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Streams: Theory, Water/Watersheds/Irrigation
Discipline: Sociology, Economics
Panel: Multiple-use Commons, Collective Action and Platforms for Resource Use Negotiation

Irrigation Systems as Multiple-use Commons: Experience from Kirindi Oya, Sri Lanka

Abstract

Irrigation systems are often recognized as common pool resources supplying water for agricultural production, but their role in supplying water for other uses, notably fishing, homestead gardens, domestic water supply, and micro-enterprises is often overlooked. The importance of non-agricultural uses of irrigation water in livelihood strategies has implications for irrigation management and water rights, especially as increasing scarcity challenges existing water allocation mechanisms. This paper identifies the multiple uses of water in the Kirindi Oya irrigation system in Sri Lanka, examines who the users are likely to be, and explores implications for water rights and management policies.

There are important gender, class, and residential differences among the different water users. In addition to the cultivators of irrigated paddy fields, other households use the irrigation system water for fishing, harvesting lotus, livestock, and other enterprises. Even within irrigated farming households, men have more control over paddy crops in the main fields, whereas homestead gardens are women's domain. Because the irrigation system provides water for a variety of birds and animals, even wildlife and non-resident environmental groups can be considered stakeholders.

Current policies for supply in Sri Lanka, as in many countries, emphasize increasing user involvement in both irrigation and domestic water. While government agencies have had primary responsibility, institutions such as Farmers' Organizations are being promoted. These have the potential to serve as user platforms for negotiating water allocation among irrigated farmers. However, the user organizations mirror the sectoral responsibility of the government agencies--either irrigation or domestic water supply. Their membership and structure do not take into account the multiple uses or users of water. Developing platforms that accommodate different user groups remains a major challenge for improving the overall productivity, as well as equity, of water use.

Introduction

Irrigated agriculture is the largest consumer of fresh water worldwide, and accounts for over 90 percent of withdrawals in low-income developing countries (World Bank 1992). Although the primary function of irrigation systems is to produce field crops, the water is used for many other purposes that often go unrecognized. It supplies critical water for a variety of productive and reproductive uses, notably fishing, homestead gardens, domestic water supply, and micro-enterprises. Furthermore, irrigation systems provide water for a range of environmental functions, and can play a critical role in maintaining or threatening biodiversity. The quantities of water used in these activities may be small, but these uses have high value in terms of household income, nutrition, and health. The stakeholders in irrigation systems therefore include more than just farmers with irrigated fields--they include a variety of users.

The importance of non-agricultural uses of irrigation water in livelihood strategies has implications for irrigation management and water rights, especially as increasing scarcity challenges existing water allocation mechanisms. Nevertheless, most other water users in irrigation systems are not generally recognized in water resource policies or in the practical administration and management of irrigation schemes.

One reason the multiple uses of irrigation water are generally not included explicitly in the ongoing management of irrigation systems is that most agencies dealing with water resources have only sectoral responsibility to deal with irrigation or drinking water or industry or environment. The government as a whole has responsibility for overall water use, but the implementing agencies do not have the mandate nor the incentive to balance the needs of various users (Yoder 1981).

Within irrigation systems, these other uses have often been dismissed because they consume relatively small amounts of water, relative to the main field crops. They may therefore not appear to compete with irrigation, except perhaps in times of overall water scarcity. While many of the seemingly "marginal" water uses may consume relatively little water, they have a high value. Focusing only on the value of irrigated field crops significantly underestimates the value of production in irrigation systems.

Managing irrigation systems to maximize the "efficiency" of irrigated crop production, and ignoring the other uses, risks reducing the overall productivity of the system. This could happen either by removing water from other uses (e.g. through timing of water releases, or lining of canals to reduce "losses" that are actually used elsewhere), or by degrading the

water quality (e.g. through agrochemicals that interfere with fish, wildlife, or human domestic consumption). Therefore, taking all uses and users into account in water management could contribute to higher total productivity of irrigation systems. In some cases, complementarities between uses may be found, but in many other cases there will be trade-offs between different uses, in either quantity or quality of water. Recognizing the full spectrum of uses and users of irrigation water is therefore a critical first step to optimizing the use of water. The second step is to develop platforms that accommodate different user groups, and give them a voice in the management of the system.

This paper examines irrigation systems as a multiple-use common, using the case of the Kirindi Oya irrigation system in Sri Lanka. This provides a useful example because in addition to irrigated agriculture, water is used for many different uses by the same and different users. Therefore a wide variety of stakeholders are involved in the multiple uses of water in Kirindi Oya. For instance, because the irrigation system provides water for a variety of birds and animals, both within the system and in an adjoining wetland protected by international agreement, even wildlife and non-resident environmental groups can be considered stakeholders.

