. This was because the yields had been poor compared to the expenses, which were reported as being around Rs 6,000-8,000[4] or more per allotment. The total cost for land preparation in maha 1986/1987 was about Rs 2,500-3,000 per allotment for those who were cultivating for the second time. By the end of December, the average investment on an allotment for maha 1986/1987 was around Rs 3,500-5,500. Since these amounts exceeded the bank loans granted to farmers, borrowing money from relatives in native villages, in some cases on very high interest, and sale and mortgage of land in their native villages in order to invest in cultivation and for daily expenses, were very common.

When the drought brought disaster, those farmers living in the settlement temporarily, only for the cuttivation period, left the settlement after two or

[4]US$1.00 equaled approximately Rs 29.00 in 1986/1987.

three weeks. Out of the 87 farmers in Distributary Channel-2, 20-30 had gone back to their native villages by the end of February. The rest remained in the settlement. The poorest among them went hungry because the free food ration given to them at the beginning had now been withdrawn on the assumption that they were successful in yala 1986. We observed poor settlers come to the field instructor's quarters to inform him of their problems or to obtain some food or money. Their poverty and helplessness seemed to generate a feeling of hatred towards the officers whom they believed responsible far the crop failure.

The Government Agent, Hambantota and ID officials were the targets of verbal attacks for taking a wrong decision at the kanna meeting to cultivate land when there was inadequate water in the reservoir. Many farmers believed that ID officials should pay Compensation for the crop failure because they believed it was caused by their reducing the water level in the reservoir for repairing the spillway gates just before the commencement of the season.

Even those farmers who were closely associated with higher-level ID officials were blamed. An example is the accusation directed at the president of the distributary-channel organization in Hamlet 11 for organizing a religious function on the instructions of irrigation officials at the Kataragama Temple to invoke the blessing of God Kataragama (a Hindu God worshipped by many Buddhists, whose major shrine is nearby) to get rain. Although some officials say that farmers initiated this, many farmers believed that Department officials organized the ceremony to pretend that they were really worried over the fate of the farmers. The president of the farmers' organization was accused of helping the officials in their attempt to trick fanners.

When the farmers were short of water they searched their memories to find reasons. The president of the farmers' organization was vehemently criticized and abused for encouraging irrigation officials to breach Lassanawewa Tank, which they thought could have provided them with water for drinking and bathing. The officials of the Land Commissioner's Department were reproached by some farmers for their alleged insensitivity to the suffering of settlers by not providing them with water and free food rations in time.

The IMD also faced setbacks in its program for organizing farmer groups. It clashed with other departments in its search for solutions to the pressing problems of the farmer population in distress. All these problems were really caused by the drought, which had a great impact on the behavior of organizations, as discussed in the next chapter.

The overall result of the drought was the large-scale abandonment of land by farmers in Dismbutary Channel-2 who went in search of a livelihood in their native villages, where they could at least fall back on their kin for help. They left the settlement with hatred which could have brought about a social upheaval if not for the powerful ideology associated with God Kataragama, who is treated by many, though not all, as the one responsible for drought. Many farmers claimed to believe the drought was caused by the God at the request of the politicians to withold rains in order to hold the *udagama* festival (a village revival program initiated by the government) as rains would have disrupted preparations. Other farmers suggested that the drought was created by the deity to punish those who ill-treated the Hambantota natives by not giving them land in the settlement area.

Conclusion: Key Water-Management Problems

The underlying causes of the major issues we raise here are associated with problems in decision making, soil conditions in the area, and organizational weaknesses. The defects in decision making and organization are our concern as social scientists. The water management problems in maha 1986/87 were overshadowed by the drought. But it is no more "rational" or scientific to explain the severe water problems by simply blaming the drought than by attributing it to God Kataragama. As the farmers argue, the decision to start the season perhaps should not have been taken on the assumption of future rain, especially in a new system with little history to guide decisions. Some farmers suggest the tragedy in Kirindi Oya might have been avoided if the extent to be cultivated had been decided based on the quantity of water available in the reservoir, leaving room for the expansion of the cultivation area if there were sufficient inflow later. Perhaps this is second-guessing.

But as the ID has no field data on actual water requirements for the new lands in the area, it cannot guarantee the required quantity to farmers. Alternatives like constant flow during the land preparation period were not possible because of the scarcity of water. The reality, however, could have been explained to the farmers at kanna meetings without concealing it or putting the blame on the canal system's limited capacity. Farmers were apparently never adequately informed of the risk involved in starting cultivation with a low reservoir.

The impact of lack of farmer participation throughout the construction phase of irrigation infrastructure and land development is also evident in the Kirindi Oya Irrigation and Settlement Project. The farmers' accusations regarding the unsatisfactory construction of field-channel bunds, and shortcomings in the construction of ridges and structures by contractors, express in themselves the dissatisfaction of farmers for not being allowed to participate, at least by making ridges in their own fields during the period of advance alienation.

Chapter 3

Organization for System Management

The Organizational Setup

KIRINDI OYA is the largest irrigated agricultural settlement project under the IMD program in southern Sri Lanka. The service area of the project falls under the Tissamaharama Electorate in the Hambantota District. The main government agencies involved in the project are the Departments of the Land Commissioner, Irrigation, Agriculture, and Agrarian Services. The main project-level decision-making body is the Project Coordinating Committee chaired by the Government Agent, Hambantota (Figure 2).

The project is in two stages of development: Phase-I settlement and irrigation infrastructural development activities are nearly completed, and Phase-II settlement and construction activities had not yet begun at the time of this research. Therefore, the original organizational setup for settlement and construction activities still remains. The activities of the two IMD Project Managers have been restricted to the formation of farmers' organizations, and they are not responsible for the development of effective linkages and cooperation among the service agencies involved in the project. Project management is thus in a transitional stage. The rest of this section briefly describes the project-level structures and roles of the major line departments as of the period of research.

The Irrigation Department

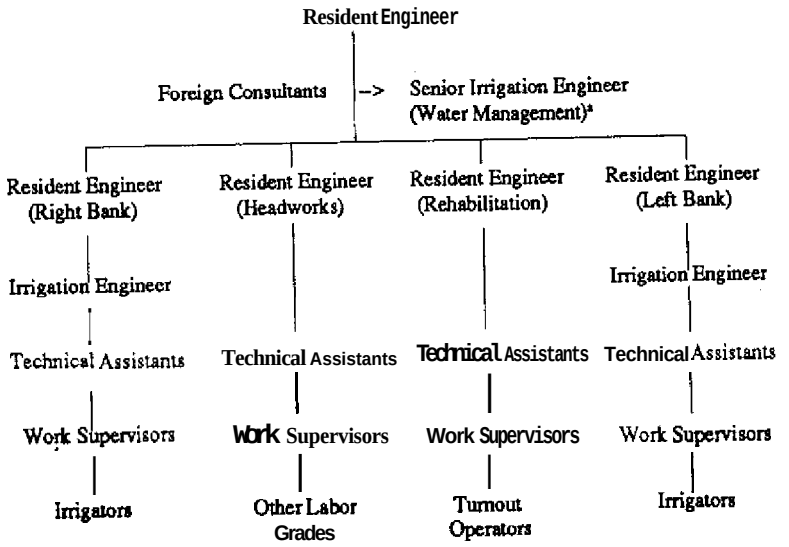
The Chief Resident Engineer, also designated as Project Manager (Irrigation), has overall responsibility for operation and maintenance activities in the completed Phase-I area and for construction work in Phase-II area (Figure 4).

He reports directly to the Deputy Director (Major Construction) of the Irrigation Department (ID), Colombo.

The Senior Irrigation Engineer (Water Management) is in charge of the Water Management Feedback Information Center. At this stage two foreign consultants temporarily assist the Senior Irrigation Engineer. The duties of the Senior Irrigation Engineer entail advising the Chief Resident Engineer on matters such as the irrigable area, water requirements, and the operation of the main system.

