FARMERS AND WATER; INCREASING RURAL PARTICIPATION IN IRRIGATION WATER MANAGEMENT IN GAL OYA, SRI LANKA

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This paper is concerned with two important and inter-related development issues. One is the problem of developing physical infrastructure to provide a capability for a more efficient and equitable resource distribution needed to sustain increases in food production in the Third World. The other is the mobilization of local resources and rural participation, an issue that we have come to recognize as crucial if physical facilities are to be operated, managed and maintained so as to distribute the resource equitably and efficiently without reinforcing traditional elites and leaving poorer elements of village society outside the national development process.

The focus is on irrigation development, specifically in Sri Lanka, and the resource being distributed is water. This discussion gives primary attention to the problem of rural participation and organization for mobilizing local resources. However, that is not because this problem is inherently more important than the issue of physical infrastructure development, but rather because rural participation and organization has not been given the attention it should have received in the past. By emphasizing rural participation and organization, perhaps we can begin to redress the imbalance evident in the consideration that development geographers have given to physical facilities for resource allocation, their location and distribution, often at the expense of evaluating the challenging process of developing human resources in the Third World environment. Moreover, at least in the area of improving irrigation water management practices to facilitate increased agricultural productivity, we may be now on the verge of achieving some significant success in addressing this difficult problem.

As evidence of the critical importance of irrigation questions today, we should note that it is widely estimated that between 50 and 100 billion dollars will be invested in irrigation facilities and related water resource development world-wide over the next decade. It is expected that one-half or more of this investment will be in Asia.[1] Although the bulk of this investment is likely to be from external funding sources or represent national government subventions, there is now growing concern for the need to also mobilize more local resources than heretofore has been the case. Development professionals now recognize that while irrigation projects generally have been successful in providing new or improved facilities, much less attention has been given to the need for concomitant development of a local capability for subsequent operation, management and maintenance of the irrigation infrastructure that has been provided. Indeed, in many Asian countries where the provision of irrigation facilities is already well advanced, especially centrally-planned and government-developed large scale systems, there has been only very limited success in this respect. This absence of rural institutions to mobilize local resources and to assist in the construction, operation, management and maintenance of irrigation systems is viewed as a major impediment to the further development of irrigated agriculture, for in the final analysis, ". . . there is no better substitute for farmers themselves in monitoring the operation and maintenance of water control systems."[2]

The Sri Lanka Water Management Project is one current irrigation development activity that is attempting to address this problem directly by establishing a significant component of farmer participation and local organization development as an explicit project

objective. From the beginning, the process has been neither easy or smooth, but it has been challenging and instructive.

Sri Lanka Water Management Project

The Sri Lanka Water Management Project (WMP) is a joint Government of Sri Lanka and United States Agency for International Development project begun in 1980. In very broad terms, the WMP is comprised of two major, interdependent activities, each having short-term, mainly project-oriented objectives, and longer-term, country-wide implications.[3]

One component is the physical rehabilitation and modernization of the Gal Oya Left Bank irrigation system, a major part of the Gal Oya scheme originally constructed in Amparai and Batticaloa Districts in the 1950s as Sri Lanka's first major settlement project in the Dry Zone.[4] The original Gal Oya project was planned to irrigate about 120,000 acres using water stored in the Senanayake Samudra Reservoir and several smaller tanks elsewhere in the system. Of this area, the Left Bank Main Canal and its associated distribution system was designed to irrigate about 36,000 acres, primarily areas settled by colonists drawn from elsewhere in the Dry Zone and the more densely populated Highlands. The principal crop grown here in both the Maha and the Yala seasons has been rice.

The other major component of the WMP is to establish water user organizations among farmers to mobilize local resources for effective rural participation in the reconstruction of the physical system, and to provide a post-rehabilitation operation, management and maintenance capability for the irrigation system. Supporting activities for this component include various specialized training

programs for Irrigation Department personnel and farmers, system-wide master planning, and on-farm water management research in the project area.

This latter component represents a significant departure from the usual engineer-planned and implemented major irrigation system rehabilitation project. Active farmer participation in the project is expected at both the design and reconstruction stages and, following completion of physical rehabilitation, in the operation and maintenance of the irrigation system, at least at the tertiary level. By consciously drawing upon the nearly twenty-five years of farmer knowledge of and experience with the Left Bank system, there is a greater likelihood of obtaining the information necessary for physical rehabilitation that will meet farmer needs at the field level, and to do so at less cost. Active farmer involvement from the outset also is likely to foster a greater sense of farmer responsibility for the irrigation system than now exists throughout the Left Bank. Including farmers in an important and continuing operational role should help to sustain their sense of responsibility for the rehabilitated system, and enhance the capability of the Irrigation Department to manage and maintain the system to better meet the water requirements of a more productive agriculture.

Immediate Water Management Project beneficiaries, of course, will be the farm families who depend upon the Left Bank canals for water for their Maha and Yala paddy crops as well as the Irrigation Department personnel ultimately responsible for managing the system. Over the long-run, however, water management lessons learned in the complex physical, hydrologic and social environment of Gal Oya should be applicable to major irrigation schemes else-

where in Sri Lanka, notably those now being developed through the Mahaweli Development Project.

The Irrigation Environment in Gal Oya

Current estimates of the area commanded by the several hundred miles of main, secondary, and tertiary canals which comprise the Gal Oya Left Bank irrigation system range between 55,000 and 65,000 acres, almost all of it paddy land. Included in this figure are the original colony allotments of three or four acres each, pre-existing private lands, and an unknown but substantial area of encroachment on Government reservation and drainage land. This latter area is mostly occupied and cultivated by second or third generation sons and daughters of original colonist families for whom no provision for agricultural land was made in the original settlement scheme.[5] Thus, the commanded area of the Left Bank system is now about 75% greater than originally planned and at least double the extent initially granted irrigation water rights. Even if the system had been maintained superbly for the past 20 years, it is doubtful that adequate and timely water supplies could be distributed effectively and efficiently to such an increased commanded area, especially in the dry Yala season.