The first section following the introduction describes the Kirindi Oya system, including the multiple uses and users of water. Following that we identify the institutional structure for water use, including water rights and organizations. We then examine the potential for developing a multi-user platform for water management within the system, building upon the existing institutions.

This paper is based on recent interdisciplinary field research by the International Irrigation Management Institute, International Food Policy Research Institute and International Center for Research on Women. The study used focus group interviews, a survey of 156 households stratified by old and new irrigated areas within the system, and direct observation to identify different categories of uses, users, with key informant interviews to derive the implications for management of the irrigation system, and water quality measurements throughout the system.

Site Description

The Kirindi Oya irrigation system is located in the southeastern dry zone of Sri Lanka, about 260 km from Colombo. The climate of the area is tropical and is characterized by nearly constant year-round temperatures (26°C to 28°C). Evaporation is uniform throughout the year, with an annual average approximating 2,100 mm. Mean annual rainfall is 1,000 mm. About 75% of the rainfall is received in the Maha season (October to April), and 25% in the Yala season (April to October).

The system consists of an old and a new irrigated area. The five tanks under the old Ellegala system have been built over a thousand years ago. By constructing the Lunugamwehera reservoir in 1987, the irrigable area was expanded by 5,400 ha of newly developed lands. Besides water for the new area, the reservoir provides irrigation water to 4,200 ha of land under the old Ellegala system and 850 ha of land under the Badigiriya irrigation system. The drainage water from the new area and the Badagiriya system is flowing into Embilikala and Malala lagoons that are part of the Bundala National Park (see Annex 1 for a map of the Kirindi Oya irrigation system). The inflow of drainage water

upset the salinity balance in the lagoons and caused, among other things, a dramatically reduction in the shrimp population.Which in turn affected 200 families who were completely dependent on shrimp farming to make a living (key informant interviews 1997).

The total number of inhabitants in the study area is approximately 87,750, of which about 30% live in the new area. The household size estimated from the field surveys is 4.8 persons per household in the old area and 5.1 persons in the new area. The old area is more urbanized, the settlements are already existing for centuries. In the new area, a total of 5,200 families were settled during the 1980s. About 55% of the residents in the new area acquired land because of being displaced from old holdings (alternate settlers); the balance came under the government program to allocate new irrigated land to the landless in other parts of the country (open settlers).

In both areas, literacy rates are quite high: 97.7 percent for men and 94.5 percent for women in the old area, and 96.7 percent for men and 93.4 percent for women in the new area. In both areas, there has been a declining trend in dependence on agriculture and rise in salaried employment like factory worker, trader, armed forces or police.

Identifying Uses and Sources

Irrigated agriculture, which mainly consists of rice (paddy) cultivation, is the most important water use in the Kirindi Oya system. Although farmers will grow other field crops (OFCs) such as green gram, cowpeas, groundnut, chilies, and onions when there is insufficient water for paddy, rice is preferred because it is the staple crop, and marketing channels are much better set up for rice. The old area has a paddy irrigation intensity of 1.7 while the new area uses the water that is left after supplying the old area. The main irrigation source is the Lunugamwehera reservoir. It is estimated that there are between 300-400 agrowells, providing supplementary water for cultivation, mainly OFCs and sometimes paddy as well.

In addition to field crops, there is considerable horticultural production in homestead gardens. While they are smaller in area than the main fields, homesteads cover a fairly large area in total--up to 20 percent of the land in the old area (IIMI 1995). Intensively managed homestead gardens can be highly productive, yielding not only a range of vegetables and fruits for home consumption, but for marketing as well. Homesteads are not eligible to draw water from the surface irrigation system directly. Instead, wells and wastewater from domestic uses provide the main source of irrigation. However, both recharge for wells and domestic water originates from the irrigation system.

Livestock is an important enterprise in both the old and the new area. Livestock includes cattle and buffaloes owned by irrigated farmers, as well as large herds owned by farmers from outside the official irrigated area. The animals use irrigation canals and tanks for drinking and bathing.

The overall system offers several fish habitats: the reservoir, tanks, the river, irrigation canals, and lagoons in the Bundala wildlife sanctuary. Aquatic plants are also harvested; with the most important being lotus, which grows in the tanks and is harvested for the flowers, seeds, and roots. Reeds are also harvested for mats, though to a lesser extent.

Domestic water use can be broken down into drinking/cooking and bathing/laundry.

The former requires smaller quantities, but higher quality of water, while the latter requires more water, but can often be done instream in larger bodies of water, and can use water of somewhat inferior quality. A piped water supply system was constructed in the new area to supply the people with good quality drinking water. Water, taken from the reservoir, is treated (by aerosion, sand filtration, and chlorination) before it is distributed to the standpipes and some household connections. The old area has also a piped water supply system, which distributes treated river- and groundwater, with fewer standpipes than the system in the new area. For their drinking water, people in the old area rely more on wells. Bathing and laundry is mainly done in the irrigation canals and tanks. During the dry period, when there is no water issued for irrigation, once in 14 days water is especially issued for bathing and laundry.