The daily operation and maintenance of the Right Bank, Left Bank, and Ellegala subsystems are handled by the three Resident Engineers of the respective areas, while the Resident Engineer (Headworks) is responsible for head works maintenance. In addition, the Resident Engineers in charge of the new areas are responsible for construction work in their areas and the Resident Engineer in charge of the old area (Ellegala) for rehabilitation work in the old tanks.

Figure 4. Project-level structure of the Irrigation Department.



[a]The position of Senior Irrigation Engineer (Water Management) was created after maha 1986/1987 season.

Each Resident Engineer has an Irrigation Engineer under him to handle operation and maintenance activities. He is assisted by technical assistants in his work. The manual operation of regulators and branch canal, distributary channel and turnout gates of the field channels is done by irrigators supervised by work supervisors. Though there are on average four technical assistants and two work supervisors per tract, there are more technical assistants attached to offices of the resident engineers because of the ongoing construction in the Project.

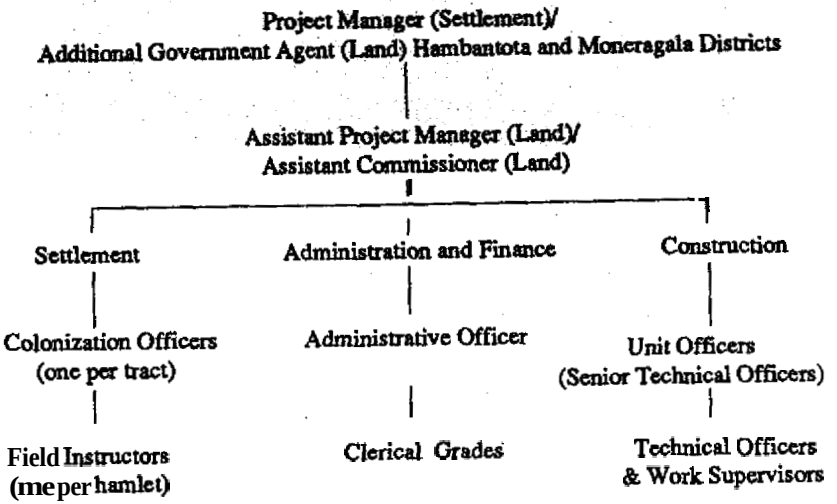
Land Commissioner's Department

The Project Manager (Settlement), assisted in 1986/1987 by a Deputy Project Manager, is responsible for settlement, community development, and welfare activities in the Project (Figure 5). Colonization officers under him are in charge of these activities at the tract level, and are assisted by field instructors, the hamlet-level officers of this Department. *Kattinayakas* (plot leaders) are supposed to be elected by farmers, but in fact some have been appointed from the settlement communities on the recommendation of field instructors (one leader for 25 highland allotments) to facilitate work such as food distribution and organizing farmers for meetings and other functions. Prior to the arrival of the IMD officers, the Project Manager (Settlement) and his deputy attempted to form farmer organizations. At the time of our research, the Project Manager (Settlement) held the position of coordinator of IMD activities.

The Project Manager (Settlement) and his deputy are officers of the Sri Lanka Administrative Service. They are Assistant Commissioners in the Land Commissioner's Department. The Project Manager (Settlement) has also been delegated the authority of an Additional Government Agent (Land) to deal with land acquisition and relevant matters in both Hambantota and Moneragala Districts under which the project area falls.

The infrastructural development in hamlets and towns under the Project area is handled by the Land Commissioner's Department. These activities are done under the supervision of a deputy commissioner at the Department headquarters.

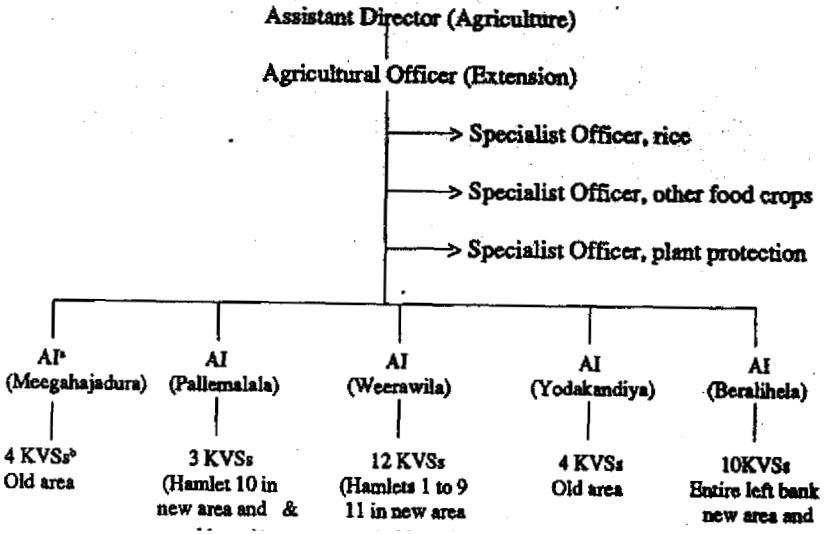
Figure 5. Project-level structure of the Land Commissioner's Department.



Department of Agriculture

The Department of Agriculture performs three functions at the project level, through three wings: extension, training and education, and research. The Assistant Director (Agriculture) in charge of Hambantota District attends the Project Coordinating Committee meetings along with the Agricultural Officer (Extension) in charge of the Tissamaharama area. The Agricultural Officer is in charge of extension work both within and outside the project area, as shown in Figure 6. He is assisted by three specialist officers in rice, other food crops, and plant protection. There are five Agricultural Instructors' Divisions in the Tissamaharama area. The agricultural extension work in these divisions is handled by five Agricultural Instructors, assisted by *krushi viyapthi sevakas* (KVS), the grass-roots level officers of the Department.

Figure 6. Project-level structure of the Department of Agriculture.



[a] Agricultural Instructor.
[b] *Krushi Viyapthi Sevaka.*
[c] Old area includes land under Ellegala and Badagiriya system and small tank areas under the Department of Agrarian Services. and encroached land areas.

The major functions of the extension service are to give appropriate training to farmers, collect field data on agricultural activities such as seed requirements and extent cultivated, and give field instructions regarding application of fertilizer, weedicides and pesticides.

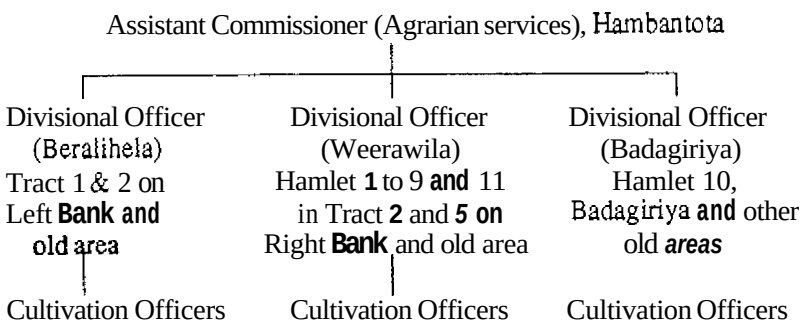
There is a training center in Weerawila New Town to give special training to farmers in agriculture. It is under the charge of a training officer directly under the supervision of the Assistant Director (Training and Education) attached to the Angunukolapalessa Agricultural Training Centre. Because of the lack of facilities such as water, the Weerawila Training Center is not yet functioning properly.

A research officer has been appointed to the Adaptative Research Centre in Weerawila New Town. He is under the supervision of the Assistant Director (Research) in Angunukolapalessa Agricultural Research Centre. Because of scarcity of water and lack of other facilities, research activities have not yet begun.

Department of Agrarian Services

The Assistant Commissioner (Agrarian Services) represents the Department of Agrarian Services at meetings of the Project Coordinating Committee. The Tissamaharama area, which includes both the new and old areas of the project, falls under the Agrarian Services divisions of Beralihela, Weerawila, and Badagiriya. Therefore, the Divisional Officers have responsibilities within and outside the project area. Cultivation Officers are the lowest-level officers of this Department (Figure 7).

