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160

Revitalizing Canal Irrigation: Towards Improving Cost Recovery

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International Water Management Institute

RESEARCH PROGRAM ON Water, Land and Ecosystems

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Contents

Summary

Most of the large irrigation projects around the world have been built, are owned, and are being operated and maintained by the governments. The cost recovery from such projects through levy of Irrigation Service Fees (ISF) in almost all the countries presents a dismal picture. The limited cost recovery from ISF in irrigation projects has meant that extensive contributions from governments' public investment and current expenditure budgets have been necessary to sustain irrigation systems. Over the years the underlying conditions have however changed. With government finances coming under increasing pressure they have been unable to provide adequate funds for maintenance of the built infrastructure. They have also failed to increase the user charges from the users of water to any significant level. The widening gap between financial resources required to maintain the infrastructure and that available from government budgets plus that collected as user fees, has led to the deterioration not only of the quality of the built infrastructure but also of institutions managing and governing such infrastructure, creating a vicious circle of low-cost recovery, poor maintenance of infrastructure, inadequate and unreliable water supply, inefficient and corrupt institutions, unwillingness of the farmers to pay and low cost recovery. Breaking this vicious circle requires, apart from other interventions, identifying ways to improve availability of financial resources to keep these systems in perfect working order. Improving cost recovery from all users including irrigators of the water, offers one of the most important avenues for raising financial resources. The present study examines some of the important issues that impinge on improving the cost recovery in canal irrigation and assesses the feasibility of some of the efforts being made to improve cost recovery in irrigation.

As in the case of any infrastructure development, in the case of irrigation infrastructure also there are three basic questions relevant to the financing of capital and recurring costs of infrastructure: (1) who pays? (2) how much is paid? and (3) how is the money used? In terms of who pays and who should pay the answer is obvious – not the farmers alone. It has however long been recognized that while farmers may be the primary beneficiaries of the investments in irrigation, they are rarely the sole beneficiaries. From even the most casual comparison of the economic activity in a region before and after the availability of irrigation, it would be obvious that the benefits of growth as a result of the availability of irrigation water are reaped not only by multiple segments of the rural population – both farm and nonfarm – but often by residents of urban areas as well. Some derive these benefits directly, while others derive them indirectly through the benefits of increased agricultural production transmitted to other parts of the society. In addition to the economic benefits accruing to various segments of the rural and urban population, investments in irrigation provide a number of social benefits, such as enhanced food security, lower food prices and increased income-generating opportunities. The fact that some benefits of irrigation are unintended and that some of these benefits accrue indirectly to nonagricultural sectors – does not make them any less real, less valuable or less important. The argument that it is not easy to identify other beneficiaries or to quantify indirect benefits, or the amounts these indirectly impacted beneficiaries are already paying to the government, does not mean that revenue realized from the direct beneficiaries alone can be treated as the sole revenue from the sale of irrigation water. The net must therefore be cast wide so that all the beneficiaries impacted directly or indirectly by the availability of irrigation water and currently paying or not paying must pay for deriving benefits from the availability and/or use of water. The fact that some of them are already paying for this service in a different form to the government and the government accounting procedures do not

permit attribution of at least a part of this contribution to the provision of irrigation water should not undermine the contribution of users to this payment. Ways must be found to at least notionally account for counting of a part of such payments as revenue derived from availability of water. It needs to be underlined that payments received from the farmers as ISF should not be treated as the sole revenue from supply of irrigation water.

In terms of how much is paid and how such receipts can be enhanced, the obvious answer is that it is partly by increasing low water tariffs and partly through improvement of collection efficiency. Irrigation cost at prevailing tariff rates forms a small part of the revenue derived from the use of irrigation water for crop production and farmers can afford to pay higher tariffs. There is in fact a willingness, on the part of the farmers, to pay higher tariffs provided the services are improved. There is substantial scope for increasing receipts through improvement in collection efficiency of the raised bills. An appropriate institutional arrangement combined with some more powers to the enforcement agencies can help improve collection efficiency.