Other enterprises that use water in Kirindi Oya include an army site, a textile factory, and a number of tourist hotels. In addition, there are a number of household enterprises that depend on water, notably making bricks and clay pots for the curd production. Those uses rely on a variety of sources, including irrigation canal, tank, standpipe and wells.

Identifying Users

There are important residential, gender, and class differences among the different types of users of water. The social composition of water users in the Kirindi Oya area reflects the old system/new settlement phases of irrigation development. Most residents in the old area have been settled in the area for generations (as would be expected in an area with a thousand years of irrigation history). They are more likely to have well landscaped homesteads with fruit trees and other permanent vegetation, plus gardens producing vegetables.

During the 1980s, residents came to the new area. The poorly developed physical and social infrastructure when the project began, combined with the need to develop their land and homestead sites, made a difficult life for the settlers. Further distress was caused by the fact that less water was available than expected. Since livelihoods obtained from irrigated production alone were insecure, many families were induced to diversify income sources and migrated seasonally to cities or their place of origin. Under the irrigation development project there has been considerable government investment in infrastructure and subsidies for housing. Employment generation and increases in literacy have been greatest in the new area, but they have not yet caught up with the old area in many respects. The one domain in which the new area has an advantage is in terms of domestic water supply. Because suitable sources were not available in several tracts (due to unsatisfied accessibility and quality of shallow ground water in the new area), a piped domestic water supply system was set up for drinking water in the new area. By contrast, the old area relies primarily on private wells for their drinking and cooking. Both areas depend on the irrigation system for bathing and laundry, as the piped water supply system doesn't provide sufficient water for these uses.

In addition to distinguishing users by new/old area, it is important to disaggregate by gender, which cuts across households. In a broad sense, men are seen as the primary paddy farmers, while women are defined as "helpers" in paddy production (IIMI 1995). Women play a larger role in OFC production, and homestead gardens are primarily under

women's control. Men and women are both involved in livestock production, although women are more likely to be involved with livestock as part of farm enterprises, while men are more likely to be involved in hired tending of large herds. Fishing is primarily a male activity, while harvesting lotuses can involve both men and women, and reeds are usually harvested and used by women. Both women and men (and children) are involved in brick and curd pot making. Although both men and women are users of domestic water, women and children tend to be more involved than men in fetching water for these activities.

The Institutional Environment: Organizations Involved in Water Use

The institutions for water management in Kirindi Oya do not take into account the multiple and interacting uses of water in the system. There are a range of government agencies whose mandate involves water in some way (notably Irrigation Department, National Water Supply and Drainage Board, Department of Wildlife Conservation, Aquaculture Department, and National Livestock Development Board), but these agencies are sectorally defined.

Current policies for water supply in Sri Lanka, as in many countries, emphasize increasing user involvement in both irrigation and domestic water. While government agencies have had primary responsibility, institutions such as Farmers' Organizations are being promoted. These have the potential to serve as user platforms for negotiating water allocation among irrigated farmers. However, the user organizations mirror the sectoral responsibility of the government agencies--either irrigation or domestic water supply. Their membership and structure do not take into account the multiple uses or users of water. The Farmers' Organizations, which are developed as participatory bodies for irrigation management, limit membership to cultivators of irrigated land. Even among irrigated households, it is predominantly men that attend Farmer Organization meetings. Women, who may have stronger interests in domestic water supply or other uses, are not directly involved.

This section describes the institutional environment for water use in Kirindi Oya. The information is structured around the kinds of water use. Most information is given on water use for field crop production. Other uses that are covered are: garden crop production, livestock, fisheries, domestic and other uses.

Field crop production

Water rights tied to irrigated land are one of the most widely recognized forms of water rights in Sri Lanka, and particularly in Kirindi Oya. Generally, farmers in the old area own their homestead and irrigated land, while settlers in the new area have been allotted management and use rights by the government. Alienation rights to land for settlers were limited: they could not legally sell or lease it, and while it could be inherited, the land could not be divided between heirs (Stanbury 1989). In addition to irrigated land and homesteads, farmers may also have use of chena (slash and burn cultivation in highland areas) or un-irrigated plots, which are used on a seasonal basis. Nevertheless, because of water shortages and low productivity of the system in early years, many settlers in the new

area abandoned their plots, and either returned to cultivate only on a seasonal basis, or allowed someone else to cultivate their land.

In developing the Kirindi Oya Irrigation System, the government recognized the seniority of existing water rights of farmers in the old area. Those farmers were assured that their water use would not be reduced by expanding the irrigated area, and in fact, were able to increase their cropping intensity due to more reliable water supplies from the newly constructed Lunugamwehera reservoir. Based on this guarantee, the Ellegala (old area) lands were given priority for water, even if it meant that the new area did not get any.

