DEMONSTRATED BENEFITS FROM SOCIAL CAPITAL: 
THE PRODUCTIVITY OF FARMER ORGANIZATIONS  
IN GAL OYA, SRI LANKA

Norman Uphoff and C. M. Wijayaratna

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Norman Uphoff
Cornell International Institute for
   Food, Agriculture and Development
Box 14, Kennedy Hall
Cornell University, Ithaca, NY 14853
Phone: (607) 255-0831 (work), (607) 257-6660 (home)
Fax: (607) 255-1005   E-mail: ntu1@cornell.edu [contact information]

C. M. Wijayaratna
Consultant (Agricultural Economics/Rural Development)
17 Vanbrugh Place
Buckland Beach
Auckland, New Zealand
Phone: (64-9) 537-3764   Fax: (64-9) 537-3764
E-mail: wijay@titan.co.nz )

SUMMARY: An analytical construct of social capital is presented, followed by a case study from Sri Lanka. There, farmer organizations were established in the Gal Oya irrigation scheme in the early 1980s with a combination of roles, rules, norms and values that supported mutually beneficial collective action. This produced measurable improvements in system performance and efficiency. In the 1997 dry season, after farmers were told there was not enough water in the reservoir to grow a rice crop, they achieved through their organizations a better-than-average harvest from 65,000 acres by efficient and equitable distribution. Ethnic cooperation was demonstrated by upstream Sinhalese farmers sharing water with downstream Tamil farmers.

KEYWORDS: Social capital; farmer organization; irrigation management; Sri Lanka; participation; ethnicity; rice production.
The concept of "social capital" has captured the imagination of academics and practitioners alike without much agreement on its definition or content. In recent work, we have offered some conceptual and empirical contributions to the subject supported by extensive field data from watershed development programs in India (Krishna and Uphoff 1999; Uphoff 2000). Here the productivity of social capital for improving irrigation management is documented and analyzed, showing how conceptually defined components can yield tangible outputs.

In the Gal Oya irrigation scheme in southeastern Sri Lanka, a system of farmer organization was established in the early 1980s that greatly improved the efficiency and extension of irrigated rice production. This has been confirmed by several evaluations for the International Irrigation Management Institute (IIMI) that showed very favorable benefit-cost ratios, with farmer organizations contributing most to the benefits. Almost 15 years after project completion, there is now additional evidence of what social capital can accomplish in physical and monetary terms: the production of millions of dollars’ worth of rice during a dry season when engineers and officials had concluded that there was not enough water in the reservoir to try to grow the usual crop.

The system of organizational roles and rules created by farmers, with assistance from Sri Lanka’s Agrarian Research and Training Institute (ARTI) and Cornell University, was able to distribute a very limited volume of water so sparingly yet effectively that a better-than-normal crop was obtained with only a portion of the water supply considered necessary. The norms and expectations that were evoked and reinforced by these organizations provided support also for an equitable sharing of water. Shared value orientations encouraged head-end farmers to cooperate
in ensuring that tail-enders too could get a successful crop, all the more remarkable because the upstream and downstream areas are cultivated by different, often rival, ethnic groups. In this article, we show how such social capital operates and what are the "income streams" that can come from assets of social organization and shared values and meanings.

1. UNDERSTANDING SOCIAL CAPITAL AS AN ASSET

If social capital is to be more than a metaphor, it needs to refer to things that can be observed and measured. Also, we should be careful not to confuse cause and effect. Following the lead of economics, we regard any capital as referring to certain assets that produce definite flows of income, also referred to as streams of benefit. The benefit that we find most generally associated with social capital is mutually beneficial collective action (MBCA).

The forms of capital presently recognized in economics that produce streams of goods and services are physical capital (made by people, including financial assets), natural resources (coming from nature, not created by people), and human capital (people's capacity for productive activity that utilizes these other forms of capital). While these sources can be socially beneficial, they are used mostly so as to benefit those persons who are utilizing them rather than others. Social capital, in contrast, although it benefits individuals, is expected to produce goods that are more collective than just individual.

Below we elaborate two categories of social capital that are, we think, as fundamental as the distinction that is made in economics between renewable and non-renewable resources for analyzing natural capital. We first introduce the two categories in general terms and then give an example that will make the distinction -- and what comes under each category -- quite concrete.
Social capital can be understood as existing in either *structural* or *cognitive* forms. Both forms arise from the mental rather than the material realm, so both are ultimately cognitive. But structural forms are *indirectly* rather than directly based on mental processes, whereas the latter forms are purely mental, and thus interior to the mind and not observable like structural forms. Both categories of social capital can have definite material consequences, as seen in the Gal Oya case. Indeed, this distinction became evident from trying to understand the impacts of introducing farmer organizations in that irrigation system (Uphoff 1996: 330-345).

The main difference between the two categories is that *structural* forms of social capital are relatively external and objectified. This category derives from various aspects of social relationships that can be explicitly described and modified. Mental activities supportive of MBCA, on the other hand -- represent *cognitive* forms of social capital that are more internal and subjective. The two forms interact, of course, and are in practice connected. The distinction made here is intended to be analytical so that social capital can be understood more concretely.

Under the category of structural social capital, we include *roles, rules, procedures, and precedents* as well as *social networks* that establish on-going patterns of social interaction. In particular, *roles* for decision-making, resource mobilization, communication, and conflict resolution are supportive of collective action. They make it easier for people to engage in mutually beneficial collective action, by lowering transaction costs as well as accumulating social learning. Structural forms of social capital *facilitate* MBCA.

*Norms, values, attitudes* and *beliefs* that predispose people to cooperate are, on the other hand, forms of cognitive social capital that are *conducive* for MBCA. They are individual in
origin but usually reflect broader, shared symbols and meanings within the culture, or subculture. The norms of trust and reciprocity have often been written about as forms of cognitive social capital, but one can see how values of truthfulness, attitudes of solidarity, and beliefs in fairness similarly create and maintain an environment in which mutually beneficial collective action becomes expected and thus more likely.

One way to make this more concrete is to consider a hypothetical village in any country, where a family's house has burned down during the previous night (Krishna 2000). If there are various forms of social capital in the village, structural and/or cognitive, when the sun rises the next morning, the stricken family will have to begin putting its life together again all by itself. With structural social capital in place, fellow villagers can organize themselves easily and predictably to assist the unlucky family to rebuild. Someone in the role of village headman is likely to come to assess the damage and call a meeting of the village council to organize the assistance. Perhaps there is even a standing committee in the village to render disaster relief.