In terms of how the available money is spent there is a substantial scope for more efficient utilization of available financial resources for improved system maintenance by cutting on the cost of salaries of huge and often inefficient bureaucracies in the irrigation departments. There is a need for reallocation of available funds for the irrigation sector by prioritizing operation and maintenance (O&M) of existing infrastructure rather than allocating more and more funds for creation of new infrastructure. There is an increasing realization all around that revitalization of canal irrigation systems and putting the infrastructure and water therein to more productive and efficient use would, as a first step, require rehabilitation of the dilapidated and worn out systems due to years of neglected maintenance and inefficient operations. Once rehabilitated, it would need to be ensured that the systems are maintained on a regular basis so that the rehabilitated systems continue to provide useful services on a sustainable basis. Unless both the components of the revitalization package – rehabilitation of worn out systems and regular maintenance of the systems once rehabilitated – are considered concurrently as a suite, money invested in one component of the rehabilitation package without ensuring required allocations for the other, is unlikely to bring in any significant change from the current scenario in the long run. The two components of the revitalization package however have different financial implications. For system rehabilitation the financial requirements are relatively much larger and need to be invested upfront as a lump sum investment in comparison to financial requirements for system maintenance which require an annual stream of relatively smaller magnitude of financial resources.

Revitalization of irrigation systems will thus require huge amounts of money for both rehabilitation of the systems and their improved O&M. Where will this money come from? Closing the cost-revenue gap thus is the first step in the process of revitalization of irrigation systems. The revenues have to come in line with the costs and there is no such thing as free lunch. In a real world, there are only two sources of revenue to pay for the (rising) costs of these services – taxes or user charges. If the governments are not willing to raise either of these, then there is simply no way forward. Given the current scenario of condition of irrigation infrastructure and the levels of cost recovery, the financial gap cannot be bridged in a short period of time. For the foreseeable future, budget support (taxpayers' money) for irrigation would therefore need to continue. But it is also obvious that charges of all users including the irrigators must be increased for a host of reasons, and the revenue should be channeled for O&M of irrigation infrastructure, irrespective of how the collection was made, and by whom. So, it is clear that starting with the idea of increasing user charges (for bad services provided by corrupt and inefficient agencies) will quite reasonably be resisted. For this reason, the idea of bringing tariffs into balance with costs must be seen as the third leg of a triangle in which the first two legs must be ‘improve services first,’ and ‘provide those services in an efficient and accountable manner.’ Asking users to pay for the costs of these services can come only after the first two have been clearly done and are so perceived by users. During this transition period the governments would need to provide this bridge financing. The duration of this transition period would vary from system to system based on the prevailing ground situation.

INTRODUCTION

Most of the large irrigation projects around the world have been built, are owned, and are being operated and maintained by the governments. The costs incurred in supply of water from such built infrastructure are broadly categorised into two main categories: investment costs and working expenses, though as discussed subsequently, there are other direct and indirect costs incurred in supply and use of this water. Investment costs refer to the upfront costs incurred in building of the infrastructure such as constructing storages, dams and conveyance systems, such as canals for transport of water. The working expenses refer to the annual costs incurred in keeping the created system in good working order and in appropriately managing the water available in the system in the most efficient way. An important difference between the two costs is that while capital costs are one-time lump investments incurred over a short time period, the working expenses are more moderate and are required to be incurred on a regular basis, often measured on an annual basis. The magnitude of annual working expenses required to keep the created assets in good working order are relatively much smaller – around 4-7% of the capital cost of the project.