Figure 7. Project-level structure of the Department of Agrarian Services.



The functions of the Department of Agrarian Services include, maintaining of small tanks; holding kanna meetings for such tanks: issuing farmers' identity cards; collecting acreage fees from farmers; supplying agricultural inputs such as weedicide, insecticide, and fertilizer to farmers; estimating damage to crops

by cattle; assisting the Agricultural Insurance Board to estimate crop failures; settling disputes between landlords and tenants; instructing farmers for cleaning and fencing of field channels; and enforcing the provisions of the Agrarian Services Act.

Irrigation Management Division

Two project managers had been appointed by the Division to Kirindi Oya just prior to the commencement of yala in 1986. One project manager is in charge of the old areas under the Badagiriya and Ellegala systems and the other is in charge of the new areas under the right and left banks.

The IMD Project Managers are responsible for coordination of activities of the various agricultural and irrigation agencies. The Project Managers are, however, presently restricted to forming farmer organizations because of the domination of other organizations at this particular stage of the development of the project. We observed some tension towards the officers of the IMD because some project officials see the IMD as an intruder.

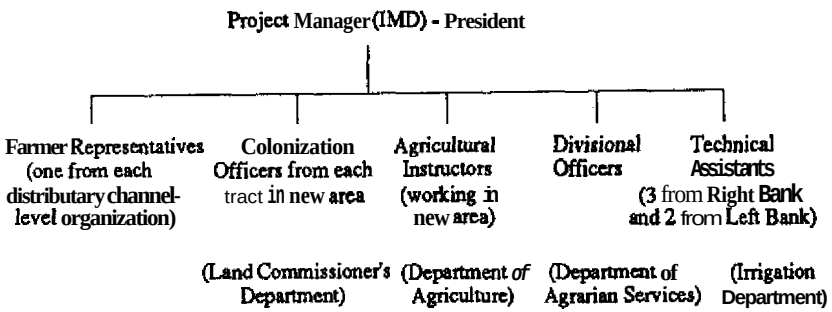
Despite some obstacles, the IMD Project Manager for the new areas was able to form a project committee in November 1986, though with little support from some of the other agencies (Figure 8). The Project Committee meetings are chaired by the IMD Project Manager. The members of the committee are representatives from distributary-channel organizations, Technical Assistants of the ID, Divisional Officers of the Department of Agrarian Services, Colonization Officers of the Land Commissioner's Department, and the Agricultural Instructor of the Department of Agriculture. Though irrigation engineers are not members of the committee they attend meetings as observers.

The number of farmer representatives on the committee was seven at this stage because farmer organizations had not been well organized on all distributary channels. The officers of the organization attending meetings and carrying out duties established by the IMD are paid an allowance of Rs 250 per month. The duties of the members include:

1. to assist the IMD Project Manager to prepare, and implement the agricultural program;

2. to assist in collecting agricultural data in the project;
3. to attend distributary channel-level organization meetings;
4. to encourage farmers to pay operation and maintenance fees;
5. to encourage farmers to develop a proper water management system (farm level);
6. to report damage to irrigation structures and illegal use of water, etc., to the relevant authorities who will take action against offenders; and
7. to prepare estimates for construction when necessary.

Figure 8. The IMD Project Committee.



Notes:
1. The Secretary is elected from among the government official members.
2. The number of farmer representatives should exceed that of the officers.

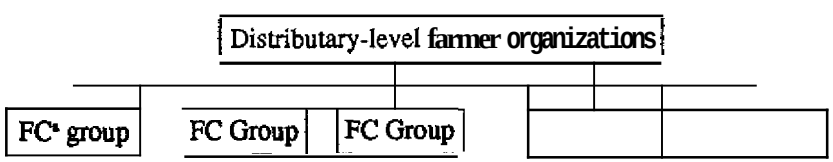
In addition to these duties and responsibilities they should reside in the Project area, forward their advance program to the IMD Project Manager, and do at least two crop surveys per season, to be eligible to claim the allowance.

Though the government official members of the Project Committee are lower in status than the Project Manager, he has no supervisory power over them, as they are directly under the Project Manager (Settlement) or are under district-level or project-level heads of other organizations.

Farmer Organizations under the IMD

Field-channel groups consist of the legal allottees under a particular field channel. They are informal groups, with leaders chosen by the farmers by mutual agreement (consensus). The field-channel leaders -- farmer representatives -- under a distributary canal form a distributary-channel organization, which is a formal farmer organization, though with no legal basis (Figure 9). At the preliminary stage it is established with the guidance of the IMD Project Manager. The secretary, president, treasurer, and other office bearers are elected by the fanner respresentatives. In addition, divisional field-level officers attend meetings as associate members. Either the president or the secretary of the distributary-channel organization can represent the organization at the Project Committee.

Figure 9. Structure of fanners' organizations.



[a]Field channel.

The duties of the distributary-channel organization are water management within field channels, maintenance of the irrigation subsystem within its area of authority, participation in the preparation and implementation of the

agricultural program, and participation in and organization of other socio-cultural functions tending to promote links between the farming and non-farming population.

COMMUNICATION WITHIN AGENCIES

Communication within the agencies is officially through formal meetings and correspondence within a hierarchical setup, At monthly meetings or special meetings headed by higher-level project officers, matters relevant to programing, planning, or implementation of the agency's project activities are communicated to field-level officers. When higher officials need information on field conditions, reports are requested from field-level officers. In addition, the higher-level officials give instructions to their subordinate field officers during routine visits to field sites.

The Land Commissioner's Department held such meetings, headed by the Project Manager. The Agricultural Instructors of the Department of Agriculture and Divisional Officers of the Department of Agrarian Services also held weekly meetings with their field officers. In addition, monthly progress reports were called from the officers. These meetings, correspondence, and reports are important media of communication within these agencies.

The ID, however, held no such formal meetings with its field staff during the season of research. Though there were reports and correspondence among the officials, personal (individual) meetings of higher officials with field staff or vice-versa was the primary method of communication observed among the irrigation officials. Though personal meetings have important functions, we observed that reliance on these led to many officers not being aware of or accurate about day-to-day operational problems. The usefulness of formal meetings for information exchange was observed on two occasions described below.

An irrigation engineer, addressing the Project Committee meeting on 27 November 1986, assured farmer representatives and others that although the water level in the reservoir was low, the quantity was sufficient if used economically. In addition, he remarked that there was a good inflow too.

Subsequent events showed these assurances to be incorrect. An officer responsible for operation and maintenance in the right-bank area was apparently not aware of the reality of a low reservoir. The other example is the different views on the quantity of the water released for the repair of the spillway gate. The Chief Resident Engineer said it was 7,000 acre-feet (8.64 MCM), but according to one resident engineer, the quantity released was much more -- complete reduction to dead level. This engineer's information was apparently incorrect.

We also observed that technical assistants in charge of operation and maintenance were often not aware of actual field conditions. For example, the technical assistant in charge of the Distributary Channel-2 area was not informed about the scarcity of water on Field Channel-13. We know of at least 10 occasions when fanners had to meet the technical assistant personally at his office to complain because the irrigator and work supervisor had not told him of their water problems.

INTERAGENCY COMMUNICATION, COOPERATION, AND CONFLICT

Communication among Agencies

In addition to routine correspondence among the departments, the most effective communication method was monthly meetings of the project officials. The Project Coordinating Committee chaired by the Government Agent, and the Project Committee chaired by the IMD Project Manager, were the most important in this respect. The Project Coordinating Committee discusses issues relating to settlement, infrastructural development, commencement of the cultivation season, and other project development activities; but agricultural planning for the season or operational problems of the irrigation system are not addressed in detail at these meetings. The decisions taken at these meetings are communicated to divisional and field-level officers by district- and project-level officers attending the meeting.