There will probably be certain rules about how such situations are to be dealt with, with established procedures or precedents for how best to give emergency assistance. For example, each household may be expected to send one able-bodied person to help with the reconstruction; or men will go off to collect building materials while women cook meals and gather clothing and utensils. Indeed, in a village that has abundant social capital, there would probably have been well-known roles, rules, precedents and procedures for mobilizing villagers to fight the fire hurriedly and to extinguish it before it destroyed the house. Volunteer fire brigades are good examples of structural social capital that produces MBCA (Schwartz 1979).
Since this is a hypothetical village, however, we can imagine it as entirely lacking in structural social capital but having cognitive forms of social capital. If there are values of solidarity, norms of mutual aid, and shared attitudes and beliefs about how people should help each other in times of need, one can expect that people in the village would come voluntarily and spontaneously to provide some assistance. This would occur *not because of or through* established networks, roles, rules, procedures or precedents, but simply because people are predisposed to give aid according to their respective and shared ways of thinking and acting.

To be sure, it is hard to imagine structural forms of social capital existing without *any* cognitive forms. It is similarly unlikely that there would be roles and rules for cooperation without any norms and values supporting them, or that procedures and precedents for working together would persist without any attitudes and beliefs that favor such efforts. However, the cognitive foundations for MBCA could be fairly minimal if there are well-established and effective rules, roles, procedures, precedents and networks that evoke cooperative effort because people expect that this is how things should and will work in that community, and at higher levels in that society.

In practice, the two forms may be so intertwined that it is hard to dissect them. For example, in Cambodia, despite the decades of conflict and disruption, some noteworthy social capital persists for resolving conflicts. It is widely understood that whenever a dispute arises, for example, the parties to it should immediately seek out the oldest person in the vicinity and ask him or her to mediate. The informal mediator role is created and buttressed by the normative expectation that such a person should be enlisted and that his or her decision will be binding.
Cognitive and structural forms are thus commonly connected and mutually reinforcing.

Where there substantial cognitive social capital exists, it is hard to imagine there not being some forms of structural social capital, because roles, rules, norms and procedures facilitate the achievement of what is favored by the prevailing mental orientations. Having roles, rules, procedures and precedents makes it easier and more predictable for people to cooperate to mutual advantage.

2. SOCIAL CAPITAL IN IRRIGATION MANAGEMENT

Irrigation systems, especially large-scale gravity flow systems, are a good place to look for social capital. The essential resource, water, is usually finite and relatively scarce. If used efficiently and well distributed, this resource can be very productive for all who have access to it so they can grow and harvest a good crop -- in Sri Lanka, usually rice. If water users do not cooperate, and especially if they conflict, field channels and control structures will not be maintained; many will become damaged, and their operation will be unpredictable or inequitable, or both.

In a previous study of participatory irrigation management, four basic functions were identified for performance by farmers and/or technical staff in any and all irrigation systems: decision-making; resource mobilization and management; communication and coordination; and conflict resolution (Uphoff 1986). These are, indeed, relevant to all forms of social organization.

When thinking about structural social capital that can facilitate and support MBCA, we would emphasize these four functions.

- If people are to work together predictably, fruitfully, efficiently, they need to have roles --
supplemented by rules, procedures and precedents -- for *making decisions*.

- To *mobilize resources* and manage these, there need to be some designated roles for this, supported by rules, procedures and precedents.
- There should also be roles, rules, procedures and precedents for *communicating* efficiently and effectively, and for *coordinating* activities that are decided upon.
- Finally, whenever *conflicts* arise or are incipient, there should be roles, rules, procedures (processes), and precedents for resolving these, so that disputes do not impede collective action and are, if possible, prevented.

These four functions can be accomplished through *formal* or through *informal* roles and other mechanisms, so societies are not limited to just formal social structures. Informal structures -- roles with associated rules, procedures and precedents -- can be as or more effective than formal relationships. Along with such structures there are usually social networks of acquaintance and mutual assistance that work according to rules, precedents and procedures of reciprocity.

In Gal Oya between 1981 and 1984, young institutional organizers were recruited and trained to act as *catalysts* for eliciting and assisting farmer organization. They were assigned to villages where they lived alongside farm households. In these novel roles, they started their organizing efforts at the field channel level where 10 to 20 farmers would be cultivating from a common source of water, a gate or a turnout from a larger distributary canal. *Field channel groups* were started over several weeks or several months, depending on the pace that farmers were prepared to accept.
These groups functioned informally at first, deciding on temporary officers, ad hoc committees, work leaders, etc., until such time as their members wanted to create a more formal structure. This they did by choosing one of themselves to fill the role of farmer-representative (FR). The next higher level of organization were the *distributary canal organizations*, each made up of all the representatives from field channel groups that received water from the same canal.

Above this level there were *area councils*, composed of all the FRs from groups whose areas of cultivation were served by a certain branch canal. These area councils in turn selected representatives who sat on the *project committee* for the area served by a main canal, which for the Gal Oya program was the Left Bank main canal. This committee was made up of farmer-representatives and officials, eventually with farmers in the majority.

The simple but sufficient role of farmer-representative was created at farmers' suggestion at the outset of the program, because they did not want to have an elaborate or complex system of organization. FRs were chosen by consensus, which made them more clearly responsible to all the farmers on their channel than if they were elected by voting. Even a secret ballot could divide farmers into factions and possibly lead FRs to give preference to their supporters. The FR designation was used rather than the common term already in use, "farmer-leader," because the new term signaled that the FR would be accountable to all water users and could be replaced.

We will not discuss here the system and process of organization in detail (on this, see Uphoff 1996). For understanding social capital, what is important is that a new structure of roles was created, through the activities of persons functioning in the role of institutional organizer,
which extended from the field channel on up to the project level. The new roles made it easier for farmers to reach decisions about collective action. They were also able to mobilize resources, either cash or, more often, contributions of labor. The roles and procedures established by the farmer organizations also made it easier for people to communicate among themselves and to resolve any disputes or disagreements.

A traditional institution known as *shramadana*, which means donation or gift of labor, was an important form of social capital which combined both structural and cognitive forms. It had historically facilitated the mobilization of labor for accomplishing tasks of community benefit. Many Hindus and Buddhists throughout much of South Asia recognize and observe this complex of norms and beliefs, with associated procedures and precedents. These enjoin people to participate in voluntary work campaigns and provide efficient means for carrying out such work. Whenever shramadana is organized in a community, everyone should participate. Those who do not, for whatever reason, are expected to contribute money or food for refreshments for those who do the work. The campaigns themselves are very "social" events in that there is considerable camaraderie among everyone participating, with singing and socializing besides partaking of refreshments.