In fact, the physical condition of the Left Bank system is so deteriorated that it is very difficult, if not impossible, for the Irrigation Department to control water below a small number of locations in the main system. Moreover, the Irrigation Department's efforts to manage and maintain the Gal Oya system are complicated and weakened by political interference in the determination of locations allocated water and the schedule of water issues, by

incentives

inadequate budgets and shortages of trained personnel, by relations with farmers that reflect farmers' lack of confidence in the Department's ability to manage the system, and by its own engineer-oriented perspective on who should control water and how it should be managed. It is no surprise, therefore, that the agro-hydrologic situation in the Left Bank area reflects the combined effects of these circumstances.

Three quite distinct geographic sub-regions can be identified in the Gal Oya Left Bank command; these are the top-end area, a middle zone, and a tail-end region. All farm families in the top-end area are from the majority Sinhala community. Generally, farmers here experience little difficulty in obtaining adequate irrigation when the system is operating, given their locational advantage. Although there are farmers in this sub-region that do not get sufficient or timely irrigation because of their location at the tail-end of long tertiary channels, more often there are problems of drainage, with too much water pouring uncontrolled from field channels and farm ditches into and through farmers' paddies. High average paddy yields confirm that this is a well-watered area (Figure 1).

The middle zone is the area where large numbers of Tamil-speaking Muslims are resident, although there is a considerable Sinhala population here as well as some Hindu Tamil farm families, the latter concentrated in the eastern margins. Irrigation problems often are serious in this area, especially in the Yala season, a result of the combined effects of unpredictable water deliveries, the physical condition of the system, and the greater distances water must travel to reach farmers' fields. In many cases, farmers have responded with traditional water management techniques to

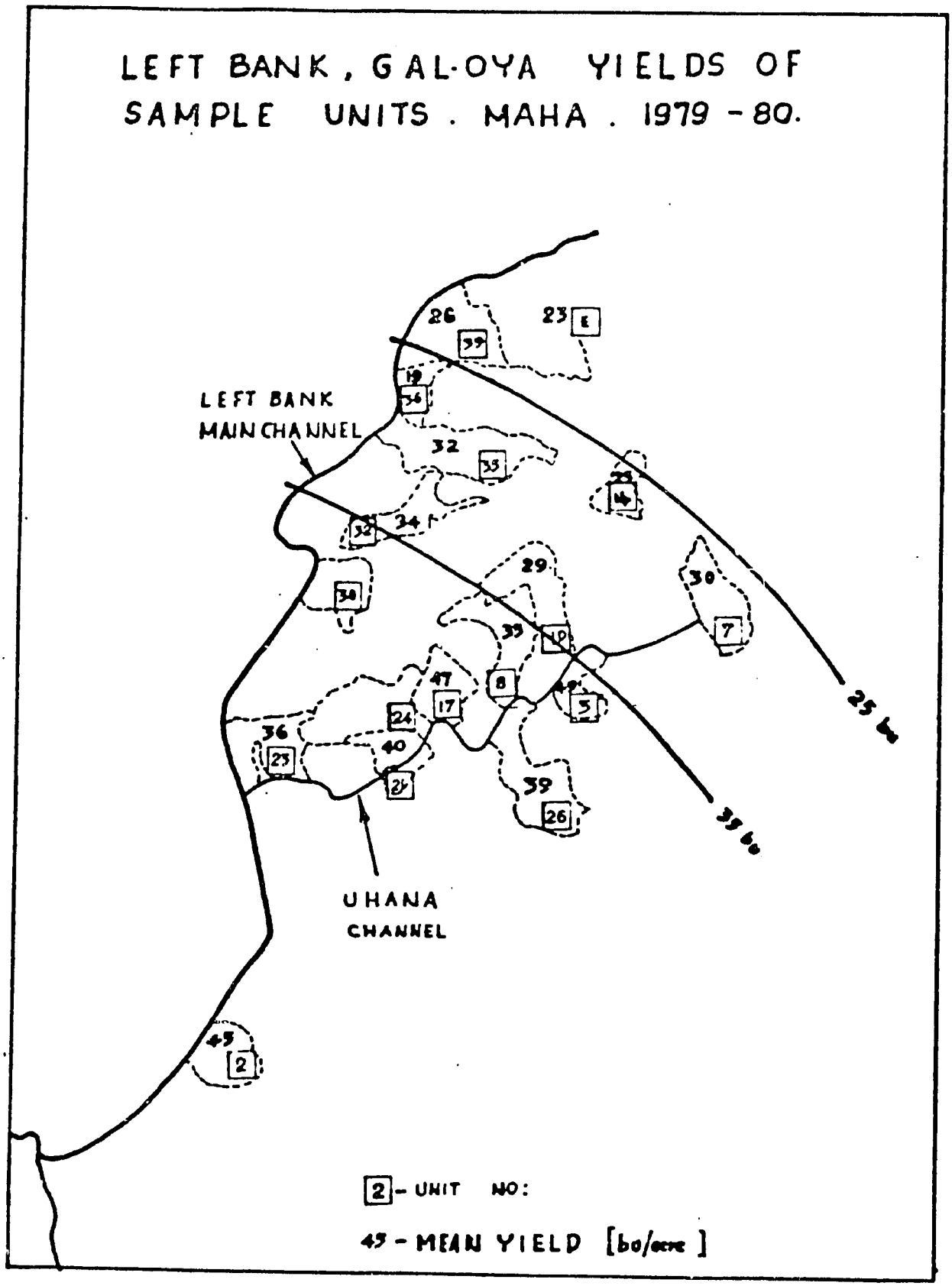

LEFT BANK, GAL-OYA YIELDS OF SAMPLE UNITS. MAHA. 1979-80.
LEFT BANK MAIN CHANNEL
UHANA CHANNEL
2 - UNIT NO:
45 - MEAN YIELD [bo/acre]

Figure 1

partially compensate for undependable main system operation, e.g. constructing anicuts (weirs) in several locations across drainage channels to supplement water supplies from the canal system, shramadana ("gift of labor") activities to clean and maintain field channels, informal group measures to manage and distribute water. Consequently, although some farmers obtain excellent paddy yields overall paddy yields in the middle zone are significantly lower than in the head-end area, reflecting the greater degree of uncertainty surrounding water deliveries in this area and its greater location disadvantage.