The Irrigation Department is the main state agency involved with water management for field crops. Since 1978, various experiments in giving farmers greater responsibilities in irrigation management were carried out in Sri Lanka (Brewer 1994). Kirindi Oya was brought under the Integrated Management of Major Irrigation Systems (INMAS) program in 1986. This program included the creation of:

1. Field Channel Groups (FCGs)
2. Distributary Channel Groups (DCOs)
3. Sub Project Committees (SPCs)
4. Project Management Committee (PMC)

The Farmer Organizations (FCGs and DCOs) were created by the Irrigation Management Division (IMD) to assist with the management of the irrigation system, while the Project Committees (SPCs and PMC) give farmers a voice in allocation decisions.

The DCO is the legally recognized farmer organization while the FCGs are subgroups that select Farmer Representatives (FRs) to form the DCO Committee (an executive committee that governs the DCO). There are currently 690 FCGs and 59 DCOs in Kirindi Oya and Badagiriya irrigation system in addition to the 4 SPCs and one PMC. All 59 DCOs have taken over maintenance responsibilities for their distributary channels.

Water distribution—the delivery of water to execute the water allocation plan—is the responsibility of the Irrigation Department at the reservoir and main canal levels, and farmers' organizations (FCGs and DCOs) below the distributary level. In addition to water distribution, FOs are responsible for maintenance of the distributary channel and field channels. If they wish to do so FOs can take on other functions (IIMI 1995).

Farmer Organizations are well recognized by the farmers. Overall, Farmer Organizations have taken over maintenance but not operations. Their performance in maintenance seems to be satisfactory and they clearly have helped improve water distribution, at least at the field channel level. Above that level, most are weak and do not play a significant part in system operation. While they do handle aspects of maintenance, they do so in conjunction with the Irrigation Department (IIMI 1995).

One reason why Farmer Organizations are weak in the New Area is that many farmers are not resident the whole year round or have leased their lands to others (IIMI 1995). Another problem in the new area is that one DCO can include farmers from different hamlets. This social division hampers the functioning of the DCOs.

The Project Management Committee (PMC) is the main organization involved in water allocation in Kirindi Oya. This is a joint government-user group entity composed of:
the project manager who is of the Irrigation Management Division;

one representative of the Director of Irrigation, the Land Commissioner, the Commissioner of Agrarian Services, the Director of Agriculture and the Commissioner of Cooperative Development respectively;
the Divisional Secretaries of the Divisions where the irrigation infrastructure is located representatives of other irrigation-related agencies, as may be determined by the Secretary of Irrigation;
representatives of the Farmers' Organizations (DCOs) in the irrigation command area;
representatives of Cattle Owners' Farmer Organizations;
a Farmer Representative from Badagiriya to represent the interest of those farmers.
In addition to water allocation decisions for irrigation, the Project Management Committee attempts to resolve other problems brought to them, particularly problems that require the assistance of one of the government agencies.
The Project Management Committee allocates water for agricultural purposes by negotiated seasonal planning. In developing the plans it is assisted by Sub Project Committees for the sub irrigation systems in the area, Old Area, New Area Left Bank, New Area Right Bank, and Badagiriya respectively. Seasonal planning is flexible in the sense that it adjusts water allocation to water availability. According to Brewer (forthcoming) there are two generally recognized principles underlying water allocation for irrigation:
1. Equity of water distribution (defined as ensuring that every farmer gets water in proportion to his landholding within the command area); and
2. Priority to standing crops over those not yet planted.
Within the broad framework of rights there has been considerable scope for negotiation about water allocation, particularly through Project Management Committee's seasonal planning meetings.
In Kirindi Oya irrigation system, allocation decisions were made by the officials without direct input from the farmers until 1991. According to Brewer (forthcoming), making the Project Management Committee responsible for seasonal allocation decisions made the decisions more acceptable because farmers had some input. The Project Management Committee's authority was also accepted by government officials because of the government's participatory management policy (Brewer forthcoming). However, the Project Impact Evaluation Report found that the role of the PMC in water allocation is not generally understood by the majority of the farmers, indicating that the linkage between Farmer Representatives and other farmers is a weakness in the management structure (IIMI 1995).
Through participation in the FOs and PMC, farmers have also acquired some voice in the management of the system. The strength of that voice depends on the degree of participation of the individual farmers in the FOs, and the strength of Farmer Representative's in the Project Management Committee. Nevertheless, farmers' interests in water for field (especially paddy) crop production is better represented than any other type of use in allocation decisions.
Garden crop production
There is no recognized water right for homestead gardens. To the contrary, taking water from either the irrigation canals or piped water supply for gardens is formally prohibited. Taking groundwater from private wells, however, is not regulated,_ and the development

of “agro-wells” is even promoted by the Agricultural Development Authority. Informally, a certain amount of watering gardens from canals or domestic supply systems may be tolerated, and runoff or wastewater from domestic use is certainly applied to gardens. However, garden production is treated as an individual use, and there is no user group to represent their interests.

