

Douglas Vermillion  
International Irrigation Management Institute  
P O Box 2075  
127 Sunil Mawatha  
Pelawatte, Battaramulla  
Sri Lanka  
Fax: 94-1-866854  
E-mail: d.vermillion@cgnet.com

Stream: Governance

## **Management Devolution and the Sustainability of Irrigation: Results of Comprehensive versus Partial Strategies**

Douglas L. Vermillion<sup>1</sup>

### **Introduction**

The central challenge facing irrigated agriculture today and in the foreseeable future is how to produce more food with less water. With an increase of 90 million people per year, world population in 30 years is expected to exceed eight billion. In the coming 30 years approximately 80 percent of the additional food supply needed to serve the growing requirement will have to be produced on land served by irrigation. This is expected to result in a 650 percent increase in the demand for water over this time (Serageldin 1995). Furthermore, given the balance of economic and political power, industrialization and urbanization in developing countries will no doubt cause a reduction in the share of available fresh water which is allocated to agriculture. In developing countries about 70 percent of accessible fresh water is used for agriculture (FAO 1993).<sup>2</sup> Except for rare inter-basin transfers of water or possible effects of long-term climate changes, the total supply of water in water basins is basically fixed (Seckler 1996). The inevitable result of this convergence of factors is increasing competition for water and increasing pressure to use water much more productively.

Largely driven by government fiscal shortages and a common inability to raise sufficient revenues from collection of water charges, an increasing number of governments around the world have adopted programs to devolve responsibility for irrigation management to water users associations (Johnson, et al. 1995). Consistent with more general structural adjustment strategies adopted from the 1980s to the present, irrigation management transfer has been supported by the major international development banks (EDI 1996; Arriëns, et al. 1996).

It is expected that decentralization and devolution<sup>3</sup> of water resources management will increase water user participation in decision-making and investment and that this will in turn improve management incentives, accountability, agricultural and economic productivity and cost recovery (World Bank 1993). Devolution generally includes efforts to organize water users associations, train future managers, make essential structural repairs and negotiate and formalize agreements between water users and the government.

Inasmuch as the reforms are normally motivated by financial pressures and driven by donor deadlines, devolution policies tend to be adopted before a clear strategy for implementation has been identified. There is a significant knowledge gap about actual results of irrigation management transfer--especially which strategies work and what are the necessary pre-requisites.

At the heart of the *theory of devolution* is the argument that local, common users of a resource, who are empowered as a group to take over management of the resource, have the incentive to manage more efficiently and sustainably than does a centrally-financed government agency. This, however, is subject to the qualification that certain pre-conditions must exist, such as existence of local management capacity and an effective regulatory framework. There is an extensive literature about the socio-economic pre-requisites to viable local management of common pool resources, or CPR (Wade 1988; Ostrom 1990; Baland and Platteau 1996). The three most commonly identified factors are:

1. mutual strong and repeating dependence of users on the resource,
2. favorable benefit/cost ratio between value of output from resource management and the cost to users of investing *social capital* through community resource management and
3. absence of severe social divisions among resource users which would preclude communication and direct interaction among them.

There is concern that devolution programs are sometimes promoted in environments where these pre-requisites do not exist (World Bank 1993). There is further concern that partial or incremental attempts at devolution may not be effective and may strengthen resistance to reform (Vermillion 1995).

This paper focuses on the basic organizational elements which are included in devolution itself. Two questions are addressed. First, what is the essential set of elements (rights, responsibilities and powers) which should be included in irrigation management devolution? In other words, is there a critical mass of elements that should be included in a devolution program so that it will result in an effective and sustainable result, and if so, what are these elements? The second question is, what are the outcomes of devolution efforts which do and do not contain this essential set of elements?

This paper argues that the following five characteristics are essential for any irrigation management devolution program, if the objective is to produce sustainable improvements in the performance of irrigated agriculture. Where any of the characteristics are missing, the results will be correspondingly sacrificed.<sup>4</sup>

1. a sustainable *water right vested in a legally recognized WUA*,
2. an agreed *irrigation service*,
3. *balance between responsibility and authority devolved*,
4. *devolution of integrated management responsibility*,
5. adequate *incentives and sanctions* to ensure accountability.