Tamil-speaking Hindu and Muslim farm families are concentrated in the tail-end sub-region and the Sinhala community is virtually non-existent here. This area experiences the most acute and persistent water problems, including occasional serious shortages of domestic water.[6] Large areas of this sub-region do not receive regular irrigation deliveries, especially in the Yala season, and rice cultivation is often one crop per year, grown in the Maha season and using rainfall and drainage water, rather than irrigation from the system. The pattern of planting and harvesting dates in the area illustrates greater farmer reliance upon non-system water sources, and average yields of paddy here are the lowest in the Left Bank command.[7] However, as the most disadvantaged area in the Left Bank, this sub-region could be the principal beneficiary of the WMP through restoration of its severely deteriorated physical system and the implementation of a water management program that would ensure a more equitable distribution of water throughout the command area.

Recent analyses of irrigation data reinforce the foregoing brief review of the agro-hydrologic environment of the Gal Oya Left Bank. The area served by Uhana Branch channels receive about 50% of the flow entering at Uhana head, on average, but this is only one-third of the cultivated area irrigated by water entering the system at Uhana head in an average Yala season.[8] More than one-half of the variation in paddy yields for the several hundred farms being surveyed by ARTI in the project area was accounted for by water alone. And, there is significant variation in paddy yields between farms located along tail-end D-channels, middle-area D-channels and head-end D-channels; farms in the former area have substantially lower yields than do those in the latter two locations.[9] Clearly, significant problems of equity in farmer access to water have emerged in the Left Bank command with the gradual, yet coincident, deterioration of the physical system, decline in Irrigation Department operation and management capability, and expansion of irrigated area.

However, there was little chance that in the complex social environment of Gal Oya a typical engineering-oriented reconstruction program for the Left Bank irrigation system, in itself, would produce a successful and lasting solution for the water management problems found there. The Water Management Project recognized this fact, and through it, the various participants are now evolving an approach that involves both the farmers and the irrigation bureaucracy in system rehabilitation and builds a local institutional capability to help solve irrigation problems through improved system operation and management.

Rural Participation Strategy in Gal Oya

The record of rural participation and local organization in Sri Lanka suggests that there is little problem in getting organizations started or in securing initial participation from all segements of the rural population. In terms of sustained successes, however, past experience has not been encouraging. Seldom has the initiative for rural organization emerged from rural people themselves. Usually government has promoted rural organizations for one or more purposes, typically following a preconceived model backed by administrative regulations or legal statutes. Once the external stimulae have been withdrawn, rural organizations often have collapsed, or they have become highly politicized, losing their original sense of purpose and non-partisan identity, thereby discouraging participation by all members of the rural community.

The strategy for building water user organizations adopted by the ARTI/Cornell team in the WMP has a number of different and distinct characteristics. Overall, the approach to institutional development can be characterized as "bottom-up", more oriented toward what might be labeled as a "social science learning process", in contrast to "top-down" methods which first establish and then work through a legal framework and basis for local organization development.[10] In Gal Oya, institution building has been approached in an evolutionary fashion, developing through the accumulated experience of farmer participants in mobilizing local resources --past experience and knowledge of the irrigation system and milieu, labor-time, tools and equipment, local funds--to identify and begin solving local water management problems.

This approach has not assumed or prescribed any particular

organizational model as most suited for water user associations. In fact, given the complexity and diversity of the project environment--hydrologically, agriculturally, ethnically--it would have been inappropriate to do so. Rather, we have argued that developing water user organizations should be approached with flexibility, working inductively to build an institutional framework which farmers find suitable for solving water problems in their behavioral and resource environment. Consequently, the strategy has been to begin with small, informal organizations of farmers, and then to move toward formalizing institutions at a pace dictated by farmers' experience and needs.

The process by which informal organizations are initiated involves the stimulus and activities of a cadre of Institutional Organizers (IOs) trained to work and live with farmers as institutional "catalysts" or facilitators.- IO training stressed the necessity of working with farmers and field-level government officers in a cooperative mode, how to become knowledgable about water and farming problems in locales of assignment through skilled observation and discussion with farmers, and ways to encourage farmers to begin solving water problems locally and improving water management through cooperative, small group action. IOs must work through persuasion and by example for they have no authority either over farmers or field-level government officers.

Obviously, IO activities are expected to induce behavioral change among farmers and between farmers and the irrigation bureaucracy. Thus there is a need to know whether or not the resulting interactions and organizational forms fit the circumstances of time and place, and are perceived by farmers and officials as acceptable