Livestock

Before the construction of the Lunugamwehera reservoir, there were a number of traditional herders in the area who used a combination of jungle and fallow fields for grazing, and a combination of small tanks and other sources for water. These herds were not taken into account in the original project plans, which caused problems when the scrub jungles and small tanks were razed to create the new irrigated area, and fallow periods were shortened by the second season cultivation (IIMI 1995). The herders have modified their grazing and watering patterns to include migration to nearby jungle areas during wet and return to villages during dry (fallow) periods. Water is not especially allocated/ issued for livestock uses like drinking and bathing.

The increased contact between herds and fields causes crop damage and conflict between livestock and crop production. To solve this problem, three Cattle Owners’ Farmer Organizations (COFO) were formed on the initiative of the Project Manager Settlement in 1991. They are officially recognized as farmer organizations for cattle owners. These organizations are working together with the Divisional Secretary to find alternative grazing for the herds. The leaders try to work with the FO leaders to resolve disputes due to cattle damage to crops. Representatives of COFOs are also attending Project Management Committee meetings (IIMI 1995) to discuss issues of crop damage and damage to irrigation structures by animals.

The water use rights of livestock are informal and not clearly defined. The fact that customary cattle watering places were not recognized in the development of the Kirindi Oya system is an indicator of the relatively weak representation of livestock interests in the system development. The various government organizations involved with livestock (National Livestock Development Board and Department of Animal Production and Health) have not been involved to any great extent in water allocation and/or distribution issues. Even though livestock owners are represented in the Project Management Committee, their participation in that forum is primarily related to crop damage, and does not involve water management decisions.

Fisheries

There are a variety of government, NGOs, and user organizations involved in fisheries, but no coherent policy towards water use for fishing exists. For religious reasons_ the government support to inland fisheries was terminated in 1989. The private sector that leased the fishery stations, NGOs, and cooperative societies continued with fishing. Due to their relative lack of technical expertise and the end of the government’s large subsidy program for fingerlings, boats, and other assistance, there was a large decline in tank fishery production. With the election of a new government in 1994, fishery field stations were reopened and are providing fingerlings again. An Aquaculture Development Division has been set up in the Ministry of Fisheries.

Fishermen are organized in Cooperative Societies for each tank. In total there are five Fishery Cooperative Societies (FCSs) in the Kirindi Oya area. Reservoir and tank fishing rights are legally restricted to Fisheries Cooperatives (Steele et al. 1997). Government assistance to fishermen is channeled through those cooperatives and they are responsible for checking if fishermen stick to the rules (e.g. size of holes in the nets). Since the FCSs are not represented on the Project Management Committee, the fishermen have little say in water management.

Keeping the water in the tanks at a certain level contributes to the fisheries, because when water levels are low, fish gets concentrated and too many are harvested, depleting stocks for the future. During interviews, fishermen indicated that fishing is not taken into account when water allocation decisions are made. However, the fishermen do not seem to make an issue of this. Because most have agricultural land, they consider fishing as a subsidiary use of water, while the first and most important activity is agriculture. They feel that agriculture has the first right for water.

Domestic

Although the Irrigation Department was nominally responsible for construction of the water supply scheme, responsibilities were surrendered to the National Water Supply and Drainage Board, and that organization continues to be responsible for the distribution of domestic water through the piped system (IIMI 1995). In Kirindi Oya, a certain amount of water from the Lunugamwehera reservoir is set aside for domestic water supply. Most of this is a fixed allocation to the NWS&DB to operate the piped water supply system that serves especially the new area. When there is no irrigation going on, the Irrigation Department issues water once in fourteen days for domestic purposes. In Yala 1992, water issues for irrigation were even stopped in early July to protect domestic water supply (Brewer forthcoming). This is an indicator of the priority given to domestic water supply. However, it is noteworthy that the NWS&DB is not represented on the Project Management Committee.

On the users' side, standpipe committees are established under the supervision of the NWS&DB to manage standposts for piped water supply. Approximately 15 to 20 households make use of the same standpost. These standpipe committees are informal, i.e. no authority is vested in them under existing legislation, although they are responsible for collecting user charges_ from the households who make use of the standposts. It is also the responsibility of the members of the standpipe committee to safeguard the water stand, and the committee is liable for the misuse of water by the users. If the users do not stick to the rules and regulations set by the NWS&DB, the water is disconnected and a re-connection fee of Rs 250 has to be paid by the committee.