First, we argue that the *water right* should be environmentally sustainable and vested in a legally recognized water users association. This enhances farmer confidence in the service and willingness to invest in the long-term viability of the system. Second, clear and binding *irrigation service agreements* between the government and the water users association (WUA) and between the WUA and the individual users create essential cross-accountability between parties and clarify expectations essential to effective management. Such agreements should also be implementable within the constraints of local management capacity and irrigation technology.

Devolution programs tend to involve power struggles. This sometimes results in a transfer of responsibilities without commensurate authority. An example is in the case of Colombia, where, for the early schemes which were transferred, responsibility to implement O&M was given to the districts but the districts had no control over developing the O&M plan and budget. We argue that without a *balance between responsibility and authority* for key management tasks (the third element) the local organization will lack the ability and incentive to discharge its new responsibilities.

The fourth element is *integrated management responsibility*, meaning that the local organization must have primary control over the three closely-interconnected roles of financial management, O&M and conflict resolution. Because of their inter-relatedness, where farmer organizations do not have primary control over all three, management will be overwhelmed by political disputes, speculation, corruption and standoffs.

And fifth, organizational incentives and sanctions should be commensurate with whatever level of management control and accountability is required by the agreed irrigation service. This may sound obvious but it is commonly absent in centrally-financed irrigation agencies and development authorities. It is one of the main problems that devolution is supposed to solve.

We will now examine three cases of irrigation management devolution, each of which varies in the extent to which devolution contains the above set of elements. The three cases are from the USA, Colombia and Sri Lanka, and represent what is herein referred to as comprehensive, partial and minimal types of devolution, respectively. After describing each case of devolution we will examine the outcomes of each.

### **Three Cases: Comprehensive, Partial and Minimal Devolution**

#### ***Comprehensive devolution: USA***

The Columbia Basin Project (CBP) is a large multi-purpose, reservoir-based project located on the Columbia River in the state of Washington in the USA. The irrigated area is about 230,000 hectares. All water used by the irrigation system must be lifted 85 meters, from which point it is distributed to the command area, largely by gravity flow. Today, each district consists of 2,000 to 2,500 landowners and is controlled by a five-to-seven person board elected from among the water users. Seventy-four percent of all landholders have less than 160 acres of irrigated land in the project. Districts purchase water from the US Bureau of Reclamation and then resell it to their members.

Over five years the districts negotiated with the Bureau over water and cost allocation and which works should be reserved by the Bureau, managed jointly between districts, and transferred to individual districts. After coming to agreement in 1969, the Bureau transferred management of the system to three farmer-governed irrigation districts (Svendsen & Vermillion, 1994). Farmers generally favored the transfer of management. Their primary interests were in obtaining more local control over water allocation, water fee structures, O&M expenditures, and drainage ways and in minimizing water charges. The Bureau's main interest was in shedding responsibility for delivering water to individual farms and handling special water sales. It preferred to focus mainly on construction and regulation of water and land use at the basin level. The farmers didn't like the "red tape" of government management and the Bureau didn't want the "headaches" of dealing with thousands of individual farmers.

Control over the dam and intake was retained by the government, since the headworks involved a massive hydro-electric power generation facility. Full responsibility for managing the main and subsidiary canal network was transferred to the three districts (Table 1).<sup>5</sup> This also included responsibility to fully finance the cost of O&M and develop a capital replacement fund to pay for all future costs of rehabilitation. Farmers pay a 30% surcharge over the routine O&M fee to build up this fund.

**Table 1. Key characteristics of devolution in USA, Colombia and Sri Lanka**

Elements	Columbia Basin, USA	RUT, Colombia	Hakwatuna Oya, Sri Lanka
Water right vested in legally-recognized WUA	Water right & strong legal status	No water right, limited powers	No water right, weak status
Legally binding service agreement	Between govt & WUA, users approve O&M plan	Informal, board defines service to users	Informal, govt not legally bound
Balance between management responsibility & authority	Balanced. Full authority for management responsibilities	More responsibility than authority, govt oversight	More responsibility than authority, close govt supervision
Integrated management for financing, O&M, conflict resolution	Integrated and independent in all 3	Not fully integrated due to partial dependence on govt in all 3	Not integrated. due to strong dependence on govt in all 3
Balance between incentives & type of accountability required in farmer organization	Strong mgt control through sanctions and personnel incentives	Only partial control over staff, labor laws restrict incentives	No, ID still deploys staff, WUAs have no hired staff & rely on volunteerism