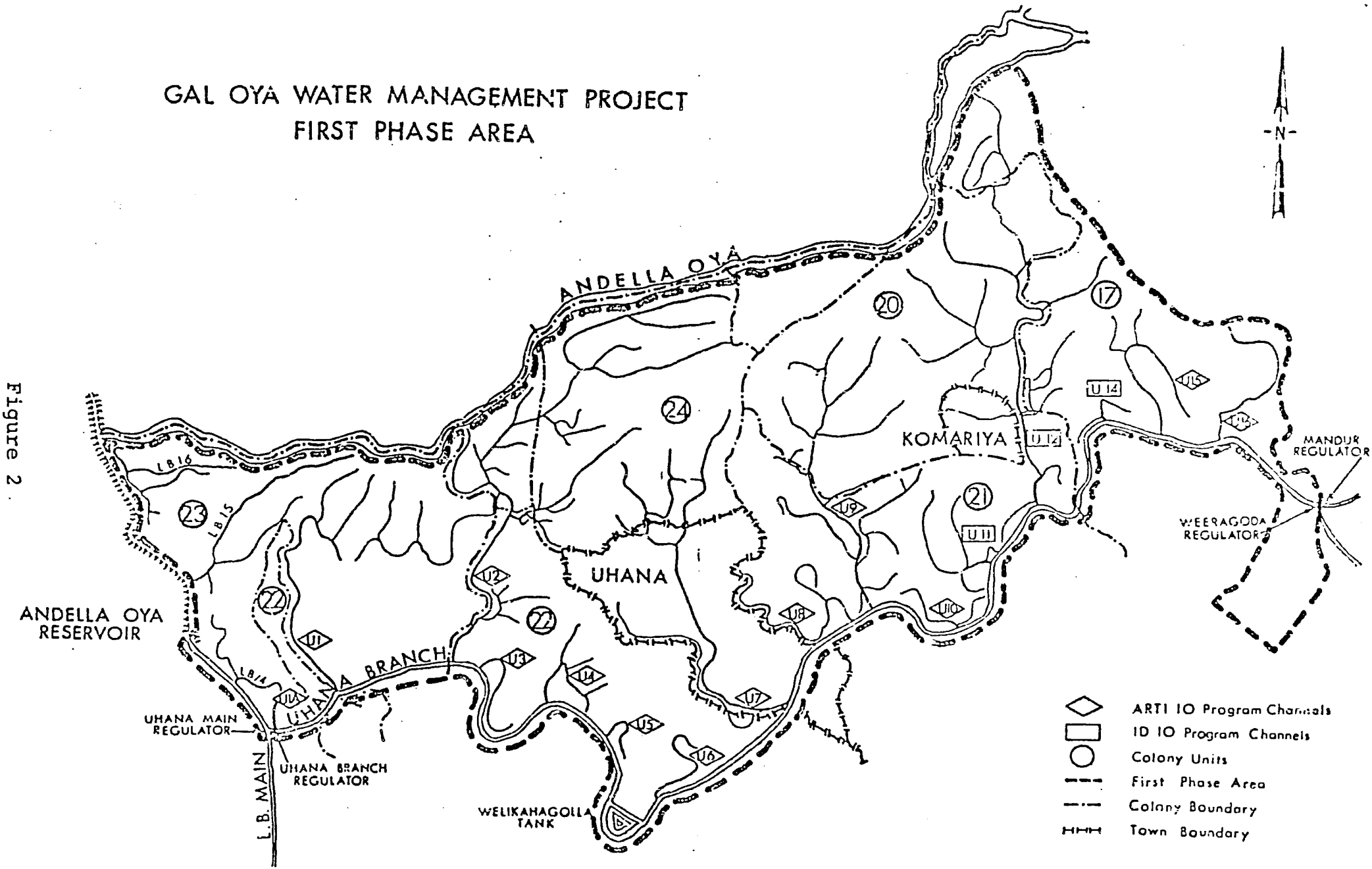
and appropriate. The organizational strategy recognizes the possibility that mistakes may be made while encouraging promising avenues for more effective rural participation, or in trying out new organizational modes. It is crucial to the success of this learning process approach that IOs be periodically appraised of their progress and errors or problems be quickly identified so that appropriate adjustments or changes can be made. A process documentation component has been incorporated in the organizational strategy for this purpose. A small group of process documentors have been designated to observe and monitor the organizational activity as it proceeds, carefully recording the details of its progress. Their reports are used by both IOs and program supervisors to assess organizing work and develop ways that it can be improved.

This organizational strategy and the learning process through which it is being implemented has drawn upon the experience of similar programs underway for the past five years in the Philippines. There, the National Irrigation Administration has used trained groups of community organizers to obtain effective farmer participation in building, improving and managing several communal irrigation systems.[11] Important differences in Project circumstances, the bureaucratic milieu, and the local environment, however, made it inappropriate to directly adopt the Philippine strategy in Sri Lanka. Hence, in adapting to these conditions, the Institutional Organizer program and the process of building farmer organizations in Gal Oya differ significantly from the Philippines experience, although prospects for a similar degree of success are encouraging.

Implementing Rural Participation in Gal Oya

In late March, 1981, less than two months before the rehabilitation program was then scheduled to begin, ARTI fielded thirty trained IOs in two pilot areas of the Left Bank.[12] The largest number of IOs were assigned to an area designated by the ID as the first phase construction area served by the Uhana Branch canal (Figure 2).[13] IOs were fielded here in direct support of the rehabilitation program, especially to facilitate farmer participation in the redesign planning process about to begin as well as in actual physical rehabilitation of the tertiary system planned to commence shortly thereafter.[14] Because of its "head end" location, this area of the Left Bank system is comparatively "water rich", and it was anticipated that farmers here would be less inclined initially toward organizing and adopting improved water management practices since they typically experienced fewer water problems than in other locations in the system.

Thus, a smaller group of IOs was assigned to the Gonagolla Distributary area where rehabilitation was scheduled to occur in the second construction phase of the Project (Figure 3). The objective here was to obtain experience in mobilizing local resources and stimulating institutional development more in keeping with the original strategy developed by the ARTI/Cornell team. There were fewer time constraints here and an opportunity to initiate informal farmer organizations as a vehicle for beginning to solve existing local water problems, independent of such project pressures as involving farmers in design meetings and contributing their labor for tertiary channel reconstruction. Moreover, the "middle" location in the LB system of this area suggested that potential productivity


GAL OYA WATER MANAGEMENT PROJECT
FIRST PHASE AREA
-N-
ANDELLA OYA
ANDELLA OYA RESERVOIR
UHANA
UHANA BRANCH
KOMARIYA
MANDUR REGULATOR
WEERAGODA REGULATOR
UHANA MAIN REGULATOR
UHANA BRANCH REGULATOR
L.B. MAIN
WELIKAHAGOLLA TANK
LB16
LB15
LB14
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
17
20
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22
23
24
ARTI IO Program Channels
ID IO Program Channels
Colony Units
First Phase Area
Colony Boundary
Town Boundary