Those rules and regulations specify that water from the standpipes can only be used for drinking purposes. Reliability of water supply through standpipes is quite low. Water is supplied for only a few hours per day and these hours can vary every day. Sometimes water is supplied during the middle of the night and next day it can be early morning. During key informant interviews and focus group discussions, other uses like bathing, business use, and washing clothes were reported. The users allow each other to use standpipe water for these kinds of purposes if there is no other water source nearby. They also reported that priority is given to pilgrims for bathing, at standpipes as well as in

canals, because of religious norms. Local norms allow for obtaining water for business or factory use only if it is a small-scale enterprise and if other income generating activities are lacking.

The formal rules are specified by the NWS&DB, with little user involvement. Informally, however, each group decides what uses will be tolerated or even considered legitimate, so there are some de facto management rights.

Other uses

No special water rights and allocation are recorded for recreation, wildlife and the environment. There is a district-level Bundala wetland management committee which evolved from the District Environmental Agency. Participants in the committee include:
the Assistant Director of Wildlife
local heads of departments like Irrigation, Education, Livestock, Agrarian Services
district Government Agent
representative of the Women and Development Foundation
salt farm representative.

There are further plans to include the fisheries committee of Bundala and the chairman of the farmers' organization federation. Although user groups' representatives are included in this
Committee, because it is not on the irrigation system level, it does not provide a forum to deal with problems related to multiple uses of water.

There is no linkage between the BWMC and the irrigation system PMC, nor is the Department of Wild Life Conservation represented on the Project Management Committee. Although wildlife itself does not have a "user group" per se, environmental NGOs can be considered an interest group representing such water uses (Edwards and Steins, forthcoming). The Bundala Wildlife Sanctuary is on an international list of protected wetlands, so both national and international NGOs might be involved. However, at this moment, no such organizations make their presence felt within the system.

According to the Irrigation Department, a number of hotels have requested water, but have been denied permission to take water from tanks and other surface sources. They therefore turn to groundwater abstraction, which is less regulated (although the Irrigation Department notes that this water ultimately comes from the irrigation system)._ Water is not especially allocated for small-scale enterprises like curd pot making and brick making. People make use of the available water, which has been allocated for other purposes like irrigation and drinking. No user groups were encountered representing the water interests of industrial or micro-enterprise water users.

Government Agencies and User Groups

Table 1 gives an overview of the range of organizations found in Kirindi Oya that relate to a type of water use. In many cases, there are parallel government agencies and user groups for each type of water use. In some cases there are even multiple government departments related to a type of water use. However, effective coordination among departments is very difficult. In Sri Lanka, government organizations are strongly

hierarchical with clear lines of authority. Officers are generally not rewarded for effort put into coordinating with other departments, and are sometimes punished for it (IIMI 1995). Just as the users are not homogeneous, so also the government agencies involved in water allocation are also far from homogeneous in their interests or mode of operation. The negotiations over water allocation do not just take place among user groups, or between user groups and the government, but also among government agencies. Of these, the Irrigation Department (ID) is seen as the strongest, with the greatest control over water releases. For example, the Department of Wild Life Conservation has requested changes in water flowing to the Bundala sanctuary to preserve the salinity balance in the wetlands, but doesn't feel it can direct the ID. The ID feels it is responsive for allocation of domestic water from the reservoir, but NWS&DB does not always feel it is.

Accommodating Multiple Users: Scope for a Common Platform

Recognition of the various uses and users of water is an important first step toward managing the system to accommodate all needs. However, trade-offs between different uses are inevitable. In such instances, decisions can be externally made (e.g. by a government agency), or can be negotiated among various stakeholders. The latter has the potential to reach decisions that are more acceptable to a range of parties, but it requires some form of platform for negotiation (Röling 1994; Steins and Edwards 1998).

At present the structure of water-related institutions at the national and project level does not provide for integrated water resources management. There are over 20 government agencies involved with water resources management, as well as many different types of user organizations. At the national level, the newly constituted Water Resources Council is mandated to develop an Action Plan for Comprehensive Water Resources Management. The government has been striving to devolve management and increase user involvement, and the establishment of a range of formally recognized user organizations (e.g. the hierarchy of Farmers' Organizations, Cattle Owners' Farmers' Organizations, and Fisheries Cooperative Societies) can be seen as a step toward establishing a platform for negotiation within a single use sector.