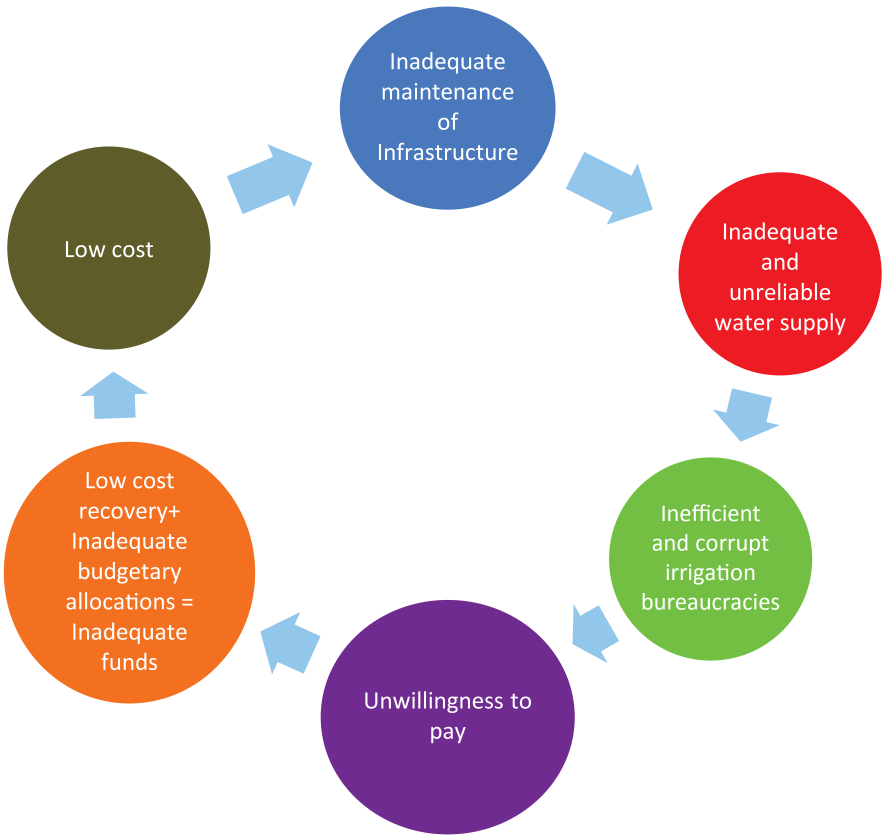
Cost recovery refers to the recovery, from the users of water, of the cost incurred in supplying water. The governments often tend to recover this cost from the users of water through a levy of user charges. Cost recovery is thus expressed as a ratio of charges recovered from the users (revenue realized) to cost incurred (cost of water provision) expressed as a percent. Thus:

$$\text{Cost recovery (\%)} = \text{revenue realized/cost incurred} * 100 \qquad (1)$$

Cost recovery thus crucially depends on two variables – revenue realized and cost incurred: the higher the revenue realized relative to cost the higher the level of cost recovery. Depending on how the numerator (revenues) and the denominator (cost of provision) are defined and measured, the resultant percent cost recovery figures can vary. There are no agreed to or consistent definitions of what constitutes revenues and costs nor are there any standardized methodologies for measuring them. There is also no agreement on who the users are, who should share the cost and provide revenue and how their shares should be determined. Different countries, different projects within a country, and even within a country over different periods of time, have defined and measured such costs and revenues differently (Malik 2008). As such, a simple comparison of cost recovery estimates, measured as a ratio of revenue to cost (howsoever these may have been defined and measured), spatially and temporally makes them noncomparable. It is therefore important to have conceptual clarity on the underlying variables – costs and revenues – and the methodology to be followed in estimating each of them so that more transparent, uniform, comparable and accurate estimates of cost recovery can be generated. Such a conceptual and methodological clarity is the first step in identifying possible avenues for improving cost recovery. Deriving comparable estimates of cost recovery however depends on the availability of data, which most countries either do not have or if they have refuse to part with.

Notwithstanding, for the time being, the differences in concepts used and/or methodologies employed in measuring revenues and costs and thereby in estimating cost recovery by different countries, cost recovery in almost all the countries presents a dismal picture. While the reported range of cost recovery in different countries has varied between a low of 20% to a high of around 80%, most of the countries are near the lower end of this spectrum. The limited cost recovery in irrigation projects has meant that extensive contributions from governments' public investment and current expenditure budgets have been necessary to sustain irrigation systems. Over the years things have however changed. With government finances coming under increasing pressure they have been unable to provide adequate funds for maintenance of the built infrastructure. They have also failed to increase to any significant level the user charges from the users of water. The widening gap between financial resources required to maintain the infrastructure and that available from the government budgets plus that collected as user fees, has led to the deterioration not only of the quality of the built infrastructure but also of institutions managing and governing such infrastructure creating a vicious circle of low cost recovery, poor maintenance of infrastructure, inadequate and unreliable water supply, inefficient and corrupt institutions, unwillingness of the farmers to pay and low cost recovery (Figure 1). This vicious circle has, in large part, been responsible for supply of inadequate and unreliable quality and quantity of water through these dilapidated storage and transmission systems replete with line-losses leading to underutilization and often disuse of irrigation systems built with huge amounts of public money in different parts of the world. Breaking this vicious circle requires, apart from other interventions, identifying ways to improve availability of financial resources to keep these systems in perfect working order. Improving cost recovery from users of the water offers one of the most important avenues for raising financial resources.