In 1980, this form of social capital passed down through centuries was not being drawn on in Gal Oya, however. Most of the people there were settlers (or offspring of settlers) who had been moved into the area from communities all around the country in the 1950s. In traditional villages, shramadana was a well-established practice for mobilizing voluntary labor to create or maintain infrastructure like roads and canals, and to build and improve facilities like temples and
schools. But in Gal Oya, settler communities were still quite heterogeneous socially and lacked much sense of solidarity.  

There were no persons in traditional roles like village headman, and there were few active, respected temple priests, so this practice had fallen into disuse. By appealing to the (cognitive) value that Sri Lankans attributed to doing voluntary public service, organizers were able to get farmers to undertake shramadana to rehabilitate irrigation channels, gates, roads and bridges and to do other things that benefited their communities. According to Buddhist and Hindu beliefs such contributions of labor earn participants "merit" as well as gain them appreciation from friends and neighbors (or disapproval if they shirk).

The role of farmer-representative introduced into a situation where previously there was disorder and dysfunction was able rather quickly improve water management, which requires cooperation and various kinds of collective action. The roles of FR and other farmer organization officers were supplemented by sets of rules that the farmers themselves developed, something that Ostrom (1990) emphasizes as critical for effective and sustainable collective action. Precedents of non-cooperation and selfish behavior were replaced by norms of cooperation and by amicable resolution of conflicts of interest.

3. INTRODUCING PARTICIPATORY MANAGEMENT IN GAL OYA

What we had not anticipated when we initiated this organizational process was the extent to which there needed to be cognitive factors complementing efforts to create social structures for better water management. If their collective action was to be mutually beneficial, it was important for farmers to revive and act upon egalitarian norms and values. Irrigation is an
enterprise where geography is crucial. Those farmers whose fields are situated upstream have a locational advantage that is seldom countervailed by legal or formal means.

Water stealing, by siphoning or diversion, had become rampant in Gal Oya before our program started. Unless head-enders were willing to change their behavior and to accommodate the interests and needs of tail-enders, the distribution of water could be interminably embroiled in conflicts, and there would be no cooperation needed to clean, maintain and operate channels and physical control structures, gates, weirs, etc. A complicating factor was that Sinhalese settlers had been located in the upper reaches of the Left Bank, while Tamil households had been moved in from the east coast to the lower reaches. Already by 1981, there were incidents of violence elsewhere in Sri Lanka between Sinhalese and Tamil chauvinists.

Fortunately, irrigation management has some potentially unique positive-sum possibilities. Although water is a quintessentially "scarce" resource, its supply can be, in effect, expanded if it is used more efficiently, i.e., with less loss of water into drainage canals or underwater aquifers through seepage and during conveyance. Cooperative actions reducing losses can get more water to farmers' fields. Farmers in Gal Oya were able to double the efficiency of water use even within the first season. Practically speaking, this doubled the supply of available water at a time when it was in very short supply. The main reservoir was only 25% full at the start of the planting season, so our program began at a time of severe shortage. We considered postponing its start because we anticipated that conflicts over water could be greater than ever that year; fortunately, the opposite occurred.

The techniques for using water more efficiently were worked out by the farmers
themselves. The first thing needed was to *clean* the irrigation channels, some of which had not been cleared for 20 years. This involved removing the silt, sand, stones and weeds that impeded the flow of water. The more slowly water flows in channels, the more will be lost through seepage and evaporation.

Next, the available supply was *rotated* in turn among all eligible water users, rather than being distributed simultaneously to everyone in small amounts. With a single, faster-flowing stream of water going to each field in turn, there was much less loss of water than if many smaller, slower flows were diffused throughout the command area. A rotational system also freed up farmers' time because otherwise they had to remain almost continuously in their fields, spreading their meager supply of water and guarding it against theft by others.¹⁰

Third, once water had been carefully and quickly distributed within a channel's command area and all of its fields had received a sufficient supply, farmers usually agreed among themselves to *donate* any surplus water supply to farmers on downstream channels who were still in need of water. The first season of the program, when there was a severe shortage of water, we calculated that the organizations had been willing to donate about one-sixth of the supply allocated to them to benefit downstream farmers who were more in need of water than they, once distribution and application had been made more efficient. Sometimes this meant that Sinhalese farmers were giving up water to assist Tamil counterparts, quite unexpected in a county where ethnic tensions were mounting.

Such behavior can be characterized as generous, even altruistic, though farmers saw it as doing for others what they would want others to do for them under similar circumstances, and the
more orderly distribution of water was a benefit to everyone. Some head-end farmers who participated in this system of more efficient and equitable water use were possibly putting their own crops in jeopardy if their crop experienced subsequent shortages. But there was informal agreement that if the crop of an upstream farmer was threatened, the distribution would be modified to help save it. Giving priority to upstream farmers who voluntarily ran some risk by being willing to share their water followed a logic that economists call Pareto-optimality: total welfare is considered to be increased unambiguously if some or many persons can gain while nobody is made worse off than before.11

Still, there were some costs to upstream farmers. They had to expend more labor than before in channel cleaning and in water rotation efforts, which they had (often purposefully) avoided in the past. When channels became and remained silted up, more of the water flowing into them remained in their upper reaches. Given the new "moral climate" that prevailed after 1981, however, farmers were more willing to make efforts for the common good, reducing their offtakes of water to the minimum needed for their crop so that others would not have short supply. Such careful management was made possible by the establishment of roles and rules, by new precedents and procedures that were appreciated and supported by members. These structural forms of social capital made farmers better able to make, monitor and enforce decisions.

When we planned the water management program, we had not considered the potentials and importance of the cognitive and ethical dimensions of organization, having thought more in terms of incentives than of ideas or ideals. These dimensions were impressive developed by
farmers themselves as they wrestled with how to make the best use of scarce water supplies. Perhaps Sri Lankan culture has stronger egalitarian elements than in most other countries -- although that certainly had not prevented inequitable distribution of water over the previous three decades and even murders over water (Uphoff 1996: 10, 138).