At the Project Committee meetings, division-level officers of line agencies meet farmer representatives to discuss issues relevant to agricultural planning, water issues, and related activities for agricultural development. This Project Committee was formed in November 1986, after the commencement of maha 1986/1987. Hence, it could not contribute much to seasonal agricultural planning. The committee however, attempted to solve some water-distribution problems. It contributed much to building mutual relations among the farmer representatives and officials in order to solve farmer problems. Some farmer representatives claimed that 50 percent of irrigation problems were solved through the mediation of the IMD Project Committee. Solving some serious problems, however, required the assistance of higher-level officials. Though decisions of the Project Committee were communicated to the Project Coordinating Committee, this committee did not address them. These problems were also not discussed at the District Agricultural Committee.

Cooperation and Conflict Among Agencies

The field-level officers of other agencies had little contact with official of the ID, and they were rarely seen at each other's offices other than for formal meetings where participation was obligatory. Though we do not know much about the relationships among the higher-level project officials of line agencies, we can say that most of the divisional and field-level officers had no intimate relations with the ID.

We constantly heard criticism that irrigation officials were carrying out contract construction work. The main reason for these accusations was that when farmers reported irrigation problems to field-level settlement officials, with whom they have close relations as settlers, it would be reported to the respective resident engineer for solution. But the irrigation officials preferred to channel requests through their respective heads according to administrative regulations. The colonization officials and field instructors were not satisfied with these arrangements because they took a long time to get results. Hence, the outcome was severe criticism.

The other major conflict, of which most officials and farmers were aware, was the tension between the Project Manager (Settlement) and the newly appointed IMD Project Managers. Some colonization officers even claimed

they had been instructed not to assist the IMD Project Manager in his work. We do not know if this claim is correct, but the Project Manager clearly had to make a great effort to organize farmers' groups with little help initially from the colonization officers until he had won their confidence. There are a number of incidents in our notes that support this statement, which need not be recounted here. The important fact is that this tension between the two departments of the same ministry has had a serious impact on the development of effective scheme management, and is an issue that needs to be addressed in future.

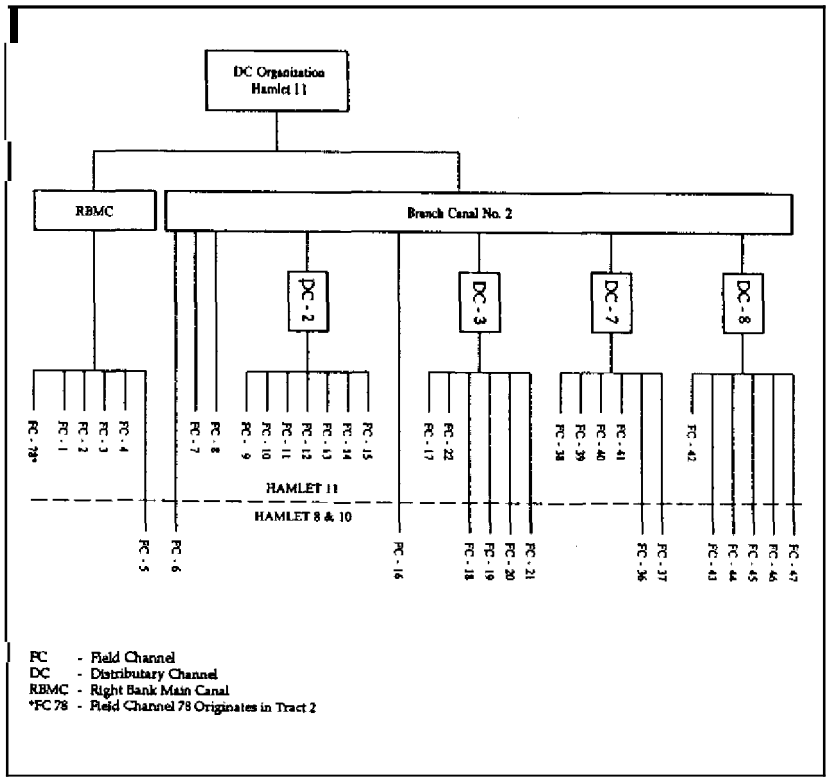
DISTRIBUTARY-CHANNEL ORGANIZATIONS

Though there are a number of organizations such as Buddhist associations, rural development societies, school development societies, and political societies in Hamlet 11, the only farmer organization based on the irrigation area is the Distributary Channel-2 organization formed under the guidance of the Project Manager. This organization was formed in July 1986, some time after water issues for yala 1986, the first season in the scheme. Before the formation of this organization, field-channel leaders had been selected by farmers on the day of the kanna meeting, with the guidance of the IMD Project Manager. The Project Manager says he had regular monthly meetings with field-channel leaders, to train them to act independently on their own initiative. He presided over the field-channel leaders' meetings during this period, and the technical assistant in charge of the area was supposed to act as secretary of the organization. However, the Technical Assistant is said not to have attended the meeting regularly, though he came to meetings on important occasions on the invitation of the Project Manager, according to farmers.

The members of the distributary-channel organization membership included all leaders of field channels where Hamlet 11 residents have allotments. As shown in Figure 10, the irrigation area under the organization was not confined to a single distributary channel. Membership was extended to leaders of direct field channels from the right-bank main canal, Branch Canal-2, and distributary channels, in order to incorporate all the field-channel leaders residing in Hamlet 11 into this distributary-channel organization.

But Figure 10 also shows that there were some anomalies resulting from this approach to membership. Some field channels under Distributary Channels 3, 7, and 8 and two direct field channels, 5 and 6, were excluded because farmers under them are from Hamlets 8 and 10, though other field channels on the same distributary channels, and adjacent direct field channels, were included. Attempts were made to include the leaders of Field Channels 5 and 6 in the Hamlet 11 distributary-channel organization, but they never came to meetings because they live in Hamlet 8, nearly 5 km from Hamlet 11. In addition, they were Muslims, whose mother tongue was Tamil, while almost everybody in Hamlet 11 was Sinhalese.

Figure 10. Field channels represented in Hamlet 11 DC organization.



In Distributary Channels 3, 7, and 8, allotments under different field channels are owned by farmers in Hamlets 11, 8, and 10. The field-channel leaders of other hamlets could not be brought into the Hamlet 11 distributary-channel organization, but field-channel leaders under those canals residing in Hamlet 11 were incorporated into the Hamlet 11 distributary-channel organization.

The IMD Handbook (IMD 1985) on farmer organizations suggests incorporating adjacent direct field channels into the distributary-channel organization, but incorporation of selected field channels under different distributary channels into one distributary-channel organization does not lead to a cohesive distributary channel organization. The main problem facing the IMD at this stage is to bring fanners of different hamlets but sharing water from a common distributary channel into a common distributary-channel organization. But since the hamlets are located five to six km away from one another, bringing the settlers of these hamlets together for meetings and other activities is difficult. This is why the IMD had organized the distributary-channel organization in Hamlet 11 based on field-channel groups living in the same hamlet.

As Figure 10 shows, the main distributary channel on which the Hamlet 11 distributary-channel organization is based is Distributary Channel-2; all of its 87 allotments have been allocated to settlers in Hamlet 11. None of the leaders of its seven field channels, however, holds a responsible post in the distributary-channel organization. The president, secretary, and treasurer are leaders of Field Channels 1, 2, and 3, which are direct field channels from the right-bank main canal. Hence the problems of fanners under Distributary Channel-2 did not receive much attention unless individual farmers brought them to the notice of the leaders. On one occasion, we accompanied the president of the distributary-channel organization to Distributary Channel-2 to find out whether he was aware of farmers' problems there. We discovered that he did not know anything about problems of Distributary Channel-2. As a result of its not paying much attention to their problems, the Distributary Channel-2 came to perceive the distributary-channel organization as a bureaucratic organization, and they had little trust in its leadership. This situation was aggravated by the fact that the field-channel leaders under Distributary Channel-2 were not very active at this stage.