FIGURE 1. Vicious circle of low cost recovery.



The present study examines some of the important issues that impinge on improving the cost recovery in irrigation and assesses the feasibility of some of the efforts being made to improve cost recovery in irrigation. The study is based on the data available in the literature and from secondary sources supplemented by limited primary data collected from a sample of eight countries – India, Pakistan, Nepal, South Africa, Ethiopia, Uzbekistan, Tajikistan and Kyrgyzstan, where IWMI conducts its research.

CONCEPTUAL ISSUES - WHICH COSTS? WHICH REVENUE?

Before we discuss the current status of cost recovery and examine ways to improve cost recovery in irrigation, it is important to have conceptual clarity on the two underlying concepts – cost and recovery – on which cost recovery depends. In the following sections we elaborate on these two aspects to bring out their relevance for measuring cost recovery.

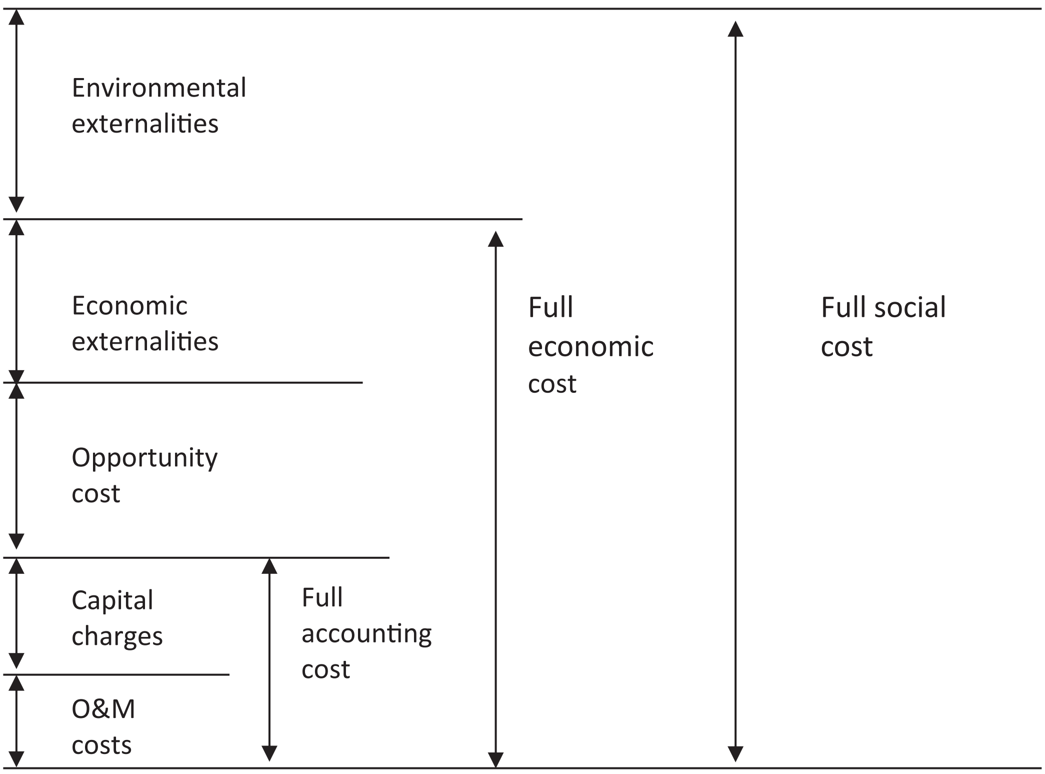
Which Costs?

Depending on the purpose at hand, cost of making irrigation water available can be defined in various alternative ways.

Cost of Water Provision

Following Rogers et al. (1998) we distinguish three cost concepts – the full supply cost, the full economic cost and the full (social) cost. Figure 2 provides a schematic presentation of the various components of different costs. Each of these is explained below in brief.