Prior to 1981, the lower third of the Left Bank command area had hardly ever received irrigation water during dry seasons, and the middle portion had gotten water only intermittently. Even farmers at the tail-end of channels drawing water from the upper reaches of the main canal often went without water because so much was being taken by upstream farmers.

What the organizers did, together with farmers who shared values of equity and participation more actively than did their neighbors, was to bring these values to the fore of collective consciousness (discussed in Uphoff 1996, especially Chapters 12 and 13). We came to appreciate, post hoc, that there was a normative dimension to the water management program that complemented and strengthened the structural dimension.

This normative reorientation operated with a kind of cascade effect as increasing numbers of farmers began accepting cooperation and generosity as modes of interaction, valuing positive-sum outcomes. This contrasted with the individualism and self-centeredness that had characterized most behavior in Gal Oya for the previous three decades. This reorientation derived more from the new social organization emerging than from any teaching or preaching by the organizers. Persons who had lived for a generation in close proximity began through group activities to become well acquainted and to value each other's well-being. Any personal sacrifices involved were more than repaid by a combination of economic, social and political gains.
At the time, we did not think of these changes as representing the rapid creation of social capital; this concept was not yet in vogue. But since they produced impressive streams of MBCA, starting within the first six weeks of the program’s introduction, we understand now that this is an appropriate way to comprehend what was happening.

4. RESULTS FROM THE PROGRAM

By the time the program ended in December 1985, about 12,500 farmers were cooperating in the organizations established to improve water management and also to solve other problems of members, such as crop protection, marketing, and employment creation (Wijayaratna and Uphoff 1997). In December 1988, the government by cabinet decision made participatory irrigation management a national policy, and today there are about 250,000 farmers participating in the system of farmer organizations established in all of the major irrigation schemes in the country. There are again as many farmers in the organizations that co-manage irrigation in the several large systems under the Mahaweli Authority (Brewer 1994).¹²

Post-project evaluations of the Gal Oya farmer organizations have attributed substantial economic benefit to the more efficient management of water and other effects they made possible, as noted in footnote 1. A recent impact assessment conducted by the International Irrigation Management Institute concluded that both the physical and institutional components of rehabilitation in the Gal Oya Left Bank system had contributed significantly to increases in the area irrigated and to the productivity of water as well as of irrigated land (Amarasinghe et al. 1998).¹³

Analyzed statistically, institutional innovations were shown to be the main factor
contributing to increased area irrigated and water productivity. The results of such quantitative analyses are, however, matters of percentages and decimal points, affected by assumptions and open to dispute. The productivity of government and donor investments in the Gal Oya farmer organizations as social capital is concretely demonstrated by considering their performance during the 1997 dry season.

5. SUBSEQUENT EVIDENCE OF SOCIAL CAPITAL'S PRODUCTIVITY

In Sri Lankan irrigation systems, the area that farmers are authorized to cultivate using irrigation water is determined at meetings before the growing season begins on the basis of how much water is available in the reservoir at the start of the season. The government through its Irrigation Department (ID) plays a dominant role in this decision-making process in major irrigation systems simply because the ID manages the reservoir and maintains the data base on water levels.

Just before the start of the 1997 dry season, the Irrigation Department announced that the water supply in the main reservoir was not adequate for farmers to grow their usual crop of rice that year. At a special meeting of the Project Committee held on February 28, 1997, the regional director for irrigation formally declared that this was a "water-short" situation and recommended that there be no paddy cultivation that season.\(^{14}\)

The representatives of farmer organizations were understandably reluctant to accept this proposal, but the majority of officials present agreed with and supported the regional director of irrigation. Farmer-representatives suggested to officials that if such severe restrictions were imposed, the police might have to be called in to handle water distribution during the season. As
a compromise, officials suggested that, instead of growing paddy, farmers should plant other crops that require less water. The ID insisted that the area to be cultivated on the Left Bank should be limited to 12,000 acres at most (plus 10,000 acres in the Right Bank and 8,000 in the River Division). Without farmers having formally agreed to this, the meeting adjourned.

Most farmers did not accept this decision, and informal protests began developing within the farming community. Especially in the four subdivisions in the upper and middle reaches of the Left Bank where our project's organizing effort had concentrated between 1981 and 1985 (Paragahakele, Uhana, Gonagolla and Weeragoda), farmers actively expressed their concerns to various officials and to local politicians.15

Given this "unrest," the Irrigation Department decided not to issue any water as agreed at the previous meeting of the Project Committee. This led to a special Project Committee meeting on March 25, 1997, with a Member of Parliament presiding, and 103 FRs and 23 officials present. After a hot debate, the decisions taken at the preceding meeting were amended. The extent of land area authorized for non-paddy crops in the Left Bank area was increased to 15,000 acres (5,000 acres each in Uhana, Weeragoda, and Gonagolla), and in order to have seed for the next season, it was agreed that a short-age variety of paddy could be grown on 2,000 acres in Paragahakele. A cultivation calendar with time table for issuing irrigation water was decided accordingly.

A large majority of the farmers, however, still did not accept these decisions either and began campaigning against them. A young resident in the area with some higher education who was a part-time farmer obtained time-series data from the Irrigation Department on reservoir
inflows and water issues throughout several previous seasons. From this information, he concluded that the ID had forgotten to consider additional inflows into the reservoir from the catchment area that would occur even during the dry season. Also, having confidence in the capabilities of the farmer organizations to manage water still more efficiently, he was convinced that a considerably larger extent could be cultivated with the projected water supply.16

On March 28, 1997, this analysis was presented to a gathering of farmer-representatives at the divisional level in Uhana. A few officials were also present at this meeting. The farmers decided to approach political leaders and senior government officials to get the previous decision changed, and another special meeting was arranged for farmers with senior officials March 31.

At this meeting, the regional irrigation director cautioned farmers that if they increased the extent cultivated, there could be an acute water shortage and their crop would fail entirely. The irrigation department was willing to allocate 60,000 acre-feet of water to the Left Bank, but it believed that this amount was not adequate for growing paddy. The director said that in his expert opinion, the area approved for cultivation should not be increased. If farmers exceeded this limit, he added, they might run short of water even for domestic uses and for drinking.

In response, the young educated farmer presented an alternative scenario based on data from previous dry seasons. He stressed the potential for increased water-use efficiency through group action by the farmer organizations. This view was strongly supported by the farmer-representatives, who requested reconsideration of the previous cultivation decision. The politicians present agreed, and in the end, most of the officials accepted that a larger area could indeed be irrigated.
The Irrigation Department agreed to revise the earlier decision, under two conditions:

- The earlier water allocation of 60,000 acre-feet to be released to the Left Bank would not be changed, and
- The department would not be responsible for any crop failures (or domestic water supply problems) that might occur due to this decision. It warned farmers that they were taking a big risk (minutes of the meeting, signed by the Government Agent).