Figure 2

GAL OYA WATER MANAGEMENT PROJECT
IO PROGRAM RESEARCH AREA

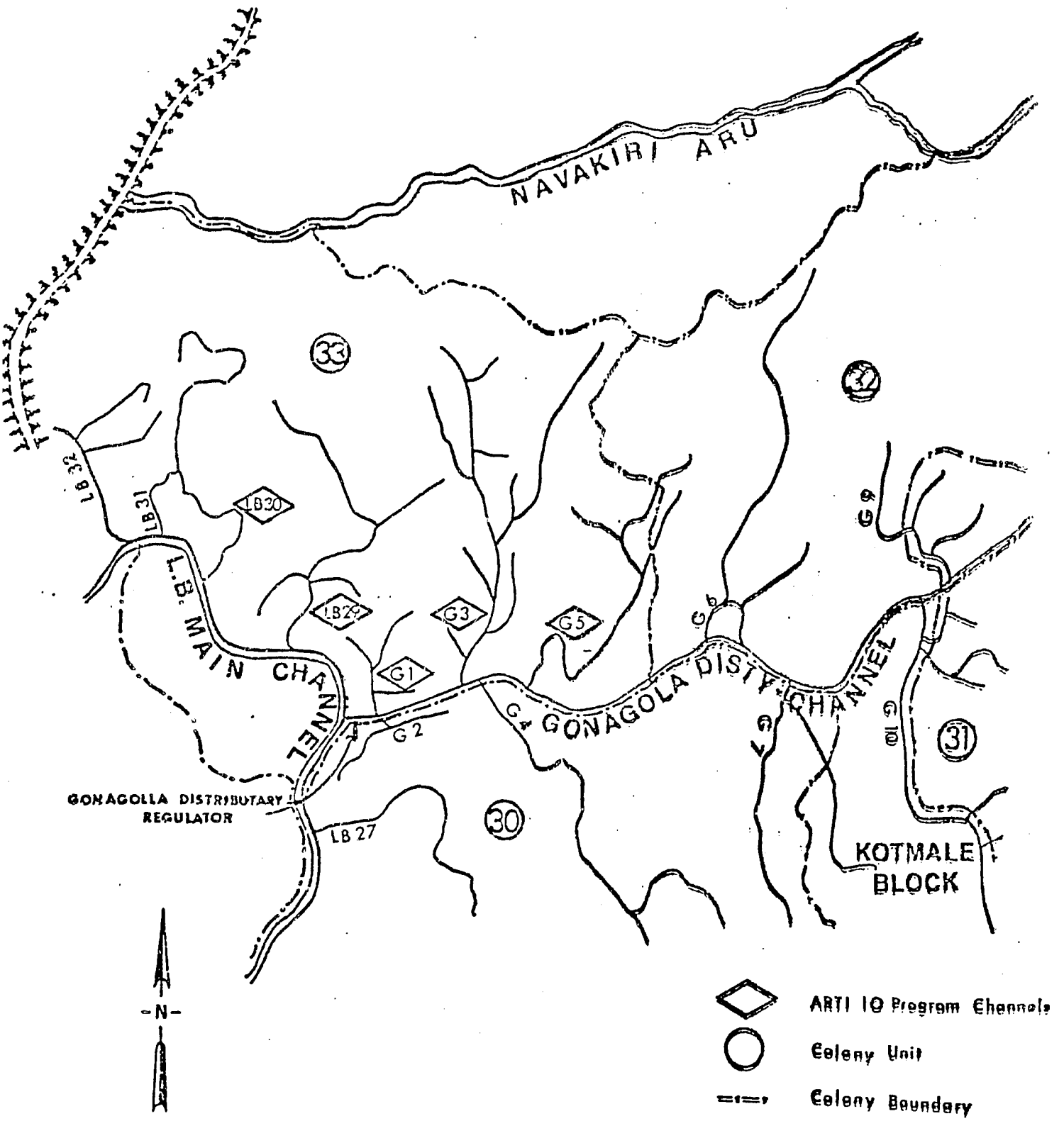

Figure 3

gains from improved water management would enhance prospects for institutional development success.

As the IO program continued into an increasingly difficult, water-short yala season, accompanied by considerable slippage in the reconstruction schedule, both pilot areas provided considerable opportunities to "test" the learning process strategy that had been developed. Farmer participation in scheduled redesign meetings with ID engineers in Uhana proved to be useful for stimulating informal farmer organization development along a few field channels in this "head-end" area. However, substantial program progress in both institutional development and implementing farmer-initiated water management practices appears to have been more directly related to serious water distribution problems in the LB system. By late May, the water level in Senanayake Samudra was falling rapidly, and there was growing doubt that sufficient water would remain to meet the needs of the yala rice crop in the Left Bank. IOs in both the Uhana and Gonagolla areas exploited these concerns to stimulate discussions among groups of farmers concerning possible action for more effectively sharing and redistributing irrigation deliveries among themselves. By July, over 85% of the farmers covering 90% of both IO pilot areas were engaged in rotational irrigation and/or water-saving measures; typically, these activities were developed and implemented by farmers through field channel-based informal organizations.[15] Moreover, these measures often were preceeded or accompanied by shramadana activity through farmer organizations to clean and repair field channels and, on occasion, D-channel reaches--the latter traditionally an ID maintenance responsibility.

Encouraged and assisted by IOs, the active involvement of farmer

groups in redesign meetings with ID engineers confirmed that farmers do possess detailed knowledge and experience at the tertiary level of the irrigation system, and their inputs are especially valuable when other sources of precise data are absent, as they are in Gal Oya. This participation by non-professionals coupled with the need to consider local environment and social factors facilitated a slow but significant shift in physical rehabilitation planning and implementation by the ID. It is now generally accepted that rehabilitating the tertiary system will concentrate more on "patch and repair" or "improvement" of existing facilities rather than proceeding through formalized engineer-designed channel reconstruction. Not only will this reduce overall rehabilitation costs, it will speed progress heretofore hampered by shortages of skilled personnel, and encourage further active farmer participation, notably by providing opportunities for farmer organizations to directly share in Project construction as contractors for tertiary channel rehabilitation.[16]

Sustaining the momentum of local resource mobilization, farmer participation and institutional progress generated by IO activity in the 1981 yala season proved to be a major challenge following the out-break of communal conflict in Amparai District and the Project area in August. Although rehabilitation planning and reconstruction were severely set-back by this unfortunate development, the IOs proved to be equal to the task and the confidence placed in them, remaining in the Project area and continuing their work to facilitate farmer participation and institutional development into the 1981-1982 maha season. By early 1982, more than 80 field channel-based informal farmer organizations (FOs) were active in the pilot IO areas,

covering well over 3000 irrigable acres. Program process documentation provided numerous examples of local resource mobilization and action related to water management, notably in improving the physical condition of tertiary and secondary channels. Most FOs had elected (usually by consensus) a spokesman or Farmer Representative (FR) and many FOs had begun to take steps to strengthen their organizations and to develop linkages with neighboring FOs, normally within a single D-channel command area.