FIGURE 2. Cost of supplying water.



Source: Adapted from Rogers et al. 1998.

Full Supply Cost

The full supply (accounting) cost is equated with the costs associated with the supply of water to a consumer. The full supply cost is composed of two separate items: O&M costs; and the capital charges. Full supply cost however excludes consideration of either the externalities imposed upon others or of the alternative uses of the water.

O&M costs: These costs are associated with the daily operations (running) of the supply system. The illustrative costs include purchased raw water, electricity for pumping, labor, repair materials, and input cost for managing and operating storage and distribution systems.

Capital charges: These include depreciation charges (capital consumption)[1] and interest costs on capital charges associated with reservoirs, treatment plants, and conveyance and distribution systems. There are some disagreements on how the annualized capital charges are to be computed. The annualized capital charges coupled with the O&M costs approximate the long-term marginal costs.

Full Economic Cost

The full economic cost of water is the sum of the full supply cost as described above, the opportunity cost associated with the alternative use of the same water resource, and the economic (pecuniary) externalities imposed upon others due to the consumption of water by a specific actor.

Opportunity cost: This concept of opportunity cost addresses the fact that by consuming water, the user is depriving another user of the water. If that other user has a higher value for the water, then there are some opportunity costs experienced by society due to this misallocation of resources. The opportunity cost of water is zero only when there is no alternative use – that is, no shortage of water. Ignoring the opportunity cost results in undervaluing water, leading to under-investing in water conservation and causing serious misallocation of resources among users. There are however methodological problems associated with the estimation of opportunity cost.

Economic (pecuniary) externalities: As a fugitive resource, water results in pervasive externalities. The most common externalities are those associated with the impact of an upstream diversion of water or with the release of pollution on downstream users. There are also externalities due to over-extraction from, or contamination of, common-pool resources such as lakes and aquifers. There may also be production externalities due, for example, to the agricultural production in irrigated areas damaging the markets for upland nonirrigated agriculture, or forcing them to change their inputs. The externalities may be positive or negative, and it is important to characterize the situation in a given context and estimate the positive or negative externalities and adjust the full cost by these impacts.

Positive externalities occur, for example, when surface irrigation is both meeting the evapotranspiration needs of crops, and recharging a groundwater aquifer. Irrigation is then effectively providing a "recharge service." However, the net benefit of this service will depend on the overall balance between total recharge (from rainfall and surface irrigation) and the rate of withdrawal of groundwater.

Negative externalities, as discussed by Briscoe (1996), may impose costs on downstream users if the irrigation return flows are saline, or where return flows from towns impose costs on downstream water users. These negative externalities should be borne by the water users who impose these externalities on others.

Full (Social) Cost

The full cost of the consumption of water is the full economic cost, given above, plus the environmental externalities. These costs have to be determined based upon the damages caused, where such data are available, or as additional costs of treatment to return the water to its original quality. Environmental externalities are usually inherently more difficult to assess economically than

[1] Depreciation charges refer to the consumption of fixed assets over time in a way that reflects their reducing value.

the economic externalities, but we are of the opinion that it is possible, in most cases, to estimate some remediation costs that will give a lower-bound estimate of the economic value of damages.

While theoretical classification of different costs is relatively straightforward, in practice quite often, a clear distinction between the financial costs, environmental costs and resource costs becomes difficult, as there are risks of overlap and even mix-up with the consequence of double counting. As mentioned by Rogers et al. (1998), the distinction between economic and environmental externalities is very narrow. Thus, while keeping the spirit and need for accounting of the various costs as defined by them intact, several researchers have often put the economic and environmental externalities into one broad group of irrigation externalities to include such irrigation-induced externalities as waterlogging and soil salinization, point and nonpoint source pollution associated with the use of fertilizers and pesticides, loss of aquatic habitat, lowering of the water table and the like.

Which Cost Should Form the Basis for Recovery?