The districts have the status of semi-municipal corporations, legally constituted by the state government for the purpose of irrigation and drainage. They have rights of eminent domain but are generally exempt from liabilities for damages to property caused by the irrigation and drainage system. They are tax-exempt, not-for-profit entities constituted by the water users. A formal water right is granted to each district by a concession from the state government. The right is divided into basic allotments for water users, measured in volume of water per unit of land per season. The districts have the powers to make their own rules and sanctions (subject to environmental policy and general regulatory constraints), plan and implement O&M, set budgets and water charges, hire and fire staff and apply very strong sanctions. Since transfer the districts have seized and resold more than 20 farms because of failure of owners to pay the water charge. Water is not delivered if water charge payments are in arrears. The districts can raise sideline

revenue to help contain inflation of water charges. This includes the right to sell excess water to users outside the district. The districts agreed that the Bureau should retain ownership of system infrastructure, because they wanted to avoid liabilities attached to ownership.

Interestingly, the Bureau has the right to take over management of the system again if the districts should seriously fall behind in their agreed repayment schedule for construction, fail to pay the agreed costs of O&M for the works retained for management by the Bureau, or fail to properly maintain the system. The Bureau conducts technical audits every three years to ascertain whether the districts are maintaining agreed performance standards. The districts are obligated to comply with recommendations for essential and important preventive maintenance. Management transfer in the Columbia Basin contains all of the five elements of devolution which are hypothesized to be essential to produce viable local management of water.

The process of devolution was relatively complete. It included elimination of direct government subsidies, removal of government staff, negotiated agreements about improvements of scheme infrastructure and a clear understanding that farmers would be responsible to finance all future rehabilitation and modernization (Table 2).

**Table 2. Devolution process in USA, Colombia and Sri Lanka**

Transfer activities	Columbia Basin, USA	RUT, Colombia	Hakwatuna Oya, Sri Lanka
Water user associations created	Yes	Yes	Yes
Train farmer representatives	Yes	Yes	Yes
Train management staff	Yes	Yes	Yes
Revise O&M procedures	No	No	Partial
Revise water charges	No	Yes	No
Reduce government financing	Eliminated*	Substantial	Moderate
Remove government staff	Yes	Yes	No
Main system improvements	No	Yes	No
Subsidiary system improvements	Yes	No	Yes
Farmers prioritized improvements	Yes	No	No
Farmers invested in improvements	Yes	No	Minor
Responsibility for future rehabilitation transferred	Yes	No	No

\*Indirect subsidies to farmers continued, such as low charges for pumping water.

### *Partial devolution: Colombia*

In Colombia, the initiative for irrigation management devolution came from the water users themselves, who in 1976 successfully lobbied the government to take over management of the Coello and Saldaña districts in central Colombia (Plusquellec 1989). These first transfers were only partial in that they did not include WUA control over budgets, O&M plans or personnel. The government irrigation agency, HIMAT, retained a strong supervisory role in these areas.

The initial transfers were considered successful (Vermillion & Garcés 1996), and by the end of the economic recession of the 1980's the government adopted a national devolution policy-

-as part of its overall strategy of economic liberalization and political decentralization.<sup>6</sup> Between 1990 and 1997, 17 irrigation districts have been transferred under the national program.

The Roldanillo-La Union-Toro, or RUT, irrigation district is located in the prosperous Cauca valley, and serves 9,700 ha. It was built between 1958 and 1971. Water is pumped from the Cauca river through three pumping stations, for both irrigation and drainage. The district has predominantly small holdings, with 75% of holdings being less than 5 ha. The main crops are cotton, grapes, fruit trees and sugarcane. Water is delivered on demand. Since it is pumped twice, from the river into the canals and from the canals onto fields, it constitutes a major cost to farmers.

RUT was the first district to be transferred under the national program, in January 1990. As part of the government's overall policy to eliminate subsidies to the agricultural sector, the government discontinued its subsidy to the scheme. Before transfer the subsidy was approximately 60 to 80% of total costs. Since the scheme had been rehabilitated before transfer, no arrangements were made for further repairs as part of the transfer process. After transfer farmers began to realize that they had seriously under-estimated how much pumping costs would be without a subsidy. They have since pressured the government to provide a temporary subsidy of approximately US \$800,000 for energy costs. Several staff remained with the district after transfer and no training was provided as part of the transfer process.