Recognizing this encouraging--and unexpectedly rapid--progress, the local District Minister and the Government Agent took the unprecedented action of inviting three FRs to sit as members of the Amparai District Agriculture Committee, two as farmer representatives from Uhana and one from Gonagolla. For the first time farmers had direct representation on the official committee most deeply involved in the yala acreage allocation decision (a determination of the paddy area for which irrigation water will be made available).

The work of the IOs in the first phase area is acknowledged to have produced a substantial improvement in relations between farmers and local officers of the Irrigation Department and other agriculture -related government departments. ID engineers in Amparai frankly admit that for the IO pilot areas, farmer complaints concerning water problems are notably fewer--inspite of 1982 having been the second successive water-short yala season--and that their relations with farmers generally have become much improved. It is significant that the farmers themselves tend to agree with this assessment, noting further a major improvement in farmer/farmer relations; they also credit IO activity with having facilitated this change.[18]

A modest expansion of the IO program in Gal Oya was authorized

by the Irrigation Department as a consequence of initial program success and recognition of the value of responsible farmer participation in the rehabilitation project. However, the IO program continues to be an administrative and supervisory responsibility of ARTI. In June-July, 1982, ARTI recruited and trained another group of 35 IOs, and they began work in the second phase construction area in September. The Water Management Project farmer organization and participation program now covers a greatly expanded area--more than 13,000 irrigable acres--with 54 Institutional Organizers in the field.

Participation Issues and Prospects in Gal Oya

It would be fair to conclude that very encouraging progress has been made in mobilizing local resources and stimulating substantive rural participation in irrigation system rehabilitation and institutional development for improving water management in the Gal Oya Left Bank system. Assisted by the cadre of IOs, farmers in a limited area have formed their own field channel-based organizations that already have taken the initiative to improve tertiary distribution facilities and to share water more equitably, demonstrating a growing competence to more responsibly manage a scarce resource. Relations among farmers and between farmers and the formal irrigation bureaucracy, at least in this area, are less contentious and more cooperative than in the recent past. For its part, the ID now seems to be more prepared than formerly to share responsibility for system O & M with farmers' organizations at the secondary level, while leaving tertiary level O & M completely in the hands of organized farmers.[19] Nevertheless, it is far too early to conclude that this

promising start is an unqualified and sustainable success.

Instead of adopting a preconceived, static model for farmer organization in Gal Oya and following a blueprint approach to its implementation, the ARTI/Cornell team has sought to catalyze informal farmer organizations that would be flexible in structure to fit the physical and social milieu and complex geography of the irrigation system. With Institutional Organizers working as catalysts, the program has followed a learning process approach that anticipates problems will emerge and unforseen errors are likely to be made. However, in such a dynamic approach, these events are treated as primary sources of information for program solutions that fit the circumstances and available resources as institutional development and participation passes through the phases of "learning to be effective," "learning to be efficient," and "learning to expand."[20]

Significant issues and problems have emerged as the IO program makes the transition from learning to be effective to learning to be efficient. The geographical area of program activity in Gal Oya now is nearly four times larger than in the first year, while the number of IOs have doubled. Thus, in the second phase, each IO will be working with many more farmers and field channels, and in a much larger command area. Undoubtedly, this will help reduce program costs relative to institutional development and farmer participation, but only if the reduced intensity for IO/farmer interaction implicit in this effort to be more efficient will produce a similar relatively rapid rate of farmer turnout group development.

A related issue has been the need to avoid establishing a

a dependent relationship between farmers' organizations and the IOs. The catalyst role of the IO does not preclude a modest degree of sensitive activity by IOs to assist farmers in initiating informal organizations or water management activities, so long as farmer dependence on the IO does not develop; so far, field evidence confirms that significant farmer/IO dependency has not occurred. New leadership has come forward in the FR role in farmers' organizations, and FOs are increasingly self-reliant and confident as D-channel committees linking spatially contiguous command areas emerge to begin resolving secondary level water management issues. Thus, reducing the numbers of IOs in the first phase area seems to be appropriate at this juncture. However, farmers have expressed their desire for continued IO assistance, and the psychological significance of a continued IO presence as confirmation of continuing Project interest in strengthening the water management capabilities of these new organizations is evident.

The expansion of the IO program into the area commanded by Mandur Distributary, downstream from Uhana Branch, poses a formidable institutional and participatory challenge. For the first time in the WMP, the IO program will be active in both the middle and tail areas of the Left Bank system where water distribution problems are significantly different than in the head-end area. Many secondary and tertiary channels in the middle region experience serious water problems in yala, and opportunities for solving such problems through farmer cooperation and institutional development perhaps are greater here than elsewhere in the system. Indeed, there is evidence in this region that some farmers have been active for several years in

solving local irrigation problems through group action, using traditional techniques and institutions; such efforts likely can be expanded through IO activity. But in the tail area of Mandur Distributary, farmers have not had yala irrigation deliveries for the past 10 years. It is difficult to be sanguine about developing farmer-based water management institutions in an environment where irrigation water is virtually absent in the season of greatest need and even drinking water is scarce 5 or 6 months of the year. Here the common plea of farmers is "just give us water; we know what to do with it!" Nevertheless, if the ID were to exercise greater main system control and management thereby making available even limited irrigation issues in the coming yala, there is a reasonable prospect for making modest organizational progress through the IO program.