Given different ways in which costs are defined and measured which cost should form the basis for recovery? There appears to be a general consensus that full-cost pricing be promoted and implemented and should form the basis for cost recovery (Cosgrove and Rijsberman 2000). Although there are conceptual and methodological problems associated with the estimation of full cost of water, it is still considered important to know the full cost of service provision. Knowing the full cost of water services would bring (among other things) greater transparency in terms of impacts on the environment, the sustainability of the irrigation infrastructure, costs to deliver the service and who should pay (Tardieu 2004). This would also enable to derive more informed estimates of subsidies incurred in supplying water.

While supportive of the general principle of full-cost pricing, some analysts have, however, raised apprehensions about using it as a basis for cost recovery. It has, for example, been argued that while full cost recovery may prove feasible in a developed country environment, for example in Australia (Briscoe 1997), it may prove unrealistic in developing economies with subsistence-oriented smallholder irrigation schemes. This is why, while acknowledging that "the recovery of full cost should be the goal for all water uses, the International Commission on Irrigation and Drainage (ICID) alternatively recommended that in order to achieve sustainability, the full cost of water provision "need not necessarily be charged to the users" (Tardieu 2005).

Similarly, the Global Water Partnership (GWP) considers "the recovery of full cost should be the goal for all water uses unless there are compelling reasons for not doing so." In the same way, the European Framework Directive for Water asks for "adequate" pricing of water, leaving room for charging users a price lower than that required for full cost recovery (Tardieu 2004). Thus using the full-cost principle as a basis for cost determination does not prevent countries from deciding on a level of cost recovery and on the contribution of water users to the recovery of the costs of water services that is below the full cost. The uncovered costs can then be borne by someone – taxpayers or society at large – in the form of subsidies. Though full cost recovery is desirable from the point of view of long-term ability to finance irrigation and promote more efficient use of resources, problems related to practical implementation need to be kept in view.

Should the Entire Cost Intended to be Recovered be Recovered from the Farmers?

Irrespective of which cost the governments may intend to recover, should the entire cost so intended to be recovered be recovered from the farmers, the beneficiaries of irrigation water. An important characteristic of many public utilities is that they provide multiple goods and services simultaneously. Most large water-resource projects have this characteristic, providing at the same time some or all of the following services: irrigation water, municipal water supply, flood protection, hydroelectric power, recreation, navigation, fisheries and so forth. While some of these demands are competitive (such as agricultural and industrial consumption), others are complementary. For example, in some cases releases for agriculture can be passed through turbines to generate power and be used by ships for navigation without detriment to other consumers (Perry 1986).

In addition to these formally understood multiple purposes for which a project is built, there are several informal uses of the irrigation infrastructure in developing countries which are more difficult to address (van Koppen et al. 2006). These may include informal diversion and use, such as for livestock, fish culture and small enterprises (e.g., brick-making and brewing beer). In Asia, for example, 90% of dams for irrigation are multipurpose (Easter and Liu 2005a). Often, the initial trigger to set up a water project may be one specific factor relating to the control or use of water, yet frequently the combination of factors is such that the achievement of some particular objective may be better promoted by combining other objectives with it. In addition to helping realize the greatest total benefit from the natural resource, the multiple nature of the project also helps make the project more cost-effective, since the sum of marginal costs of each component may be less than the total cost of the project. Thus a multipurpose project may be practicable where a single-purpose project may be impracticable.

A problem arises with regard to the basis for allocation of the total cost of the project to its constituent components. Interest in the problem of fair allocation of joint costs in water-resource projects was stimulated during the early days of the Tennessee Valley Authority (TVA) in the 1930s, which had to apportion costs of dam systems among participatory uses. In the literature, various methods have since been suggested for allocating joint costs. Fair cost-allocation concepts have been studied extensively in cooperative game theory, which provides various normative approaches to the problem of allocating joint costs (and benefits) among users by taking the strategic possibilities into account. Some well-known concepts include core (Gillies 1959) and Shapley value (Shapley 1953). Since these pioneering studies, several variants and extensions have been developed (see the reviews by Krus and Bronisz 2000; Monderer and Samet 2002) and applied to the allocation of costs in joint projects (Young 1985, 1996).