As is the case elsewhere in Colombia, in RUT there is no water right or concession vested in the district or individual farmers. Water is allocated administratively by the government. The WUA consists of a general assembly of members and an elected board of directors. WUA members are all owners of farm land within the command area. A general assembly of members meets at least once a year to re-elect board members and approve policies.

Under the transfer, the WUA takes over management of the entire irrigation network, including the intake. From the time of transfer until 1995-96, the government had to approve O&M plans and budgets, changes in irrigation fees and reductions in staff (the latter of which was resisted by the government). The district can establish rules and apply sanctions against members. The maximum sanction applied has been fines against members for infractions. More severe penalties apparently require involvement of the government. The WUA has the right to make contracts with third parties and raise supplemental revenue aside from water charges. WUAs are still prohibited from making profits (Table 1).

Under the transfer process the irrigation agency, *HIMAT*, or *INAT* as it was renamed after 1994,<sup>7</sup> facilitates the formation of water users associations. This includes preparation of a constitution, formulation of by-laws and designation of basic rules and sanctions. Farmers elect representatives to a Board of Directors. This is followed by preparation and signing of a concessional contract agreement between *INAT* and the WUA. Whether or not the transfer process includes training, rehabilitation, or changes in O&M plans, fees or personnel depends, on a case-by-case basis, on the interests of the WUA and *INAT* and agreements reached between them during pre-transfer negotiations (Table 2).

Recognizing the problems inherent in the partial "delegation of administration", and needing to induce greater farmer investment in future expansion efforts, the government passed the Land Development Law No. 41 in 1993. The new law declared that thereafter full control over irrigation district finances, O&M procedures and personnel would be vested in the water users associations. This was an enlargement of devolution but it still did not include designation of

a water right, clear responsibility and authority for financing maintenance and rehabilitation and ownership of scheme infrastructure.

### ***Minimal devolution: Sri Lanka***

In Sri Lanka irrigation schemes above 80 ha in service area have been the government's responsibility until the 1980s. In 1988, the government of Sri Lanka adopted the *participatory irrigation management policy*, which called for transfer of operation and maintenance of minor irrigation schemes and distributary canals of medium and major schemes to farmer organizations. This program sought to decrease recurrent expenditures by the government, improve operations and maintenance and improve the productivity of irrigation schemes through self-reliant farmer organizations (Abeywickrema, 1986; Brewer, 1994).

The devolution of responsibilities has not included transfer of full control by farmer organizations over O&M plans or budgets, water charges or staff (Table 1). Farmer organizations must obtain approval from the Irrigation Department before making special repairs other than weeding or desilting. All major and medium scale irrigation schemes are the property of the government. The government has absolute rights over water and much of the land in the schemes which are in resettlement areas legally belongs to the government. Water is allocated administratively, whether farmers pay the nominal fee or not. Most do not.

The Agrarian Services Act of 1991 gives the Commissioner of Agrarian Services considerable regulatory control over farmer organizations. This includes regulating elections, auditing accounts, approving business transactions and prohibiting expansion of mandates of farmer organizations (Samad & Vermillion 1997). The 1994 amendments to the Irrigation Ordinance of 1968 authorizes farmer organizations to plan and implement operations and maintenance in distributary canals and formulate rules and sanctions related thereto. However, these plans and rules still require approval of the Irrigation Department.

The Hakwatuna Oya scheme is located in the center of Sri Lanka in the intermediate zone between the wet and dry parts of the island. Hakwatuna Oya is an ancient reservoir irrigation scheme which was rehabilitated in the 1960s. The scheme has high conveyance losses and experiences serious water shortages in the tail-end during dry season. The irrigated area is about 2,400 hectares. Most farm sizes are between .5 and 2 hectares. A majority of farmers are landowners.

The reform process includes formation of informal field channel groups of about 15 to 20 farmers. Each group nominates a representative to the distributary canal organization, or DCO, which is the farmer organization registered with the Department of Agrarian Services (Table 2). In some schemes, DCOs are federated to the level of the entire scheme, but this ultimate body is not recognized as a legal entity. The transfer generally includes some rehabilitation of distributary networks, which may or may not be done with farmer participation. Government field operations staff generally remain assigned to the schemes after transfer and function under supervision of the Irrigation Department. The government continues to provide partial funds for maintenance and assume responsibility for future rehabilitation. Government subsidies for maintenance are generally channeled through DCO organizations as service contracts.