To conserve water, the Project Committee with its farmer majority quickly decided that (i) all farmers should cultivate short-age varieties of paddy that season; (ii) planting operations should be completed before April 20, 1997; (iii) rotational irrigation should be followed after this date; and (iv) all water issues would stop on July 15, 1997.

The Irrigation Department left it up to farmers to decide how they would use the available supply, not wanting to be responsible for deciding who would get water and who would not, or for taking the risk of planting paddy. The farmer organizations when they took up these questions decided not to favor areas upstream over others downstream just because some happened to be located closer to the reservoir. This would violate the egalitarian ethic on which the organizations had been established and according to which they operated. So it was decided to share the available water equally throughout the system, even if this meant that each farmer would have a very limited supply to work with and all would be running a risk of crop failure. If farmers wanted to grow rice, this was their own responsibility. They would have to manage with whatever water could be provided to them through equitable sharing.

Cultivating with about one acre-foot of water per acre assured from the reservoir was very
risky. But farmers expected there would be some more inflow into the reservoir than the engineers had reckoned, and that some rains during the dry season might augment the irrigation supply. Such rainfall was likely though its amount was unpredictable. Farmers had come close to being unable to cultivate any crop at all, so they determined to proceed on the basis of solidarity rather than allocate scarce resources preferentially.

6. RESULTS OF COLLECTIVE ACTION DURING 1997 CROPPING SEASON

The value of the social capital drawn upon in this case may be assessed by evaluating the gains in crop production that can be attributed to the organized group action to manage "deficit water supply." This can be estimated by the difference between the amount of production expected without farmers' group initiative and activity and the actual production realized with organized group action, that which resulted from MBCA. The important outcomes of MBCA included: changing cultivation decisions, extending the area cultivated, increasing the efficiency of water management, and increased crop output.

The norms, values, and attitudes as well as roles, rules, and procedures for cooperative management of irrigation water were not new to these farmers. In the period since 1981 when farmer organizations were initiated in the Left Bank with farmers themselves taking responsibility for the design and operation of these social structures. After 1985 when technical assistance from ARTI and Cornell was withdrawn, farmers had still more experience with mutually beneficial collective action through decision-making, resource mobilization and management, communication and coordination, and conflict resolution.

Farmer-representatives and members were all actively involved in improving water
management and producing a crop under the crisis conditions. They were supported in this effort by the project manager for the Gal Oya Left Bank and his institutional development officer and by the heads and staff of agriculture, irrigation and other relevant departments in the region. Local politicians too played an active role during the season.

Soon after the March 31 meeting, FRs in the four subdivisions organized farmer group meetings to explain the responsibilities being undertaken by the organizations, to motivate members and decide on follow-up actions including the careful sharing of water and monitoring of farmer behavior. The organizations in these areas played a major role in implementing a system of rotational irrigation that was commenced on April 20, 1997. Almost all the farmers in the four subdivisions completed their planting by this date, as agreed at the emergency meeting.

(a) **Increase in the area cultivated/irrigated**

According to official records, the area cultivated with paddy in the four subdivisions during the 1997 dry season was 19,870 acres (Paragahakele 2,497; Weeragoda 4,994; Gonagolla 6,824; and Uhana 5,555). However, over the years adjacent areas had also been brought under cultivation without authorization. Indeed, the ID reported (disapprovingly) to a Project Committee meeting on May 30 that nearly 26,000 acres were being cultivated just in these four areas. According to farmers whom we interviewed, the whole command area of the Left Bank was brought under cultivation, which would total about 60,000 acres.

(b) **Water use efficiency**

Although the Irrigation Department committed itself to release only 60,000 acre-feet of water to the Left Bank, according to its records for the 1997 dry season, it was able to issue
98,714 acre-feet, which meant an irrigation supply of about 1.6 acre-feet per acre. Before the rehabilitation project and before farmer organizations were formed, when water distribution was very inefficient, between 8 and 9 acre-feet of water was being issued per acre cultivated in the dry season (FAO 1975). By 1985, improved water management had brought this down to 5 to 5.5 acre-feet, and it reached 4.5 acre-feet in the later 1980s. The norm for dry-season water issues in major irrigation schemes throughout Sri Lanka is 3.5 acre-feet. Most other schemes have channel systems less long and complex and soils less porous than in Gal Oya, so conveyance losses are lower in other systems.

When farmers agreed to cultivation of 60,000 acres on the Left Bank, this meant they were willing to try growing a crop with only 1 acre-foot of water per acre, less than one-third of the norm. They gambled on getting some supplementary rainfall, and, as noted, there was somewhat better than average rainfall during the 1997 dry season. This would have been quite unevenly distributed, however. Even if all of the farmers on the Left Bank got 24 inches of rainfall, the total water received was still less than the norm for issues from the reservoir alone.

(c) Crop yield, total production, and profits

Records of the Project Management Office and the Departments of Irrigation and Agriculture, as well as our interviews with farmers, confirmed that the entire area planted was harvested at the end of the season. Farmers in the four subdivisions reported an average crop yield about 95 bushels per acre, which is 10% higher than reported from government statistics for Ampara district as a whole, 85.5 bushels. (Ampare district includes most of the Gal Oya system plus numerous smaller irrigation schemes.) Using the official figure to calculate output for the
Left Bank area, 1997 dry season production would have been over 5.13 million bushels, or 107,730 tons of rice.\(^{20}\)

Recall that the government had initially said there should be no cultivation at all; then it proposed just 12,000 acres for other field crops, and finally 15,000 acres of other crops plus 2,000 acres of paddy, which would total less than 30% of the 60,000 acres of paddy that were actually produced. The latter is a gain to the whole society that can be attributed to the operation of social capital. Valuing this is a matter of figuring gross and net differences. The gross value of Left Bank production was about Rs. 1,077 million, or US$ 16.83m.\(^{21}\) For the whole Gal Oya system, which has farmer organizations in the Right Bank and River Division modeled after those established in the Left Bank in the early 1980s, this amount would be over $30m.