The traditional methods most commonly used in water-resource planning to allocate joint costs are (1) to allocate costs in proportion to some single numerical criterion, such as use, population or level of benefits; or (2) to allocate certain costs (e.g., marginal costs) directly and divide the remainder on the basis of some scheme similar to the first method (Young et al. 1982). Chief among variants of the first method is the use-of-facilities (UOF) method. This method entails that each of the purposes served by one structure, with uses being irrigation, domestic and commercial water supply, being charged in proportion to the capacity (e.g., acre-feet, cubic-feet per second) to which that purpose is entitled. Such a cost-allocation method is, however, usually not efficient.

The fundamental concept of fairness stipulates that for a fair allocation of costs, no user should individually pay more in the joint venture than he would have to pay on his own. This constitutes the minimum incentive for an individual to join. The UOF method however does not promote efficient use of resources in the greatest public interest by assuring a maximum practicable return per dollar invested (Perry 1986). There are also difficulties in relating consumptive to non-consumptive uses of water (navigation and hydropower, for example). The approach is also highly dependent on disaggregated data, which most irrigation districts or authorities do not automatically generate or retain (Lewis and Hilal 1995). On the other hand, the transparency of the approach is appealing. Among the second group of methods, the two main ones are: (1) alternative justifiable expenditures (AJE); and (2) separate costs, remaining benefits (SCRB) methods (Young et al. 1982;

Young 1985; Easter and Liu 2005a). The first approach allocates joint costs based on remaining benefits after subtracting specific costs, where specific costs refer to costs directly attributable to a single purpose (for example, irrigation) and excludes the costs of a change in project design due to the inclusion of a particular purpose. The second approach, SCRB, is similar to the first one. It assigns costs that serve a “single” purpose to the benefiting purpose, including the costs of any project design changes required to include the added purpose. The remaining “joint” costs are assigned in proportion to the remaining benefits derived for each type of use after subtracting the separable costs (Perry 1986).

Unlike methods available for allocation of joint capital cost, methods for allocation of working expenses amongst multiple uses are much less clear. While some projects after construction continue to be operated as multiple use projects, some others are split, for operational and administrative reasons, and operate as individual use entities, though in practice it may not always be possible to treat them as strictly independent entities since they depend on the same water. In such a scenario, the burden of paying for the working expenses often falls on the largest user of water viz the farmers. Farmers are expected to pay for the cost of a service from which several beneficiaries benefit directly and indirectly.

Which Costs are the Countries Currently Seeking to Recover?

There is a whole range of combinations of costs which the governments around the world are currently recovering or like to recover. The costs to be recovered differ not only between different countries but also sometimes even within the same country between different provinces/projects. While some governments look to recover either fully or partly the accounting cost (capital cost plus O&M costs) from the users, a majority of the other countries aim to recover either partly or fully the O&M costs only. There is much less clarity on what constitutes O&M cost, how these are calculated and how in the case of a multiple use project these are allocated amongst different end users. There are some countries which do not seek to recover any amount from users for making irrigation water available. The decision of the governments about aiming to recover only a certain part of the cost from the users is often deliberate and intentional dictated by a number of considerations - political, economic, social, technological, religious and others. Some of these considerations in turn are influenced by a number of factors which include - ability and/or willingness of the farmers to pay, achieving food security for the country, incentivizing farmers to make complementary investments in modernizing agriculture, reducing poverty and improving farmer’s incomes, keeping migration under check and, above all, using water price as a powerful political economy tool. It may be important to mention here that aiming to recover, whatever part of the cost the government may intend to recover, is however different from what the governments actually recover or can possibly recover.

Based on some of the available literature on cost recovery, which simply report broad country-level costs the different countries seek to recover, supplemented by some project-level information which we could specifically collect as part of the present study from a small number of projects in some of the unrepresented countries in the available literature, we separate the countries into three broad categories depending on the nature of cost these countries seek to recover. These three categories are countries/projects a) aiming to recover either in full or in part O&M costs from the users, b) aiming to recover some part of the capital and O&M costs, and c) not aiming to recover any costs from users of irrigation water.

The data presented in Table 1 below show that almost all the countries aim to recover at least some part of the O&M costs. In addition to recovery of O&M costs a number of countries also seek to recover either in full or in part the capital cost as well. There are some projects within the same country (as in Ethiopia) which intend to cover only O&M costs while other projects intend to additionally recover the capital cost as well. Similarly, in Nepal while most of the projects aim to recover O&M costs there is a project in Nepal which does not intend to recover any costs from the users.