Discussions with farmer leaders in Hakwatuna Oya indicated that no significant changes in operational procedures had been made and that decisions about planting dates and irrigation scheduling are still taken in pre-season meetings attended by farmer representatives and officials

of the irrigation and agriculture departments. Decisions are still made “jointly,” between farmers and the government, much as before transfer. In summary, this has been a minimalist approach toward devolution, with the emphasis being on transfer of responsibility rather than authority.

## **Efficiency and Financial Sustainability**

In the Columbia Basin Project before transfer farmers were already paying close to the full cost of O&M (except for subsidized cost of electricity for pumping water out of the Columbia Basin, which continued after transfer). Under pressure from farmers to contain costs, the boards reversed a pre-transfer upward trend in water charges. Water charges declined in real terms from \$80 per acre in 1969-70 (the time of transfer) to \$49.42 per acre by 1989 (in 1989 USD; Svendsen & Vermillion, *ibid.*).

In the Columbia Basin Project in the USA, there were 612 US Bureau of Reclamation (USBR) staff in 1969--the year of transfer. By 1985 only 83 USBR staff remained and were assigned only for functions at the intake and main system levels which were not transferred to the districts. USBR staff in the Irrigation and Land Management Division of the Project dropped from 297 in 1969 to only 22 in 1985. Government staff previously assigned to the districts were either re-hired by the districts, transferred to other systems, or retired.

Following transfer, the irrigation districts have diversified their revenue sources in an effort by farmer-elected board members to keep water charges as low as possible. Before transfer in 1976, the water charge was 80% of revenue. This fell to 67% of revenue by 1989 as the districts developed seven mini-hydropower stations and engaged in water selling contracts and other income generating activities.

In short, the government used the transfer to discontinue subsidies and remove its own staff from the districts. The districts responded by significant reductions in costs and water charges. They also minimized financial risk through revenue diversification and ensured sustainability of infrastructure by raising a capital replacement fund (which was required by the transfer agreement).

In RUT district in Colombia, farmers supported management transfer, expecting that it would improve management efficiency and contain costs. After transfer the WUA immediately began to reduce staff (although this was resisted and limited by the government). It also replaced ditchtenders inherited from the agency with new ones hired by the district board. Operations was decentralized into zones. The district began making structural repairs at its own expense, reportedly in more pragmatic and cost efficient ways than had been done by public agencies before transfer. The district also began to diversify its revenue sources and hired lawyers to collect overdue fees. These actions were intended to improve accountability and competence of staff, management efficiency and the financial solvency of the district.

In the first five years after transfer, government expenditures were eliminated entirely. The total cost of irrigation in RUT is relatively high, largely due to the two-stage pumping of water from the river. Under pressure from farmers, the board initially reduced the O&M budget even as the government withdrew its subsidy. Expenditures on O&M were decreased from US \$163/ha in 1989 to \$95/ha by 1995 (in 1995 USD). This was achieved largely through substantial decreases in the amount of water pumped per ha<sup>8</sup> as well as lower spending for maintenance. Despite these stringency measures the cost of irrigation as a percentage of gross value of output rose from 2.1%

in 1989 to 3.5% by 1994. This was largely due to declines in the economic value of output, caused by drops in crop prices.

Over time actual farmer payments of water charges declined from \$83 before transfer to \$65 per ha by 1995. This was mainly due to a declining fee collection rate, from above 90% to less than 70% by 1995. By 1995 only 70% of RUT's budget was mobilized from fees. In an effort to balance finances, the board was then pressured to both increase the water charge and reduce the O&M budget. These efforts were insufficient and due to concerns about pump station maintenance and lobbying from farmers, by 1995 the government again began subsidizing routine O&M costs in the district.

In brief, after transfer the WUA board responded to farmer demands to reduce the cost of irrigation. However, this resulted in under-financed maintenance. It is likely that this was partly related to an expectation that the government would resume its subsidies and eventually sponsor rehabilitation in the future.

In the Hakwatuna Oya scheme in Sri Lanka, despite the turnover of the distributary and field channel networks to farmer organizations, there were no significant changes in operation and maintenance or in deployment of Irrigation Department staff. There were 12 agency personnel before transfer, in 1989, and 11 in 1996. However, farmer leaders interviewed agreed that the establishment of farmer organizations improved communication between farmers and the irrigation department and that agency staff were more responsive than before.

There has been a pronounced decline in government expenditure for O&M beginning well before transfer and continuing thereafter. Average annual expenditure on O&M by the government before transfer was US\$ 6.5/ha, compared to US\$ 3/ha during the first five years after transfer. The reform itself did not cause the decline in government expenditure but was part of the overall strategy of reducing government investment in irrigation.