To figure the net value of production, one needs to deduct the costs of production to arrive at an estimate of value-added. The average expenditures incurred by farmers when producing paddy were about Rs. 7,000 per acre.\(^{22}\) This would make the total net profit (value-added) per acre Rs. 10,955 (US$ 171), which would add up to Rs. 657 million ($10.27 million) for the entire Left Bank. For the whole Gal Oya system, this would amount to about $20 million.

If we try to compare the actual results with the hypothetical outcome had the decisions taken at the March 25 meeting been implemented, the calculations become more complicated. Other field crops, while they require less water, are usually more input-intensive. Because the recommendation for planting other field crops came just at the time for planting, farmers would have had to decide and act quickly on a risky strategy that requires high inputs to get high outputs. Even if they could have obtained sufficient credit soon enough to purchase the necessary
fertilizers and agrochemicals, which is doubtful, they would have faced uncertain market demand and prices, quite possibly too low to recoup their investments. Rice was a preferable crop, even if the returns from other crops under ideal conditions can be higher, because its demand and prices are relatively stable.

If one assumes that the limited number of Left Bank farmers growing other crops or seed paddy were able to obtain the price level observed for these crops at the end of the 1997 dry season, they would have had a total value-added of about Rs. 186 million, or US$ 2.9 million. By such reckoning, the actual Left Bank production in that season, achieved through collective action, was still $7.4 million more than if the proposed government scenario had been followed.

At a cultivation meeting held for the 1998 dry season on the Right Bank, February 26, the Irrigation Department acknowledged the great achievement in 1997, stating that farmers had realized very good yields even though recorded water supply conditions had been the lowest in 15 years. The regional director added that farmers had been similarly efficient in water use during the just-completed wet season (meeting minutes, Irrigation Management Division).

We might note further that due to the drought and poor harvest countrywide, Sri Lanka faced a serious shortage of its staple food crop. The less rice was produced locally, the more foreign exchange would have to be needed to import rice to keep the price for consumers from rising. So the price we used to calculate the benefits from MBCA in this case does not reflect the full economic (scarcity) value of rice. This suggests that the social capital represented by farmer organizations could have been more valuable than our calculations show. Indeed, the greatest value of social capital is likely to emerge when there are crisis or emergency situations.
LESSONS REGARDING SOCIAL CAPITAL

Economists have been attracted to the concept of "social capital" in part because it can help to explain differences in the productivity of other, more material resources, a line of analysis begun by Leibenstein when he tried to account for this with the analysis of "x-efficiency" (1965, 1976; see also Weiermair and Perlman 1990). For any given stock of physical, natural and human resources, there is considerable variation in what can be produced from them.

The concept suggests that social capital is something which can and should be invested in, producing desirable returns through increased benefit flows. In the case of Gal Oya, we see a case for such investment, whether considered in terms of "social infrastructure" or organizational "software" to make more productive the physical "hardware" of irrigation facilities.23

The USAID-funded Gal Oya Water Management Project had an overall return, calculated four years post-project of between 14 and 24%, according to Aluwihare and Kikuchi (1991). Amarasinghe et al. (1998) estimated that about half of the improvement in productivity was attributable to the farmer organizations, even though they involved between 5 and 10% of project expenditure. Twenty-four percent is an unusually high rate of return for any donor-assisted project, and that was calculated for average years. In an exceptional year like 1997, the organizations were worth much more than on average, as is often true for social organization. It is most beneficial in times of crisis, provided it is sturdy enough to withstand the stress.

There are now many experience with demonstrated methods for introducing local organizations such as in Gal Oya (Uphoff et al. 1998; and case studies by Abed and Chowdhury 1997; Bagadion 1997; Khan 1997; Kiriwandeniya 1997; Krishna and Bunch 1997; Krishna and
Robertson 1997; Kurien 1997; Mechai 1997; and Yunus 1997, for examples). Most analysis focuses on the structural forms of social capital, however. From revisiting the Gal Oya experience, we are impressed again by the importance of cognitive forms, particularly the normative commitment to equitable outcomes and participatory approaches among farmer-members some 13 years after external involvement ended. Our cadre of organizers did not create such commitment but rather activated and intensified it by initiating discussions among farmers for getting mutually acquainted, identifying problems, prioritizing and diagnosing them, and proposing and refining solutions, leading to collective action. Effective MBCA produced valued outcomes that reinforced both the structural and cognitive forms of social capital that had been encouraged. These forms were produced by the farmers themselves and maintained by them.

The outside investment worked through the roles of institutional organizers. These social catalysts helped farmers actualize norms of equity, productivity and participation, creating impetus and space for new roles to take root at the grassroots and for "old" values to be reaffirmed. These roles and values reached upward from the field channel level and structured and motivated activity all the way up to the project level. Of some incalculable significance, the beneficent structures and ways of thinking supported cooperation between ethnic groups and muted the conflict between Sinhalese and Tamils that convulsed other parts of the country.24

All cultures have the basic elements of social capital within them, we believe, but social structures and shared values can be disinvested in by neglect or misuse. One reason why these elements often remain latent is that they lack appropriate structural forms of social capital for their effective expression. To be able to capitalize on cognitive social capital, it is essential to
construct or install appropriate structural forms. Appropriate in this case refers to forms that are not only effective and efficient, but which are also regarded as legitimate and locally owned. There thus needs to be a melding of cognitive and structural forms.

Outsiders should know that they cannot simply, or literally, create social capital because this comes ultimately from people's patterns of thinking and interacting. People need to create their own social capital. To be sure, as we saw in the case of Gal Oya, outsiders can play useful catalytic roles (Uphoff et al. 1998: 53-57). They can introduce or reinforce roles in communities that are then reinforced by rules, precedents and procedures which facilitate mutually beneficial collective action. Where there are strong social networks based on reciprocity and trust, a productive pattern of social organization, formal and informal, emerges.

Where people hold complementary norms, values, attitudes and beliefs predisposing them to cooperation and mutual assistance, a valuable set of assets can be created by joint action that is not only productive in the present but into the future. The farmer organizations in Gal Oya are in some respects stronger than when ARTI and Cornell withdrew at the end of 1985. Social capital need not depreciate; it can become greater and more effective if reinforced by the results of effective collective action.

It is, of course, possible for social capital to diminish, through disuse or if no or few benefits are produced by the roles, norms, procedures, attitudes, etc. But where social capital is lost, it can also be restored. As Hirschman has told us from his observations in Latin America, the sources of social energy when suppressed, can be conserved for some time and emerge again under new circumstances (1984: 42-57). Thus, social capital can be not only productive; it can
be persistent, though it is not always evident. It was not evident when we started in Gal Oya in 1981. But with appropriate catalyzation, social capital can become a factor of societal production that helps people meet their needs and aspirations better, with whatever other resources are available.