Concurrently in the second phase area, the IO program also will encounter for the first time the full range of ethnic diversity in the Left Bank system. A small Tamil farming population is located in the middle region and in the tail region of the main system, the population is exclusively Tamil. Muslim farmers are served by secondary and tertiary channels in the transition zone between these two regions. From the inception of the WMP, it has been recognized that tension between the Tamil and Sinhala communities could disrupt efforts to secure farmer participation and develop water management organizations. Coincidently, it's clear that the successful completion of the WMP also offers the best hope to reduce communal tension in Gal Oya by renewing long-disrupted irrigation deliveries to tail-end Tamil farmers through a rehabilitated and more effectively managed canal system. Early evidence suggests a slim basis for mild

optimism here insofar as the communal strife of August, 1981, did not seriously disrupt IO field work, and there were several instances where Sinhala farmers assisted Tamils during those disturbances in the first phase area of the IO program. In addition, (Sinhala) FRs from the Gonagolla area have stated their own belief that a Sinhala -Tamil water user association can be formed to manage water distribution there and have indicated their willingness to work toward that development. However, given the sensitive and often intractable nature of ethnic issues, no one really can be sure how significant an obstacle communal tension will be for institutional development in Gal Oya.

Certain water management measures adopted by FOs in the first phase area have illustrated the highly interconnected nature of the irrigation system as well as how new problems can emerge from apparent solutions to existing problems. Efforts to cut-back on water applied to head-end fields along tertiary canals, thereby reducing flows into the drainage system and permitting more water to pass down the canal to tail-end farmers proved fairly successful in solving the persistent problem of inadequate deliveries to their farms. Simultaneously, the reduction of flows into the drains disrupted the irrigation supplies of farmers that have encroached drainage reservation land and farmers of private lands located in the Andella Oya drainage area. Over the years, these farms have become dependent upon irrigation water "wasted" by head-end farmers that passed on into the drainage system. Soils in these areas often are the most suitable soils for paddy cultivation, and many of these farms are highly productive, among the best in Gal Oya; however, these farmers do not have formal rights to irrigation

from the Left Bank system. It is scarcely sensible development policy to now disrupt or deny water to such productive farms; moreover, by reusing drainage water, these farmers actually substantially increase overall system water use efficiency, a highly desirable irrigation objective. Clearly an improved and sensitive system water management policy will have to be sufficiently flexible to respond satisfactorily to the irrigation needs of farmers in these areas, but in the first phase area, most of them are not, as yet, included as members of recently formed FOs.

This problem highlights what might well prove to be the most difficult issue facing farmer organization development, viz, who will be included as members of the farmers' organizations? Only allotees and others originally granted irrigation rights? All farmers using water from the Left Bank system, including tenants whose participation by the landlord is discouraged? All allotees whether or not actually cultivating their land? The IOs and the IO program can not be expected to solve the land tenure problem in Gal Oya, but unless Government is able to resolve the complex tenure patterns that have emerged there over the past 25 years, the success of farmer participation and organizational activities is certain to be conditioned by them.

FOOTNOTES

1. P. Oram, J. Zapata and G. Alibaruho, "Investment and Input Requirement for Accelerating Food Production by 1990 in Low-Income Countries," International Food Policy Research Institute (IFPRI), Washington, D.C., 1979; U. Colombo, D. G. Johnson and T. Shishido, "Reducing Malnutrition in Developing Countries: Increasing Rice Production in South and Southeast Asia," The Trilateral Commission, New York, 1978.

2. Colombo, et. al., op. cit., p. 28.

3. About 45% of the $18.3 million cost of the Water Management Project is expected to be paid by the Government of Sri Lanka. USAID grants and loans will provide for the balance of the cost of the project. Agency for International Development, Project Paper; Sri Lanka - Water Management Project (383-0057), (Washington, D.C.: Department of State, 1979), pp. 69-70. See pp. 17-61 for a detailed discussion of project inputs and expected or anticipated outputs.

4. B. H. Farmer has written extensively about the Dry Zone environment of Sri Lanka and efforts in the pre- and post-colonial periods to resettle or colonize this region. In particular, see: B. H. Farmer, Pioneer Peasant Colonisation in Ceylon, (London: Oxford University Press, 1957) and B. H. Farmer, "Rainfall and Water Supply in the Dry Zone of Ceylon," R. W. Steel and C. A. Fisher (eds), Geographical Essays on British Tropical Lands, (London, 1956), pp. 227-68. The original Gal Oya project has been described by C. H. MacFadden ("The Gal Oya: Ceylon's Little TVA," Geographical Review, vol. 44, no. 4, 1954, pp. 271-81).

5. Determining the actual irrigated area commanded by the Left Bank Main Canal and its distributaries has proven to be a formidable problem, particularly with out current aerial photographs. Only about 30,000 acres of the 36,000 acres designed for irrigation were actually given water rights. In 1975, a UNDP-FAO team estimated that about 46,000 acres of paddy were actually commanded by the Left Bank system. However, in 1979, the CH_2M Hill team, in their feasibility study for the Water Management Project, concluded that only about 40,000 acres of paddy were irrigated by the system. The USAID Project Paper revised this figure upward again, stating that nearly 52,000 acres were under rice cultivation under the Left Bank system. The current estimate used here is based upon consultant analysis of 1975 aerial photography, Irrigation Department data, field surveys and a baseline sample survey of the project area. It is likely that the actual irrigated area will be finally determined in the next few months following analysis of 1981 aerial photography. There is general agreement that about 19,000 farm families reside in the project area. See the following for further details: UNDP-FAO, Water Management for Irrigated Agriculture (Gal Oya Irrigation Scheme) Sri Lanka; Project Findings and Recommendations, Appendix 6, (Rome: FAO, 1975), passim. CH_2M Hill, Proposed Water Management Program for Major Irrigation Schemes in Sri Lanka, prepared for USAID (1979), passim. Agency for International Development, op. cit., passim.

6. There are those who argue that the agro-hydrologic pattern and the social geography of the Project area are not accidental. However that may be, it is a fact that sufficient numbers of farmers from all ethnic communities experience such serious irrigation problems in Gal Oya that one can conclude that no ethnic group is as well off as it possibly can be.