Irrigation water has traditionally been supplied free of charge to farmers in Sri Lanka. Previous attempts to levy a fee from farmers have failed. The government expected that management turnover would facilitate cost recovery by involving farmer organizations in collecting charges from farmers. The 1994 amendments to the Irrigation Ordinance of 1969 vests authority with farmer organizations to recover irrigation costs from farmers, including the right to levy a fee for the service. However, in general, cost recovery in transferred schemes remains very minimal and the cost of irrigation to farmers has remained about the same before and after transfer.

The cost of irrigation is far lower in Sri Lanka than in the other two cases. However, the modest nature of the reform in Hakwatuna Oya has not resulted in any significant changes in total cost of O&M or cost of irrigation to farmers. The government has reduced its level of spending but continues to subsidize routine maintenance and has not changed its policy about financing future rehabilitation.

## **Sustainability of Irrigation Infrastructure**

In the Columbia Basin, USA, the farmer-elected board has continuously exerted pressure on district staff to contain costs of management. It was reported that district managers all believed that the cost containment policy was gradually compromising the long-term sustainability of infrastructure. As required in the transfer agreement, after transfer the USBR conducted technical audits every two years.<sup>9</sup> Between 1973-77 there were only five cases found by auditors where

important preventative maintenance was recommended. By the period 1980-84 there were 20 such recommendations. During the entire post-transfer period however, auditors never reported any cases where urgent remedial maintenance was required. This suggests that cost cutting measures may be compromising the quality of maintenance over time, while still holding the line against significant disrepair.

There is reason to doubt the sustainability of infrastructure maintenance after devolution in both Colombia and Sri Lanka. In the RUT scheme in Colombia, an inspection of the canal network in 1996 revealed that approximately 17% of the main and secondary canal lengths and 18% of control structures were defective. However, it is estimated that it would require an increase of only two percent in the O&M budget to repair all defects in the network within three years. Five years of budget cutting after transfer raised concern by the government about apparent under-financing for maintenance. Local financial sustainability of scheme infrastructure is in doubt with the advent of resumption of government subsidies.

In Hakwatuna Oya in Sri Lanka, government expenditure for maintenance remained about the same before and after transfer. Farmers slightly increased their investment in maintenance after transfer to the level of \$2.50 per ha (much of it in the form of labor). This is double the level of government spending on maintenance, which has continued after transfer. An inspection of scheme infrastructure found about 15% of main and distributary canals and five percent of control structures to be defective. It was estimated that it would take an increase in the annual budget of 375% to handle routine maintenance and eliminate the backlog of disrepair within three years. This raises serious concern about the capacity of farmers to ensure the financial and physical sustainability of scheme infrastructure.

## Trends in Productivity

In the Columbia Basin, management transfer has apparently had little or no effect on the quality of irrigation service received by farmers. There was a gradual shift to higher value, less water intensive crops after management transfer, but this was primarily the result of changing market prices and a shift from furrow and basin to sprinkler irrigation. The reduction in water costs after transfer had the effect of increasing average farm incomes by about 15% over what they would have been without the reduction. It is estimated that this would increase net income by about \$1,600 per year on a typical 65-hectare farm. The value of agricultural production in the Columbia Basin increased from approximately US \$ 182 per irrigated ha at the time of transfer in 1969 to about \$283 in 1989 (in 1989 USD; Svendsen & Vermillion 1994).

In RUT in Colombia a significant improvement in cropping intensity occurred at the time of transfer and afterward. Intensity rose from 110% to 160-170% after transfer. Gross value of output (GVO) per unit of land did not change after transfer but the value of output per unit of water improved significantly. This is primarily due to a reduction in the amount of water pumped per hectare, as the district attempted to reduce management costs after transfer.