The inactivity of field-channel leaders was primarily a result of their unsettled state in the settlement. Though they had come to the settlement in 1985 and were permanently settled there, they had, however, to return to their

native villages occasionally in search of money and help from their relatives. This was necessary because they had no employment opportunities in the Project area. Some members of their families, particularly children in secondary school, also stayed in their native villages because schools in the project area were not yet functioning properly or had classes only for primary-grade students. Hence, this was a transitional stage during which farmers could not pay much attention to forming an Organization.

The attendance of the field channel leaders at distributary-channel organization meetings was very poor. The number attending any meeting never exceeded 12, though there were 22 field-channel leaders in the organization. Of the seven field-channel leaders in Distributary Channel-2, only three were seen regularly at Distributary Channel-2 meetings. When asked why they were absent, they usually claimed they were absent from Hamlet 11 on the particular day. Even the secretary was absent from three consecutive meetings. He had mortgaged his land in maha 1986/87, was rarely in Hamlet 11, and had not brought his family to the settlement. There were accusations from the members of the organization against the secretary for not informing them of the meetings on time. On one occasion the secretary had to apologize for not informing the members of the meeting day.

Neither the president nor the secretary of the distributary-channel organizaztion was popular among the farmers and field-channel leaders. The secretary, being an Ayurvedic physician, did not move much with fanners and was not seen in their company. He felt that if a farmer has problems he should contact him directly or through the respective field-channel leader. His behavior was that of an indigenous *Vedamahaththaya* (doctor), who expected the patients to come to him, Hence, the field-channel leaders and farmers considered him arrogant because, though a Vedamahaththaya in his own village, the prescribed role for him in the new village was that of a leader of the distributary-channel organization.

The president of the organization had previously been an overseer in the Department of Agriculture. He was very popular in the beginning because he criticized officials at kanna and pre-kanna meetings. But when he became the president of the organization he is alleged to have changed a lot and started praising irrigation officials. The farmers and field-channel leaders who saw this change believed that irrigation officials had won him over to their side. During the drought he organized the religious ceremony at the Kataragama temple, mentioned above, to get rain, on the advice of irrigation officials and

without consulting the distributary-channel organization. Most of the farmers, who believed that the scarcity of water had resulted from reducing the water level in the reservoir, took this as an attempt by ID officials to "trick" them. Hence, the president was vehemently Criticized for taking part in this charade.

Even the field-channel leaders had little influence over the farmers under their field channels. Ninety-five percent of the land under these two field channels is owned by people from one village, Narawelpita, in the Hakmana Electorate. Of the seven field-channel leaders in Distributary Channel-2, only two participated in water distribution. Both leaders are from the same village and in addition all of them are of one caste. Because of this and also their high educational level -- one holds a BA degree and the other is GCE (A/L) -- they could influence their community to achieve the common goal of water distribution.

In the case of Field Channel-9, the leader never came to distributary-channel meetings, and was not in Hamlet 11 until after water issues began. The leader in Field Channel-10 had quarrels with a tail-end farmer under his canal. According to fanners in Field Channel-10, he stored water selfishly in his allotment without much consideration for others. His was the allotment in Field Channel-10 to be cultivated first in the season. The leader of Field Channel-13 was reluctant to go to meet technical assistants and officials to inform them of the irrigation problems of farmers, so he was not popular. Another settler had to go on his behalf to meet officials.

The leader of Field Channel-14 attended distributary-channel organization meetings regularly and tried to introduce a rotation on his field channel in maha 1986/1987. Head-end farmers opposed the rotation. However, the field-channel leader, who was a tail ender himself, tried to implement the rotation at the beginning of water issues without listening to the head enders. Most of the head enders are from Deniyaya while the tail enders are from Hakmana. Therefore, the attempt to introduce a rotation was seen by most head enders as taking the side of settlers from Hakmana. When we *inquired* from a head-end farmer of Field Channel-13 whether the field-channel leader distributes water equally, he replied that the "leader goes mad when he sees water flowing in the field channel." Analyzing the meaning of this statement, the farmer had clearly referred to the caste status of the leader -- a *dhobi* (washerman) waiting anxiously till fresh water comes to wash dirty clothes.

On Field Channel-15, though the leader was not influential. the farmers, being from a neighboring village and of the same caste, had no difficulty sharing water. The land under this *canal* was cultivated for the first time in

maha 1986/1987, and the leader was only temporarily in the settlement, so he did not contribute much to the formation of the field-channel group.

While the participation of field-channel leaders was not satisfactory for the reasons discussed above, the participation of the officials at such meetings in terms of IMD guidelines was even more unsatisfactory. Divisional Officers of the Department of Agrarian Services and Agricultural Instructors of the Department of Agriculture never attended meetings of the distributary-channel organization. When farmers had serious irrigation problems, the (IMD) Project Manager had to go personally to the Resident Engineer (Right Bank) to bring the relevant technical assistant to the meeting. The IMD Project Manager had no assistants to help him in his work; he had to do everything, such as meeting leaders of field- and distributary-channel organizations, himself. When we asked the Resident Engineer (Right Bank) why his officers did not participate in IMD meetings regularly he claimed that instructions had been given to officers regarding their participation and he had no complaints from IMD. The IMD Project Manager felt that complaining would not be an encouragement for participation.

As a result of the lack of participation by field-channel leaders as well as officials in the distributary-channel organization, it degenerated into a bureaucratic organization in which almost everything is done by corresponding with the relevant agencies. Even those problems which could be solved within the distributary-channel organization are brought to JMD Project Committee meetings. This setup is not conducive for the formation of self-reliant farmers' groups because it tends to promote in them a feeling that there is somebody above them to solve their problems.

CONCLUSION: KEY ORGANIZATIONAL PROBLEMS

Organizational Problems Related to Water Management

The main agencies involved in water management are the ID and the IMD. The officials of the ID tried to implement a rotation down to the field-channel turnout, without considering the practical problems of the farmers in irrigating

their allotments. Water management in field channels was supposed to be done under the guidance of field-channel leaders, but was often left in the hands of farmers since the leaders had not yet established themselves in their communities.

Though technical assistants made regular visits to the field to instruct irrigators and work supervisors, they did not have the necessary feedback from the field staff to understand the practical problems of farmers. The purpose of their field visits was to give instructions regarding canal operation. The only place where they could get information was the distributary-channel organization meeting, which the technical assistants did not attend regularly. Therefore, the resident engineer also did not have the necessary feedback from the field regarding farmers' irrigation problems.

Individual farmers and the distributary-channel organization corresponded with the Resident Engineer (Right Bank) but the only solution offered was the suggestion that they follow the water-issue timetable, which many farmers felt was not practical. If the officials of the ID had tried to understand the farmers' difficulties by communicating with them, rather than implementing the rotation in a mechanical way, a more amicable solution could have been arrived at to the satisfaction of both parties.

The lack of communication between farmers and the ID was observed on the days when canal bund erosion led to scarcity of water. None of the farmers in Distributary Channel-2 knew the reason for the scarcity on some days. If the Department had informed them of the canal erosion, farmers might not have panicked and could have adjusted their land preparation work.

The Resident Engineer (Right Bank) told us that though he had given instructions to the technical assistants to participate in meetings of the distributary-channel organization, they were reluctant to do so. This was mainly a result of their attitude towards fanners as people who are waiting for the government to assist them, then using the meeting as an opportunity to criticize the officials.

The problems regarding on-farm water management occurred mainly as a result of lack of guidance to field-channel leaders. The IMD Project Manager could not establish organizations and train leaders in such a large area without assistance. He had no support since institutional organizers had not yet been appointed. The only staff potentially available for such organizational activities was that of the Land Commissioner's Department, but the conflicts between the two departments precluded their participation.

Organizational Problems Relating to Planning

As the planning for the season is a process in which four major departments and other semi-government organizations are involved, an effective body is needed to coordinate the activities of these agencies. The primary function of the Project Coordinating Committee chaired by the Government Agent, Hambantota is monitoring of settlement and construction activities. The role of the IMD Project Managers in this committee is marginal in comparison with the Project Manager (Settlement) and Chief Resident Engineer who dominate the committee. The recommendations of the IMD Project Committee receive little attention by the Project Coordinating Committee. The request by the IMD Project Manager to include farmer representatives in this committee was refused.