The Project Management Committee provides a platform for negotiation over the use of water for irrigating field crops. It brings together farmer representatives from various parts of the system, along with representatives from a range of government agencies. Brewer (forthcoming) finds that the establishment of the PMC has been instrumental in obtaining agreement over the allocation of water between the various parts of the system, as well as the timing of releases for various crops. However, except for some discussion of allocation for drinking water, the PMC has not dealt with other types of water use. Although the PMC has so far not dealt with non-agricultural water uses (except for occasional allocation to domestic use, when it would impinge upon irrigation); this organization would seem to offer the most promising avenue to develop a platform for multi-user negotiations over water in the Kirindi Oya system. Ideally, a platform would emerge when stakeholders experience negative impacts of their own and other users' use of the natural resource and when the perceived benefits of organizing on a platform exceed the perceived costs (Ostrom 1992; Steins and Edwards 1998). This is not the case with the Project Management Committee in the Kirindi Oya irrigation system. The PMC

was created under the Integrated Management of Major Irrigation Systems (INMAS) program of the government in 1986. As a result of, among other things, stakeholder involvement, the PMC evolved from a government created body where decisions were made by officials to a joint government-user organization where joint decisions are made. The PMC is a joint government-user organization that includes representatives from more than the irrigation sector. Thus, stakeholder representation is already quite broad. Despite Steins and Edwards' (1998) discussion statement that multi-user platforms should not be build upon existing single-use platforms, in this context creating another body to deal with water allocation and management would seem redundant when the PMC already exists. Aside from the difficulties of establishing a new organization, it would be unlikely to be vested with the same authority as the PMC.

It may be possible to expand the Project Management Committee, which currently includes government representatives from a number of agencies, as well as farmers and livestock owners' user groups, to represent other interests. Currently various government departments are included, and this could be expanded to cover fisheries, domestic water, and environment. Bringing in representatives of other categories of users can be done through public meetings to discuss water management plans, either on a seasonal basis, or especially whenever management plans are suggested.

Nevertheless, several serious limitations of the PMC, as it currently operates, must be noted. First and foremost, it does not include all stakeholders (c.f. Steins and Edwards' 1998 Discussion Statement 1, which suggests that multi-user platforms should have representation of all user groups). Fisheries and wildlife or environmental interests are not represented by either government agency staff or user groups. Even among the various sectors that are represented, irrigation is dominant. Among government agencies, the Irrigation Department is most powerful, and the one other user group that is involved, the Cattle Owner Farmers' Organization, is there to deal with crop damage, not water needs of livestock. Finally, the fact that many farmers are not aware of the role of the PMC indicates that even the linkages between farmers and farmer members of the PMC may not be adequate. Steins and Edwards (1998, Discussion statement 3) suggest: Platform performance depends on the level of organization of individual user groups within the platform, the relations between the various user groups and the strengths and skills of the representatives of the individual user groups. The PMC has a long way to go before meeting these criteria.

The Project Management Committee has also tended to focus on quantities of water deliveries, and the timing of releases from reservoirs. Water quality issues are often far more important with other uses. Fishing, bathing, and wildlife are strongly affected by agrochemical and salinity levels of the water, and the effluent from many non-agricultural enterprises can affect all other uses. The emphasis of a multi-user platform might therefore shift from quantity to water quality issues. This, in turn, would involve both local perceptions of water quality and technical measurements of a range of chemical properties. The latter can be an important contribution of researchers and government agencies, if they are seen as unbiased sources of information.

To the extent that the members of the Farmers' Organizations also use water for domestic purposes, gardens, and even fishing, it might appear that these other types of uses could be represented by the farmer representatives. On one hand, when farmers from one part

of the system are effective in lobbying for maximum possible water allocations to their part of the system, this does tend to make more water available for these other uses in those areas, as well. On the other hand, experience from 1992, 1995 and 1997 shows that at critical times the farmers who participate give priority to water for irrigating the field crop instead of water for domestic purposes.

However, while farm households may be involved in all of these uses, there are important intra-household differences in responsibility for these various types of uses, as noted above. Membership in the Farmers' Organizations at all levels is heavily male dominated (Meinzen-Dick and Zwarteveen, forthcoming). Even though men's and women's interests are often complementary, there are often important differences in priorities for water use (Zwarteveen 1994).

Thus, establishing an effective platform for multiple water use negotiations will require balanced water interests, not a sole focus on irrigation water needs. Further, the significant barriers to gender equity in participation should be addressed. Meinzen-Dick and Zwarteveen (forthcoming) identify a number of structural barriers to women's participation in farmer water users' associations in South Asia, including: the formal definition of membership to include both male and female heads of households and making meeting location and timings accessible to all. These are relatively easy to change. More problematic are other constraints to women's participation, such as the conduct of meetings in a way that they can express their views (very difficult when hierarchically oriented government staff are attending, and often running the meetings). As Ahluwalia (1997) notes in the case of women's participation in watershed management in India: "By making people sit on a common platform, one does not necessarily make them equal." Further, to ensure participation, women need to feel that that their investment of time attending meetings will be worthwhile. The latter is most likely to occur when water scarcity is most acute (so the stakes are greatest), and when women (as well as other stakeholders) feel their voices are heard in the meetings.

Conclusion

Irrigation systems have long been viewed as a classic common pool resource. The need for farmer involvement and some form of joint management arrangements involving official agencies and user groups is now widely recognized in policy statements and programs (e.g. ICWE 1992; World Bank 1993). While there is considerable progress in countries like Sri Lanka toward developing platforms for such co-management, they have focused almost exclusively on irrigated field crops, and neglected the many other uses of water which take place in irrigation systems.