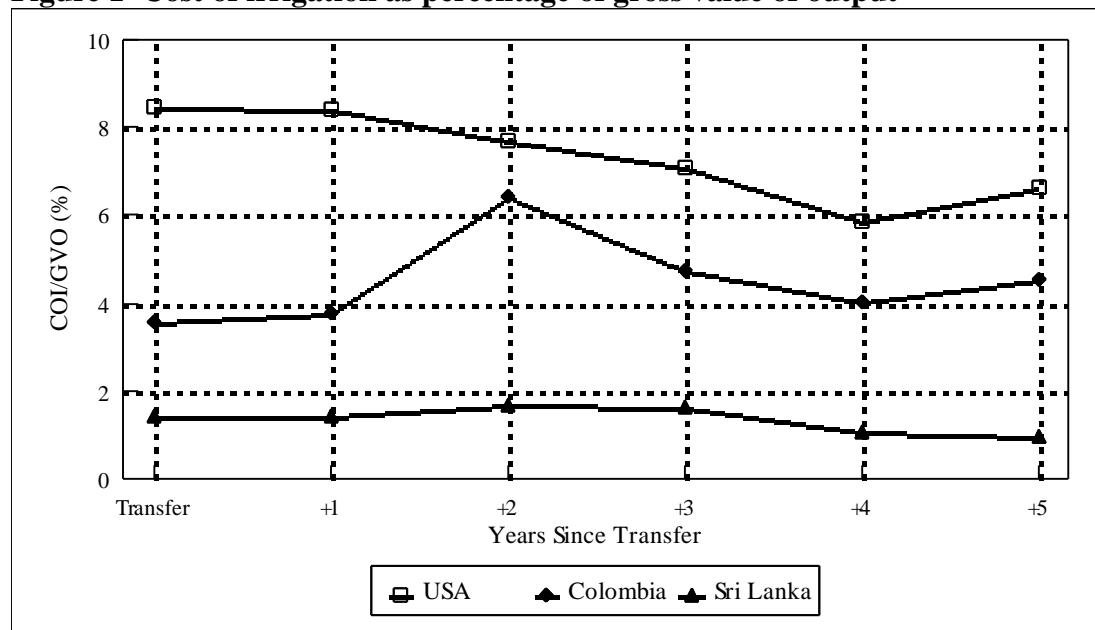
The study in Sri Lanka found no detectable change in irrigated area, crop patterns, cropping intensity (169%) or yields (3-3.6 t/ha for padi) as a result of the transfer of management of distributary canals to farmers. The transfer neither improved nor interfered with agricultural productivity. Economic productivity, measured in GVO per unit of land, declined somewhat after transfer, from US \$800-1,000 in 1985-90 to US \$600-800 in 1991-95 (in 1995 US dollars), but

this is primarily related to changes in the price of rice rather than changes in irrigation management, which were nominal.

One might argue that the different outcomes of these cases are more the result of differences in levels of economic development than devolution strategies. A larger comparative analysis would be needed to test this, but there is some reason to discount this argument anyway. In 1989, the annual gross value of output (GVO) per hectare was approximately US \$3,100 in the Columbia Basin, USA, US \$954 in RUT in Colombia and \$1,540 in Hakwatuna Oya in Sri Lanka (all in 1995 USD). However, the cost of irrigation (COI) is much higher in the USA than in Columbia and Sri Lanka and COI is much higher in Colombia than in Sri Lanka.

Figure 1 shows the annual COI as a percentage of GVO for the year of transfer and five years thereafter, in each of the three cases. This indicates a key concern of farmers, which is, does the ratio between the benefits and costs of irrigation improve after devolution? In this analysis, COI relative to GVO is positively rather than inversely related to level of economic development. Despite the high percentage of COI to GVO in the Colombia Basin (6.5-8.5%), it was the only case which experienced a significant decline in the ratio. COI as a percentage of GVO did not change significantly in the other two cases, although GVO rose slightly during five years after transfer in Colombia and declined in Sri Lanka.

**Figure 1 Cost of irrigation as percentage of gross value of output**



\* Schemes: Columbia Basin in USA, RUT in Colombia, and Hakwatuna Oya in Sri Lanka

\*\* All figures calculated in constant US dollars.

### Pre-requisites to Viable CPR Management

Regarding socio-economic pre-requisites to user management of common pool resources, the large majority of farmers in all three cases are full time farmers and are primarily dependent on irrigated agriculture for their livelihoods. This is especially the case in Sri Lanka. Farming in all three cases depends on irrigation as the primary source of water.<sup>10</sup> As indicated in Figure 1, the ratio between cost of irrigation and value of production improved significantly in the Columbia

Basin and remained roughly the same in the other two cases. The ratio between cost of irrigation and GVO did not increase in any of the cases. Although some tension exists between large and small holders in RUT, no severe social tensions existed in any of the three cases which prohibited communication among farmers. In RUT, both small and large holders were represented on the district board. It appears that all three cases contain the basic three pre-requisites to viable local common pool resource management which are identified in the CPR literature.