In principle, the coordination of seasonal planning was the primary function of the IMD Project Committee, which has as members divisional-level officers of line agencies. Because of lack of higher-level support from some departments, however, this Committee was not effective. Further, there were problems which needed the attention of the Project Coordinating Committee. Though the IMD Project Manager presented these problems through correspondence to the Project Coordinating Committee, they were not discussed at this level.

Farmers' Problems

In Chapter 2, we discussed in detail the farmers' problems regarding irrigation water. Here we address other problems confronting the settlers.

Disputes over allotment boundaries are a major problem in the Project. This is mainly because the *settlers* were shown their allotments when they were still jungle, and in the process of land development *the* boundary markers have disappeared. Farmer representatives raised *these* problems at the IMD Project Committee and they have been directed to the Project Coordinating Committee.

The drainage canals to be *constructed* by farmers also got delayed because of this problem, leading to land disputes among settlers as well as between settlers and the government,

Land disputes between original settlers and encroachers were discussed in meetings of the Project Committee by farmer representatives. Though we have no statistics on such cases for the entire project area, there were several examples from Distributary Channel-2. Two allotments under Distributary Channel-2 were held by two original villagers in the area claiming them as freehold. The two settlers to whom the land was allocated are prevented from cultivating this land by the original owners, leading to tremendous hardships due to lack of livelihood.

The delay in land development and drainage construction was another problem. There were four allotments in Distributary Channel-2 to which water could not be issued in October because of drainage problems and delay in land development. Land-development work was finally done in two of these allotments before the commencement of water issues, but the other two could not be cultivated.

Salinity is a problem in the Project. Two allotments which had a very good harvest in yala 1986 were completely devastated by salinity in maha 1986/1987. These 2 allotments are on Field Channel-13 and are 2 of the 10 allotments we selected for our intensive survey.

Potential Solutions Suggested by Farmers and Officers

The farmers had a very negative attitude towards the Project. Many had developed a great dislike for *certain* officials, whom they suggested should be transferred. One prominent farmer leader, when told farmers could not have representatives in the Project Coordinating Committee, *said*

> I worked for this government and was an ardent supporter of it, but was refused [permission] to participate in the meeting on behalf of farmers. We can't do anything with these officials. I feel I am wrong and the JVP (Janatha Vimukthi Peramuna , a Marxist political group which remains outside the mainstream of Sri Lankan politics) boys are correct. They say that nothing can be done under this setup. It is too late now. otherwise I myself would have been a JVP member.

This statement may be seen as an indication of the degree to which farmers are discouraged and disappointed after the experience of maha 1986/1987.

An official of the ID viewed the problems as having occurred as a result of farmers' lack of experience in a major irrigation scheme, in which they should cultivate according to a cropping calendar, follow water-issue timetables, and develop other behavior patterns demanded by the system. His solution was the formation of active farmer organizations which facilitate the work of the ID.

The IMD Project Manager suggests that an effective subcommittee of the District Agricultural Committee, with farmer representatives included, should be formed in order to coordinate agricultural planning and implementation at the project level. This is necessary because the Project Coordinating Committee, formed mainly for construction and infrastructural development activities, is not appropriate for coordinating agricultural activities.

It seems clear to us that although these officials' suggestions merit serious attention, they would be inadequate as solutions to the problems identified in this study. The next chapter offers some preliminary suggestions for addressing these problems.

Chapter 4

Conclusion

THIS PAPER HAS described and analyzed irrigation behavior patterns on one distributary in the Kirindi Oya Irrigation and Settlement Project, and the impact on this behavior of higher levels of management, during one cultivation season. The season began as a "normal" maha; though the reservoir was low, rains were expected to augment the supply. During the early stages of the season, the farmers faced a number of difficulties, including an unreliable and unpredictable supply of water, at times an apparently inadequate supply, and serious distribution problems which had several causes. These problems were not abnormal for a new scheme, in which farmers were irrigating for only their first or second season. Fanners on some field channels did develop an informal method of sharing water that was contrary to the rotation recommended by the Irrigation Department (ID), *called* samanawa bedaganima, equal or simultaneous sharing.

On the other hand, the inability of the newly formed farmers' organizations on the field- and distributary-channel (hamlet) levels either to solve farmers' water problems, or to represent farmers' interests effectively, was also revealed at this stage. The problems included conflict over water among fanners, poor maintenance of field channels by farmers, inequitable water distribution, and poor communication between the leaders and other *farmers.* These organizational weaknesses may be attributed in part to the novelty of the organizations, lack of experience of farmers with cultivation on large irrigation schemes, lack of adequate resources for promoting and strengthening the organizations, and inadequate support of the organizations from other departments.

The effect of the drought -- crop failure -- further weakened the farmers' organizations, leading to criticism and rejection of some of the leaders, and loss of faith in the organizations and, most importantly, in many of the project officials. The poverty and helplessness of most settlers was very serious; the people were truly in distress.

This paper has also documented some project-level management problems, and their impact on the farmers in Distributary Channel-2. Cooperation and communication *among* the various agencies involved in the Project were shown to be *inadequate*, as was the communication and cooperation between some of the agencies and the farmers. The ID attempted *to* implement a rotation plan that was not explained adequately to farmers, and did not appear to them to fit their needs at the field level, but there was no mechanism for adequate feedback of farmers' views and problems. The Project Coordinating Committee originally set up to coordinate construction activities proved ineffective for addressing system-operation problems. The Project Committee of *the* Irrigation Management Division (IMD) did not have sufficient support at high levels, and was weakened further by interagency rivalries, and lack of authority, This fragmentation of *authority*, and even competition for authority, *at* the project level was at the root of the water distribution and supply problems, and contributed to the ineffectiveness of the farmers' organizations as well.

The authorities were forced to recognize the drought condition when the reservoir emptied. The drought put further stress on both the farmers' and government organizations, which were unable to respond effectively to the drought conditions. The previous failure of officials to inform farmers of the implications of the repairs to the spill gates, and the risks of starting a season with a reservoir below the minimum level required by the *rules of* the ID, now led to farmers and even some officials blaming the ID for the drought; the irrigation officials' well-meaning attempt *to* organize a religious ceremony further exacerbated these feelings.

In the *future*, the Kirindi Oya Irrigation and Settlement Project is expected to be water-short in some seasons, especially during yala. In order to use the water productively, particularly if *crop* diversification is successfully implemented, very strong and effective organizations for system management will be required at all levels. It is unfortunate that as is often the *case* in new irrigation schemes in many countries, too little attention has been paid to institution-building at the *earlier* stages of the Project. We hope this paper will contribute to changing this, and lead to increased attention to developing strong management organizations. The research presently being carried out in Kirindi Oya will undoubtedly lead to further insights, and to more specific recommendations for improvement. Based on the maha 1986/1987 research, however, we offer the following specific recommendations in order to stimulate discussion, particularly within the Ministry.

* The Ministry should establish much clearer lines of authority, with one department, not the present three departments having persons designated as "Project Managers." There needs to be one Project Manager with overall authority for integrated project management, including the operation of the irrigation system. This person should be sufficiently senior within the civil service hierarchy to wield authority unambiguously, and should have budgetary control.

* The terms of reference of the existing Project Coordinating Committee should be confined to coordination of government agencies for construction work in the Phase-II area.

* The present IMD Project Committee should be developed into a "Kirindi Oya Project Management Committee," with high-level officials from key government and semi-government agencies and farmers' representatives. This Committee should be the vehicle for setting overall operational policies for the project and for the irrigation system, and be a forum for discussing important system management problems, and coming to agreed-upon solutions. In the short run perhaps it could be an advisory and coordinating *committee*; bur in the *longer* run it should be given considerable responsibility and authority for system management policies. Given the problems of status among present project-level officials, this Committee should be chaired by the overall Project Manager proposed above. Alternatively, if the present setup is retained, it would be best if the Government Agent (Hambantota) were to chair this Committee, with one of the IMD Project Managers as its secretary, with coordinating authority.