7. Analysis of ARTI data on planting and harvesting paddy in maha, 1979-80, for a sample of farmers in Units 21, 17 and 14, show that 80% of farmers in Unit 14, the tail-end area, had planted paddy by late October; a similar proportion of farmers having planted paddy in Units 17 (middle-zone) and 21 (head-end) was not reached until four to six weeks later. Unit 14 farmers received their first irrigation for this maha season on January 15th, by which time nearly one-third of them had completed their paddy harvest! Harvesting operations were completed in this Unit three weeks later, at a time when 20% or less of the farmers in Units 17 and 21 had completed their paddy harvests. See C. M. Wijayaratne, "An Analysis of Water Distribution in Gal Oya Left Bank: A Water Availability Index and Other Measures," 1980 Yearbook for Sri Lanka Water Management Research; Initial Analysis of Pre-Rehabilitation Situation in Left Bank Gal Oya, Agrarian Research and Training Institute, June, 1982, pp. 13-31, for further details of water distribution in the Left Bank area.

8. Hammond Murray-Rust, personal communication, May 21, 1982.

9. Mark Svendsen and C. M. Wijayaratne, "The Spatial Distribution of Irrigation Water and Yields on the Gal Oya Left Bank," Water Management Research Note, Agrarian Research and Training Institute, 1982, pp. 3-4.

10. Detailed discussions of the organizational strategy developed and adopted in the Water Management Project can be found in: Norman Uphoff, "A Case Study of 'Learning Process' Applied to Farmer Organization and Participation in Water Management--The Institutional Organizer Program in Gal Oya, Sri Lanka," Workshop on Social Development Management, National Association of Schools of Public Affairs and Administration, Washington, D.C., February, 1982 (especially pp. 1-21), and Lakshman Wickramasinghe and Edward J. Vander Velde, "Action Research into Farmer Participation in Irrigation System Management: A Sri Lankan Experiment," Conference on Field Research Methodologies for Improved Irrigation Systems Management, Tamil Nadu Agricultural University, Coimbatore, India, September, 1981 (especially pp. 4-13).

It should be noted that the Water Management Project has not been the only activity in Sri Lanka concerned with increasing farmer participation in water management. N.G.R. de Silva has recently reported on a pilot program underway for the past two years in Minipe that has had encouraging results in securing farmer participation in irrigation water management. N.G.R. de Silva, "Farmer Participation in Water Management: The Minipe Project in Sri Lanka", Rural Development Participation Review, vol. III, no. 1 (Fall, 1981), pp. 16-19.

11. David C. Korten, "Community Organization and Rural Development: A Learning Process Approach," Public Administration Review, vol. 40, no. 5 (Sept./Oct., 1980), pp. 480-511. See pp. 492-94 for a discussion of the application of the learning process approach to irrigation system reconstruction in the Philippines. NIA staff have worked in Sri Lanka as consultants to ARTI for the WMP. Further details of the Philippines institutional development experience in irrigation system can be found in: B. U. Bagadion and F. F. Korten, "Developing Viable Irrigators' Associations: Lessons from Small Scale Irrigation Development in the Philippines," Agricultural Administration, vol. 7, 1980, pp. 273-287, and Frances F. Korten, Building National Capacity to Develop Water Users' Associations; Experience from the Philippines, World Bank Staff Working Papers No. 528 (Washington,D.C. The World Bank, 1982).

12. IO recruitment and training has been described in detail in Uphoff, "A Case Study . . .", op. cit., pp. 12-16.

13. Several ID Jala Palakas (Irrigators) also were given IO training and subsequently assigned to begin organizational activities along specific channels in the Uhana Branch area. The purpose of this experiment was to test the possibility of utilizing trained ID field staff as institutional organizers in a "catalyst" mode. For a variety of reasons this experiment proved to be unsuccessful and it has now been abandoned.

14. The "tertiary system" refers to the complex of field and sub-field channels in Gal Oya which typically supply irrigation water to farms through individual pipe outlets. The LB Main, Branch and Distributary canals are commonly referred to as the "main system" while the "secondary system" is comprised of D-channels (distribution canals) that take-off from main system canals. In some instances, farm pipe outlets supply farms directly from D-channels. The boundary between the secondary system and the tertiary system is not always as clear as suggested here, nevertheless this three-fold differentiation of levels in the irrigation system is broadly useful in a water management and administrative context. Irrigation Department responsibility clearly includes the main system while farmers have had de facto control at the tertiary level. Both the ID and farmers are active at the secondary level with the former traditionally having legal responsibility here; however, farmer action at the secondary level increasingly has characterized water management activities in Gal Oya over the past decade, frequently leading to conflict and acrimony in ID/farmer relationships.

15. Norman T. Uphoff, "Initial Report on Water Management Activities of Institutional Organizers for Water Management Project, Gal Oya, Sri Lanka, May-July, 1981," ARTI/Cornell working paper, September, 1981. Rotational irrigation deliveries were reported adopted by farmer turnout groups on 35 of 71 tertiary channels in the program area; water saving practices only were implemented by another 22 farmer organizations.

16. This is a challenging approach for it conflicts with the professional training and pride of Irrigation Department engineers. However, a growing number of irrigation engineering professionals recognize that tertiary channels improved with active farmer participation are likely to be as functional, if not more so, as engineer-(re)designed channels without farmer involvement, two or three years after construction. See Gilbert Levine, "Trip Report (Sri Lanka Water Management Project) January 9-23, 1982," Rural Development Committee, Cornell University, mimeo.

17. Observations by various outside consultants substantiated these process documentation reports. See Mick P. Moore, "Report on Visit to Gal Oya Irrigation Rehabilitation Project and Institutional Organiser Programme, 6-9th December, 1981," IDS, Sussex, mimeo, and Norman T. Uphoff, "The Institutional-Organizer (IO) Program in the Field After Ten Months: A Report on Trip to Ampare/Gal Oya, Sri Lanka, January 14-17, 1982," Rural Development Committee, Cornell University, mimeo.

18. Douglas J. Merrey, "Farmer Organizations in the Gal Oya Water Management Project, Sri Lanka: A Study of the Impact of the Institutional Organizer (IO) Program," draft report, PRC Engineering Consultants, Inc., May, 1982.

19. In August, 1982, the ID Deputy Director, Amparai, announced the intention of turning over O & M responsibility for rehabilitated D-channels in the Left Bank system to farmers' organizations. This is a major shift from previous Irrigation Department O & M policy.

20. David C. Korten, "Rural Development Programming: The Learning Process Approach," Rural Development Participation Review, vol. II, no. 2 (Winter, 1981), pp. 1-8.