NOTES

1 The first evaluation, done for IIMI by Aluwihare and Kikuchi (1991) who examined a number of irrigation system rehabilitation projects in Sri Lanka, concluded four years after the project had ended that the Gal Oya rehabilitation project had achieved a 24% rate of return on the investment made by the U.S. Agency for International Development (USAID) and the Government of Sri Lanka. (The USAID end-of-project evaluation in December 1985 calculated a 47% rate of return [ISTI 1985], but we felt this was too high, as our own end-of-project evaluation had figured the rate to be between 16 and 24%.) The "software" of organization cost only between 5 and 10% of the total project expenditure, but by our rough estimate it contributed at least half of the benefit stream. A recent IIMI study that controlled for changes in the natural water supply has confirmed this estimate (Amarasinghe et al. 1998). A 1992 evaluation sponsored by IIMI concluded that the physical productivity of water (tons of rice produced per cubic meter of water released from the reservoir) was about four times greater after the project than before (reported in Wijayaratna and Uphoff 1997: 176-178). This increase was mainly due to improvements in "software."

2 Having no clear consensus on what social capital produces makes it more difficult to agree on what constitutes social capital. We conclude from our reading of the literature that mutually beneficial collective action is the most specific phenomenon (category of outcomes) that brings
together the main concepts currently given credence in the literature. It is a consequence of various forms of social capital ranging from institutions that lower transaction costs (North 1990) to trust as an attitude or habit of mind (Fukayama 1995). For a thorough review of the social capital literature, see Woolcock (1998). Reading an early draft of his article helped to crystallize our thinking on this subject.

3 This custom was reported during field research in several different villages on the current status of the elderly and disabled for the British NGO, HelpAge, by elderly persons who said that they tried to absent themselves from situations where conflict was brewing, in order to avoid being drawn into unpleasant situations by disputants (Elisabeth Uphoff Kato, personal communication). This is a good example of how structural and cognitive social capital cohere. For a thorough examination of forms of social capital persisting despite the long and many conflicts in Cambodia, distinguishing between structural and cognitive forms, see Krishnamurthy (1999).

4 We attach the qualifying condition "mutually beneficial" to exclude collective action that is engaged in for purely selfish purposes and at the expense of others. Collective action and solidarity which achieve gains for some at others’ expense (such as the Ku Klux Klan, the Aryan Nation, the Sicilian Mafia) are different from that which is more positive-sum and truly "social," such as discussed by Aristotle in *The Ethics*. The word "social" comes from the Latin term *socius*, which mean friend or comrade. When the adjective "social" is used, it refers to relationships that are intended to be mutually beneficial, not just for private gain and not at the expense of others (consider the concept "anti-social"). The same derivation applies for the German word for "social," which comes from *gesell* which has the same meaning as *socius*. 
This structure of organization was not established according to a preconceived plan but was rather devised in consultation with farmer groups and representatives. Area councils were actually established, at farmer initiative, before distributary canal organizations were created, even though our initial thinking was to proceed upwards from the field channels in logical hydrological order. The Left Bank canal, which commanded about 65,000 acres (nobody knew exactly how many when we started), was the focus of the rehabilitation efforts because its command area was the most debilitated. There was also as Right Bank canal serving another 40,000 acres, and in the center of the project area, the River Division served by the Gal Oya River covered approximately another 20,000 acres.

In a subsequent irrigation management improvement project in Polonnaruwa District, the farmer organization at Minneriya decided that the costs, delays, uncertainties and unfairness associated with solving disputes between farmers through the formal court system were too great. The 2,000 farmers belonging to the organization agreed that, henceforth, any disagreements among them (over land, cattle damage, inheritance or other matters) would not be taken to the courts but would instead be submitted to one or more farmer-representatives to try to mediate a settlement. If no mutually acceptable solution could be arrived at, the case would be taken to the distributary canal organization. If this set of FRs could not resolve it, the dispute would go to the project committee, whose decision would have to be accepted as binding by all.

There was more homogeneity in economic terms; average landholdings were about 0.7 ha, with some as small as 0.1 ha and most less than 1.5 ha. However, some land consolidation had occurred illegally, so certain persons controlled 5 to 10 ha, and a few controlled 20 ha or more.
Before the rehabilitation project started in 1980, Gal Oya had the reputation of being the most
difficult and disorganized irrigation scheme in the country. The Irrigation Department’s senior
deputy director for water management told us that if progress could be made in Gal Oya, it could be
made anywhere in Sri Lanka. The top civil servant tried to encourage the organizers when they
began their work in the field by telling them that if they could get even 10 or 15 farmers to work
together in Gal Oya, this would be a significant accomplishment (because the farmers there were
notorious for being quarrelsome and uncooperative). Their assignment was to get between 10 and
15 thousand farmers organized in the next four years, which was, to almost everyone's surprise,
actually accomplished.

When this program started, we were, respectively, chair of the Cornell University Rural
Development Committee and coordinator of its program in Sri Lanka, and head of the Irrigation
and Agrarian Relations Division of ARTI. Thus we were responsible, together with a number of
excellent colleagues, for planning and implementing the farmer organization effort funded by
USAID and the Government of Sri Lanka. We fortunately had advice from David Korten at the
outset that led us to formulate the program in a “learning process” mode (Korten 1980).

One of the benefits that farmers first reported from the system of cooperation that was established
was that “we can sleep at night.” Before then, during the intermittent and irregular periods of water
distribution, they had to spend nights in their fields to try to ensure that they received the fractional
share that they were entitled to (or to appropriate water from others less vigilant than themselves).
With a rotational system that they could trust, implemented and enforced by their FR, farmers could
spend their nights at home in bed, a benefit from cooperation that could not be monetized.
11 If there is a drought situation, the total water supply will not be adequate to obtain maximum or even normal yields from the whole area. Then the challenge is to distribute the deficit so as to maximize the aggregate output of the total system to obtain an optimal solution overall, where total gains outweigh total losses. In a previous analysis of water use efficiencies in Gal Oya, Wijayaratna (1986) developed an optimization model using field data for a sample of over 500 farmers for four crop seasons. This analysis demonstrated that crop yields overall could be increased by about half a ton per hectare through better distribution of the available water across the whole Left Bank area. The potential increase in aggregate production was over 20,000 tons per year, showing how suboptimal were the prevailing water management practices before organizations were established.