* Within the ID -- the key Department in the whole Project setup -- it would be useful if construction (Phase II) and operational responsibilities could be separated. To be effective, it would be important to provide some additional incentives to *those* officials assigned to operations. In addition, the ID should make a *clear* and unequivocal *commitment* to

establishing effective relationships with farmers' organizations, and to promoting actively two-way communication and cooperation between farmers and the ID. To make this effective, these tasks would have to be written into the job descriptions of the technical assistants, irrigation engineers, and resident engineers: monitoring of their job performance should include these parameters; and they should be given special training to improve their communication and management skills. This applies to higher-level officials as well. We strongly recommend that the ID encourage holding regular staff meetings at the various levels of management,

* If, as we assume, the Ministry is serious about developing strong farmers' organizations as an integral component of the overall management structure, the basic concept and approach of the IMD may need rethinking. We reserve comment on this until further research is completed. If the present IMD approach is retained, its management should be strengthened. Specifically, we suggest that senior IMD officials from Colombo should regularly participate in meetings of the Project Coordinating Committee (as do higher-level officials of the Land Commissioner's Department, for example), In addition, the senior officials should provide more effective guidance and support to the IMD Project Managers, through more frequent visits, consultations, and training as needed.

* Finally, we note that since this study was completed, the resources for promoting and strengthening farmers' organizations have been increased. However, we are not confident, based on more recent research, that the institutional organizers presently deployed are effective. We suggest the Ministry might experiment with using existing field-level staff, particularly field instructors of the Land Commissioner's Department, for organizing farmers' organizations. The field instructors would need special training, and would need to be guided and monitored carefully, but we believe they could do the job effectively. This may require re assigning some of these officials to the Irrigation Management Division, to be supervised by the IMD Project Managers. We also suggest rectifying the anomalies created by organizing distributary organizations by hamlet: a distributary-channel organization is likely to be most effective if it is clearly based on a common water source.

Successful development of a major irrigated settlement scheme like Kirindi Oya is a very complex and time-consuming process. It could be argued that one source of difficulties on older settlement schemes is that insufficient attention was paid to developing adequate management institutions at all levels, including among farmers. Being a new scheme, the Kirindi Oya Project offers an opportunity to avoid these problems by developing effective institutions from the beginning. If this paper contributes to initiating this process, it will have achieved its objective.

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Appendix

Timetable: Issue of Water for Maha 1986/1987, Right Bank, Tract 5, Kirindi Oya Irrigation and Settlement Project.

FC* no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
09	100-101	6.00 am to 2.00 pm	10,13,17	6.00 am to 12.00 pm	21,24,28,01	10.00 pm to 6.00 am	4,8,11.15 18,22,25,29	1,5,8,12,15, 19,22,26,29	2,5,9,12, 16,19,23,26	2,5
	99-97	2.00 pm to	10,13,17	12.00 pm to	21,24,28,01	6.00 am to 2.00 pm	4,8,11,15, 18,22,25,29	1,5,8,12,15, 19,22,26,29	2,5,9,12, 16,19,23,26	2,5
	98	10.00 pm to 2.00 am	10,13,17	6.00 pm to 12.00 am	21,24,28,01	10.00 pm to 6.00 am	4,8,11,15 18,22,25,29	1,5,8,12,15 19,22,26,29,	2,5,9,12, 16,19,23,26	2,5
10	110-111	6.00 am to 2.00 pm	7,11,14,18	6.00 am to 12.00 pm	22,25,29,02	6.00 am to 2.00 pm	5,9,12,16, 19,23,26,30	2,6,9,13,16, 20,23,27,30	3,6,10,13, 17,20,24,27	3
	112-109	2.00 pm to 10.00 pm	7,11,14,18	12,00 pm to 6.00 am	22,25,29,02	2.00 pm to 10.00 pm	5,9,12,16, 19,23,26,30	2,6,9,13,16, 20,23,27,30	3,6,10,13, 17,20,24,27	3
	113-115	10.00 pm to 6.00 am	7,11,14,18	6.00 pm to 12.00 pm	22,25,29,02	10.00 pm to 6.00 am	5,9,12,16. 19,23,26,30	2,6,9,13,16, 20,23,27,30	3,6,10,13, 17,20,24,27	3
	103-104	6.00 am to 2.00 pm	8,12,15,19	12.00 am to 6.00 am	22,25,29,02	6.00 am to 2.00 pm	6,10,13,17, 20,24,27,31	3,7,10,14,17 21,24,28,31	4,7,11,14, 18,21,25,28	4

*Field Channel.

continued to next page

FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
10	106-107	2.00 pm to 10.00 pm	8,12,15,19	6.00 am to 12.00 pm	23,26,30,03	2.00 pm to 10.00 pm	6,10,13,17, 20,24,27,31	3,7,10,14,17 21,24,28,31	4,7,11,14, 18,21,25,28	4
	105-108	10.00 pm to 6.00 am	8,12,15,19	12,00 pm to 6.00 am	23,26,30,03	10.00 pm to 6.00 am	-do-	-do-	-do-	-do-
	118-116	6.00 am to 2.00 pm	9,13,16,20	6.00 pm to 12.00 pm	23,26,30,03	6.00 am to 2.00 pm	7,11,14,18 18,25,28	1,4,8,11,15 18,22,25,29	1,5,8,12,15 19,22,26,29	5
	114	2.00 pm to 10.00 pm	9,13,16,20	12.00 pm to	23,26,30,03	2.00 pm to 10.00 pm	-do-	-do-	-do-	-do-
11	122-123	2.00 pm to 10.00 pm	8,11,15,18	6.00 am to 12.00 pm	22,25,29,02	2.00 pm to 10.00 pm	6,9,13,16, 20,23,27,30	3,6,10,13,17 20,24,27,31,	3,7,10,14, 17,21,24,28	3
	121-124	10.00 pm to 6.00 am	8,11,15,18	12.00 pm to 6.00 pm	22,25,29,02	10.00 pm to 6.00 am	-do-	-do-	-do-	-do-
	120-125	6.00 am to 2.00 pm	9,12,16,19	6.00 pm to 12.00 pm	22,25,29,02	6.00 am to 2.00 pm	7,10,14,17 21,24,28,31	4,7,11,14,18 21,25,28	1,4,8,11,15 18,22,25	1,4

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FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
11	119-126	2.00 pm to 10.00 pm	9,12,16,19	12.00 am to 6.00 am	22,25,29,02	2.00 pm to 10.00 pm	-do- -do-	-do- -do-	-do- -do-	-do- -do-
	118-127	10.00 pm to 6.00 am	9,12,16,19	6.00 am to 12.00 pm	23,26,30,03	10.00 pm to 6.00 am	-do-	-do-	-do-	-do-
12	142-143	6.00 am to 2.00 pm	7,10,14,17	6.00 am to 12.00 pm	21,24,23,01	6.00 am to 2.00 pm	5,8,12,15, 19,22,26,29	2,5,9,12,16 19,23,26,30	2,6,9,13, 16,20,23,27	2
	141-140	2.00 pm to 10.00 pm	7,10,14,17	12.00 pm to 6.00 pm	21,24,28,01	2.00 pm to 10.00 pm	-do-	-do-	-do-	-do-
	142-143	6.00 am to 2.00 pm	7,10,14,17	6.00 am to 12.00 pm	21,24,28,01	6.00 am to 2.00 pm	5,8,12,15, 19,22,26,29	2,5,9,12,16 19,23,26,30	2,6,9,13, 16,20,23,27	2
	141-140	2.00 pm to 10.00 pm	7,10,14,17	12.00 pm to 6.00 pm	21,24,28,01	2.00 pm to 10.00 pm	-do- -do-	-do- -do-	-do- -do-	-do- -do-
	139-138	10.00 pm to 6.00 am	7,10,14,17	6.00 pm to 12.00 am	21,24,28,01	10.00 pm to 6.00 am	-do- -do-	-do- -do-	-do- -do-	-do- -do-