## Conclusion

This study lends support to the argument that in order for management devolution to produce effective and sustainable results it should be formulated as a comprehensive, integrated reform. Partial or incremental approaches do not put in place sufficient motivation or capacity for farmer organizations to intensify management and investment nor ensure the long-term sustainability of scheme infrastructure.

Devolution in the Colombia Basin, USA included a water right, strong legal status for the districts, formal service agreements between the government, districts and users, full transfer of authority for district finances, O&M and rehabilitation, removal of government staff from the districts and strong capacity to impose incentives and sanctions to ensure accountability. The transfer resulted in significant reductions in staff and management costs, gradual enhancements in water delivery efficiency, technical innovation and long-term improvements in the economic productivity of irrigated agriculture.

By contrast, management turnover of distributary canals in Sri Lanka includes no water rights, only weak legal status for the WUA, no binding agreements between the agency, WUA and farmers, continuity of government staff in the scheme and a continuing supervisory and financial role for the government in O&M and rehabilitation. The modest reforms have produced no significant improvements in total cost efficiency, quality of O&M or agricultural or economic productivity of irrigated agriculture. Inspection of infrastructure indicates that farmers have been seriously under-investing in maintenance after transfer. The case of management devolution in Colombia is somewhere in between the two cases, both in terms of extent of devolution and outcomes for performance.

The basic steps in the *process* of devolution are, however, roughly similar in all three cases. Water users associations were created, training was provided and physical repairs were made in conjunction with transfer. Transfer involved negotiation and agreements between the agency and water users in each case.<sup>11</sup> It is apparent that the degree of comprehensiveness and consistency among the basic set of roles, rights and powers devolved was more important than the change process itself in defining the essential differences between the three cases. It was also found that all three cases contain the basic key pre-requisites for viable user-based management of resources. We conclude therefore, that, where the socio-economic pre-requisites to viable community managed resources are in place, the comprehensiveness and consistency of a devolution strategy is a vital determinant of successful outcomes. Comprehensiveness and consistency of devolution is defined primarily in terms of the following five essential characteristics:

1. a water right vested in a legally recognized water users association;
2. an agreed irrigation service;
3. a balance between responsibility and authority devolved;

4. integrated management of finances, O&M and conflict resolution; and
5. adequate capacity to impose incentives and sanctions to ensure accountability.

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## Endnotes:

<sup>1</sup> The author is Senior Social Scientist with the International Water Management Institute, in Colombo, Sri Lanka. This paper is for presentation at the 'Cross Boundaries' Conference of the International Association for the Study of Common Property, 12-15 June 1998, Vancouver, Canada.

<sup>2</sup> Water for agriculture also often includes water for aquaculture and drinking water for livestock. In industrialized countries industry uses about 40 percent of available fresh water, in less developed countries this figure is only about 10 percent.

<sup>3</sup> Herein, decentralization refers to movement of management roles from higher or central levels to lower or local units within the same agency or ministry. Devolution refers to transfer of management roles from a government organization to a non-governmental or financially autonomous one, which is usually a local organization constituted by resource users.

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<sup>4</sup> This list draws from an emerging consensus in the literature. See Fredericksen 1995; Perry n.d.; Johnson et al. 1995, Vermillion 1995)

<sup>5</sup> This is with the exception of a few structures which serve all three districts.

<sup>6</sup> The strategy included removal of agricultural price supports, input subsidies and trade barriers.

<sup>7</sup> In 1994 responsibility for meteorology was removed from the agency and its name was changed to the National Institute for Land Development (INAT) to reflect its narrower focus on development of irrigation, drainage and flood control facilities.

<sup>8</sup> The Relative Irrigation Supply (supply/requirement) fell from 2.0 in 1989 to 1.1 by 1995.

<sup>9</sup> The US Bureau of Reclamation regional offices conducted technical audits of systems after transfer. These involved on site inspection of all physical structures and examination of finances and management practices. Maintenance assessments were rated according to degree of urgency of need for repairs.

<sup>10</sup> In Sri Lanka, irrigation is only supplemental during parts of the rainy season.

<sup>11</sup> However, the extent of negotiation varied from a five-year process involving lawyers on both sides in the USA to a short series of meetings between representatives of the agency and farmers in Sri Lanka.