Once the physical system had been improved through rehabilitation, the formation of farmer organizations (social capital) could facilitate decision-making, resource mobilization, etc. for mutually beneficial collective action. A windfall gain could be realized if farmers enjoying better water supply would “sacrifice” some of their surplus water for redistribution downstream, enabling the system as a whole to achieve more of its yield potential from available land and water resources.

12 Readers who are acquainted with the bureaucratic and political impediments associated with the Mahaweli program, or with the general pervasiveness of partisanship and ethnopolitics in Sri Lanka, may be surprised by the absence of these liabilities in this account. Though Gal Oya was known for high levels of conflict, from the outset of our program there was a commitment on the part of farmers and the bureaucracy to keep politics out of water management. This orientation was supported by the District Minister at the time (P. Dayaratna, personal communication, June 1982). Farmers developed a protective “mantra” for their associations to keep out the influence of party
politics. Referring to the fact that each party in Sri Lanka had its own campaign color (blue, green, red, etc.), farmers said: “Water has no color, and if you put color into water, you pollute it.” Similar efforts were made to keep ethnicity out of the management and sharing of water (Uphoff 2000a).

13 “Institutional” here refers to farmer organizations. The IIMI researchers conducted a time-series intervention analysis that separated the impacts of various rehabilitation interventions in the presence of effects from both exogenous inputs and a dependent noise structure. “Exogenous” components included such factors as rainfall during the crop season, while “noise” refers to random deviations from the deterministic component.

14 Paddy is the term used for unhusked rice, which once harvested and milled is referred to as rice. The Project Committee is composed of farmer-representatives and officials representing the relevant government departments: agriculture, irrigation, etc. At this meeting, there were 45 farmer-representatives and 24 officials present. This account and the following information comes from unpublished minutes, in Sinhala, of pre-cultivation meetings, February 28, March 25 and 31; a subsequent meeting of the Project Committee, May 30, 1997; and a pre-cultivation meeting for the Right Bank, February 26, 1998. Copies were obtained from the Project Manager’s Office or the Government Agent’s Office in Ampara in doing research for this article.

15 Our discussion focuses on these four subdivisions not only because farmer organizations there were particularly active but because we were able to get the most detailed data on irrigation and production. Also, collective action in these subdivisions saved the most water to make available to farmers downstream.

16 This young farmer, G. Anananda Jayasiri, presented this analysis at a meeting of the local
government council, of which he was a member. This council sent a protest note to the Project Committee and to the district authorities. Jayasiri shared with us this information on the decision-making process, including copies of minutes of official meetings and his personal notes. Data on water issues, areas cultivated, and paddy production were obtained from the Irrigation Department and Irrigation Management Division as well as from Jayasiri and the acting project manager, Wijay Bandaranayake. The role of “agency” for drawing upon and utilizing social capital, which is exemplified by the actions of Jayasiri, is being analyzed with extensive and detailed data on village-level collective action in the Indian state of Rajasthan by Anirudh Krishna in his PhD thesis (Department of Government, Cornell University, 2000, forthcoming).

17 Given the extent of the watershed and the rainfall predictable during the dry season (usually 16-21 inches), an inflow of 80,000 to 100,000 acre-feet could be expected during this season, though only part of this could be claimed for the Left Bank. This inflow had been overlooked by officials when their initial decision was made regarding cultivation for 1997.

18 Both of these persons had gained experience working with farmers from having been among the institutional organizers recruited and trained by ARTI and Cornell.

19 Average rainfall during the 1997 dry season (April to August) was recorded as 24 inches according to Irrigation Department records, about 35% more than average, which helped to increase total supply available from the reservoir.

20 Work that we have been doing with a system of rice intensification (SRI) in Madagascar that changes plant-soil-water-nutrient management practices has shown that rice yields can be greatly increased by keeping fields unflooded (unsaturated), just moist with intermittent drying, during the
rice plants' vegetative growth phase (Uphoff 2000b). This could help to account for better yields with less water. During the early 1980s we got Gal Oya farmers to experiment with draining their rice fields several times during the growth phase; farmers found that they could save water this way without reducing and even possibly enhancing their yields. Being persuaded that rice can be grown successfully without maintaining standing water on fields, this good result did not surprise us.

21 Conversion rates used are Rs. 10 per kg of paddy; 21 kg per bushel; and 1 US$ = Rs. 64, prevailing at the time. Presently the paddy price is about Rs. 12 per kg, and the exchange rate is 1 US $ = Rs. 70.

22 This includes the cost of farm power, hired labor, fertilizer, seeds and other inputs, but it does not include the imputed cost of unpaid family labor, because in the dry season, the opportunity cost of family labor approaches zero as there is little or no scope for rain-fed farming. Outmigration would have been an option for some families, but with the country as a whole experiencing serious water shortages, wages would probably not do more than cover food.

23 In 1983, the authors offered to assist a World Bank team designing the Major Irrigation Rehabilitation Project, which was to upgrade the productivity of large-scale irrigation systems in the north of Sri Lanka, by helping plan a farmer organization component for that project using institutional organizations as in Gal Oya. We could already show a 50% rate of return, conservatively calculated, on such an expenditure. But the design team leader, although he accepted the figures, declined our offer with the comment that he didn’t want to “gold-plate” the project. Within two years, the World Bank project had encountered enough difficulties that it got four experienced organizers transferred from Gal Oya to the north to supervise a new cadre of
organizers, who were expected to “retrofit” farmer organizations into the project. This proved useful, but it was less effective than if farmers had been involved in the planning and implementation of rehabilitation from the start, as in Gal Oya.

In September 1998, we visited an area on the de facto border between where the LTTE secessionist forces are in control and where the government can still provide some protection, even if intermittently. We met a farmer organization in the process of cleaning its field channel. However, we learned with much sadness that just two days before, practically on the spot where were stood, the “Tigers” had assassinated a Sinhalese farmer-representative who was negotiating with Tamil neighbors downstream to coordinate field channel management during the next cropping season. Cultivation along this channel had been disrupted for the previous eight seasons because of the armed conflict. However, the existence of farmer organizations, persisting even under adverse circumstances, made possible group initiatives to plan and to act, and to keep alive the ideals of solidarity that they shared. On cooperation between Sinhalese and Tamils in the Left Bank of Gal Oya, see Uphoff (2000a).

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