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FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
12	133-134	6.00 am to 2.00 pm	8,11,15,18	12.00 pm to 6.00 am	21,24,28,01	6.00 am to 2.00 pm	6,9,13,16 20,23,27,30	3,6,10,13,17 20,24,27,31	3,7,10,14. 17,21,24,28	3
	135-131	2.00 pm to 10.00 pm	8,11,15,18	6.00 am to 12.00 pm	22,25,29,02	2.00 pm to 10.00 pm	-do- -do-	-do- -do-	-do- -do-	-do- -do-
	136-130	10.00 pm to 6.00 am	8,11,15,18	12.00 pm to 6.00 pm	22,25,29,02	10.00 pm to 6.00 am	-do- -do-	-do- -do-	-do- -do-	-do- -do-
	137-129	6.00 am to 2.00 pm	9,12,16,19	6.00 pm to 12.00 am	22,25,29,02	6.00 am to 2.00 pm	7,10,14,17 21,24,28,31	4,7,11,14,18 21,25,28	1,4,8,11, 15,18,22,25	1,4
	128	2.00 pm to 10.00 pm	9,12,16,19	12.00 am to 6.00 am	22,25,29,02	2.00 pm to 10.00 am	-do-	-do-	-do-	-do-
			7,10,14,17	6.00 am to 12.00 pm	21,24,28,01	6.00 am to 2.00 pm	5,8,12,15, 19,22,26,29	2,5,9,12,16, 19,23,26,30	2,6,9,13, 16,20,23,27	2
			-do-	12.00 pm to 6.00 pm	-do-	2.00 pm to 10.00 pm	-do-	-do-	-do-	-do-

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FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
13	155-150	10.00 pm to 6.00 am	-do-	6.00 pm to 12.00 pm	-do-	10.00 pm to 6.00 am	-do-	-do-	-do-	-do-
	149-145	6.00 am to 2.00 pm	8,11,15,18	12.00 pm to 6.00 am	-do-	6.00 am to 2.00 pm	69.T9.T6. 20,22,27,30	3,6,10,13,17 20,24,27,31	3,7,10,14, 17,21,24,28	9
	146-147	2.00 pm to 10.00 pm	-do-	6.00 am to 12.00 pm	22,25,29,02	2.00 pm to 10.00 pm	-do-	-do-	-do-	-do-
	148-156	10.00 pm to 6.00 am	-do-	12.00 pm to 6.00 pm	-do-	10.00 pm to 6.00 am	-do-	-do-	-do-	-do-
	161-162	6.00 am to 2.00pm	9,12,16,19	6.00 pm to 12.00 am	-do-	6.00 am to 2.00 pm	7,10,14,17 21,23,28,31	4,7,11,14,18 21,25,28	1,4,8,11,15 18,22,25,29	4
	160-159	2.00 pm to 10.00 pm	-do-	12.00 am to 6.00 am	-do-	2.00 pm to 10.00 pm	-do-	-do-	-do-	-do-
	158-157	10.00pm to 6.00 am	-do-	6.00am to 12.00 pm	23,26,30,03	10.00pm to 6.00 am	-do-	-do-	-do-	-do-

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FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
14	166-167	6.00 am to 2.00 pm	7,10,14,17	6.00 am to 12.00 pm	21,24,28,01	6.00 am to 2.00 pm	5,8,12,15, 19,22,26,29	2,5,9,12,16, 19,23,26,30	2,6,9,13,16 20,23,27	2
	165-164	2.00 pm to 10.00 pm	- do -	12.00 pm to 6.00 pm	- do -	2.00 pm to 10.00 pm	- do -	- do -	- do -	-do-
	168-171	10.00 pm to 6.00 am	- do -	6.00 pm to 12.00 am	- do -	10.00 pm to 6.00 am	- do -	- do -	- do -	-do-
	172-179	6.00 am to 2.00 pm	8,11,15,18	12.00 am to 6.00 am	- do -	6.00 am to 2.00 pm	6,9,13,16, 20,23,27,30	3,6,10,13,17 20,24,27,31	3,7,10,14, 17,21,24,28	3
	169-170	2.00 pm to 10.00 pm	- do -	6.00 am to 12.00 pm	22,25,29,2	2.00 pm to 10.00 pm	- do -	- do -	- do -	-do-
	175-176	10.00 pm to 6.00 am	- do -	12.00 pm to 6.00 pm	- do -	10.00 pm to 6.00 am	- do -	- do -	- do -	-do-
	177-174	6.00 am to 2.00 pm	9,12,16,19	6.00 pm to 12.00 am	- do -	6.00 am to 2.00 pm	4,10,14,17, 21,24,28,31	4,7,11,14,18 21,25,28	1,4,8,11,15 18,22,25	1 ,4

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FC no.	Lot no.	Time	Dates (Nov 1986)	Time	Dates (Nov 1986)	Time	Dates (Dec 1986)	Dates (Jan 1987)	Dates (Feb 1987)	Dates (Mar 1987)
14	178-173	2.00 pm to 10.00 pm	- do -	12.00 am to 6.00 am	- do -	2.00 pm to 10.00 pm	- do -	- do -	- do -	-do-
15	182,182	6.00 am to 2.00 pm	7,10,14,17	6.00 am to 12.00 pm	21,24,28,01	6.00 am to 2.00 pm	5,8,12,19 22,26,29	2,5,9,12,16, 19,23,26,30	2,6,9,13,16 20,23,27	2
	180-181	2.00 pm to 10.00 pm	7,10,14,17	12.00 pm to 6.00 pm	21,24,23,01	2.00 pm to 10.00 pm	- do -	-do-	- do -	-do-
	184	10.00 pm to 6.00 am	7,10,14,17	6.00 pm to 12.00 am	24,24,28,01	10.00 pm to 6.00 am	- do -	- do -	- do -	-do-
	186-185	6.00 am to 2.00 pm	8,11,15,18	12.00 pm to 6.00 am	21,24,28,01	6.00 am to 2.00 pm	6,9,13,20 23,27,30	3,6,10,13,17 20,24,27,31	3,7,10,14, 17,21,24,28	3

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Water-Issue Schedule, Right Bank, Tract 5, Kirindi Oya Irrigation and Settlement Project (6 lots per day).

TA[a] no.	Offtake no.	No. of farmers	Acreage Upland	Acreage Lowland	Discharge Cusec	Daily Discharge (cusecs) Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	DC[b] 2	5				1.05			1.05			
10		15					1.05	1.05	1.05	1.05	1.05	1.05
15		7				1.05	1.05			1.05	1.05	
11		10					1.05	1.05		1.05	1.05	
12		15				1.10	1.10	1.10		1.10	1.10	1.10
13		18				1.10	1.10	1.10		1.10	1.10	1.10
14		16				1.10	1.10	1.10		1.10	1.10	1.10
					Losses 10%	5.40	5.40	5.40	2.10	5.40	5.40	5.40

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Water-Issue Schedule, Right Bank, Tract 5, Kirindi Oya Irrigation and Settlement Project (8 lots per day).

TA no.	Offtake no.	No. of farmers	Acreage Upland	Acreage Lowland	Discharge Cusec	Daily Discharge (cusecs) Mon	Tue	Wed	Thu	Fri	Sat	Sun
9	DC[b] 2	5				1.05				1.05		
10		15				1.05	1.05	1.05		1.05	1.05	1.05
15		7				1.05				1.05		
11		10					1.05	1.05			1.05	1.05
12		15				1.10	1.10			1.10	1.10	
13		18				1.10	1.10	1.10		1.10	1.10	1.10
14		16				1.10	1.10			1.10	1.10	
					Losses 10%	5.40	5.40	3.20		5.40	5.40	3.20

[a]Technical Assistant.
[b]Distributary Channel-2