Yet irrigation systems are used for a variety of productive and reproductive applications. Many of these are relatively high-value uses, and as the estimated "value" of water in irrigated crop production decreases (due largely to falling real prices of staple irrigated grain crops like paddy and wheat), the other uses are likely to become increasingly important outputs of irrigation systems. They therefore need to be taken into account in the management of the systems.

Because many of the water uses are non-consumptive (e.g. fishing), or require relatively small amounts of water (e.g. a curdpot making enterprise) as long as water is

relatively abundant, it is not worthwhile to define a quantitative right. Although many of these uses may not directly conflict with one another, when water demand increases, or when water supply decreases, competition for water resources follows.

For many uses, quality issues are often more important than quantity (e.g. for domestic water, fishing, or wildlife). Hence, the critical rights are not for withdrawal, but for management of the resource (and potentially for exclusion of other users that pollute). For example, fishing is highly sensitive to salinity and agrochemical pollution, and production is reduced when water levels in the tank are too low or too high. Thus, although fishing is a non-consumptive water use, fishers have a strong interest in the management of tank levels, and in interactions with other uses. However, the rights and coordination mechanisms to deal with such issues are not presently defined in many irrigation systems, as seen in the case if Kirindi Oya.

Traditionally in Sri Lanka water allocation has been carried out by the Irrigation Department under the Irrigation Ordinance. The recent development with many sub-sectors competing for water stresses the need to create a new impartial institutional set-up to handle water sector coordination problems (Rasmussen 1993). What is lacking is an organizational framework that encompasses all water uses, even within the government, let alone with user participation.

The Project Management Committee provides a first step in this direction, by including various government departments as well as farmer representatives from each of the distributary canals in the command areas. The PMC holds seasonal planning meetings before every season, with representatives of a range of government agencies, along with farmer representatives. To resolve disputes due to cattle damage to crops, representatives of Cattle Owners' Farmer Organizations are also attending these meetings. Domestic water allocation issues can also be raised and considered in these meetings, but they have not covered other types of water use. Seasonal planning meetings might give a scope for dealing with other types of water uses and issues when representatives of relevant user groups and agencies can participate. This creates an opportunity to establish a multiple water use platform. For this to be effective, representatives of different user groups must not only be included in the PMC, but also have a strong enough voice to raise their own water issues. The interests of the different users involved in different types of uses should be balanced. Further coordination, both between government agencies and with user representatives, is needed if the Kirindi Oya system is to accommodate the needs of all water users, and deal with the potential complementarities as well as trade-offs involved in multiple water use.

Acknowledgment: This paper is based on a CGIAR System-Wide Initiative on Water Management (SWIM) study on "Valuing the Multiple Uses of Water in Irrigation Systems." We are grateful to the study team, including Randolph Barker, Chatura Gunawardana, Wim van der Hoek, Peter Jensen, Flemming Konradsen, Fuard Marikkar, Yutaka Matsuno, Rekha Mehra, Manel Pushpalatha, and Parakrama Weligamage. Further we are thankful to K. Jinapala who commented on an earlier draft. All responsibility rests with the authors.

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Table 1: Government agencies and user groups representing each type of water use in Kirindi Oya

Type of water use_Government Agency_User Group__ Field crops_Irrigation Department
Irrigation Management Division
Land Commissioner Dept.
Agrarian Services Dept.
Dept. of Agriculture
Divisional Secretaries_Farmer Organizations (distributary as well as field channel level)
__Garden crops _Agricultural Development Authority_None__Fisheries_Aquaculture
Development Division of the Ministry of Fisheries_Fisheries Cooperative
Societies__Livestock_National Livestock Development Board
Dept. of Animal Production and Health_Cattle Owners' Farmer
Organizations__Domestic_National Water Supply and Drainage Board
Local Govt. Authorities_local standpipe committees__Industry/ small scale
enterprises_National Water Supply and Drainage Board
Local Govt. Authorities_Not represented__Wildlife/ Environment_Dept. of Wild Life
Conservation
Central Environmental Authority_(inter)national NGOs__

_ No legislation exists on groundwater abstraction and use. The only legal provisions relating to groundwater are those: 1) prescribing the mandatory fencing of wells and pits by the occupier of the land on which these wells and pits are situated; and 2) prohibiting the establishment of refuse dumps, waste injections wells and the use of land for waste disposal as to adversely affect groundwater (unpublished information).
_ Buddhist opposition to raising fish to be killed.
_ User charges for one household are Rs 11 per month.

_ Hotels have also turned to groundwater because the NWS&DB charges for hotels (Rs 27 /m3) have tripled since 1984, and are considerably above the charges for most household domestic use, schools and religious institutions.