TABLE 1. Cost recovery: Costs intended to be recovered in a sample of countries.

S. No	Country/Project	Cost sought to be recovered	Source of information
Part 1 - Recovery aimed at O&M cost only			
1	Argentina	O&M	Easter and Liu 2005b
2	Armenia	O&M	Tsur and Dinar 1995
3	Botswana	O&M	Easter and Liu 2005b
4	Columbia	O&M	Easter and Liu 2005b
5	Jordan	O&M	Cornish et al. 2004; Easter and Liu 2005b
6	Philippines	O&M	Easter and Liu 2005b
7	Tunisia	O&M	Chohin-Kuper et al. 2003; Dinar and Mody 2004
8	Pakistan	O&M of the entire system. In some cases, O&M cost of the canals only.	Based on data collected by IWMI; Dinar and Subramanian 1997; Dinar and Mody 2004; Easter and Liu 2005b
9	Kyrgyz Republic (Aravan Akbura Main Canal)	O&M cost (for the whole system)	Based on data collected by IWMI
10	Tajikistan (Khojabakirgan)	O&M cost	Based on data collected by IWMI
11	Uzbekistan (South Ferghana Main Canal [SFC])	O&M cost	Based on data collected by IWMI
12	South Africa (Thabina Smallholder Irrigation Scheme)	O&M cost for the entire system	Based on data collected by IWMI
13	Nepal (Sunsari Morang Irrigation Project [SMIP])	O&M cost at branch and tertiary canal; dredging cost (electricity for dredging provided free by hydropower developer)	Based on data collected by IWMI
14	Nepal (Khageri Irrigation System [KIS])	O&M cost at branch and tertiary canal	Based on data collected by IWMI
15	Nepal (Chhattis Mauja Irrigation System [CMIS])	O&M cost for intake and branch canals	Based on data collected by IWMI
16	Ethiopia (Arno Irrigation Scheme)	O&M cost	Based on data collected by IWMI
17	Ethiopia (Tikurut Irrigation Scheme)	O&M cost	Based on data collected by IWMI
18	Ethiopia (Bedene-Alemtena Irrigation Scheme)	O&M cost of the entire system	Based on data collected by IWMI
Part 2 – Recovery aimed at O&M plus capital cost (part or full)			
19	California	Some part of total cost (Capital + O&M)	Cornish et al. 2004
20	Italy	Total costs (Capital + O&M)	Easter and Liu 2005b
21	Brazil (Jaiba project)	Total costs (Capital + O&M)	Easter and Liu 2005b

(Continued)

TABLE 1. Cost recovery: Costs intended to be recovered in a sample of countries (Continued).

S. No	Country/Project	Cost sought to be recovered	Source of information
22	Macedonia	Substantial capital costs + full O&M	Cornish et al. 2004; Easter and Liu 2005b
23	Morocco	40% of investment cost + full O&M	Dinar and Mody 2004
24	Syria	Part of investment costs + actual O&M in irrigation networks	Dinar and Mody 2004
25	Turkey	Capital cost recovery, after 10 years. O&M from previous year	Dinar and Mody 2004
26	Ethiopia (Fentale Irrigation Scheme)	O&M cost, capital cost	Based on data collected by IWMI
27	Ethiopia (Tibila Irrigation-based development project)	O&M cost, capital cost, interest on capital cost	Based on data collected by IWMI
28	India	O&M cost plus a part of capital cost	Based on data collected by IWMI
Part 3 – No intention to recover costs			
29	Sri Lanka	No cost is sought to be recovered, except voluntary contribution by farmer organizations in O&M of tertiary system	Based on data collected by IWMI
30	Nepal (Babai Irrigation Project [BIP])	This project was designed to improve livelihoods of backward ethnic farmers; so project objective did not include any ISF	Based on data collected by IWMI

What Proportion of the Intended Costs are the Countries Currently Able to Recover?

Notwithstanding how O&M costs are measured, it is important to know what part of the O&M costs (howsoever measured) the countries are actually able to recover. Table 2 below gives some information on the proportion of O&M costs some of the countries are currently able to recover. While in most of the cases the recoveries have been sufficient to recover only a small part of the O&M costs, in some other cases revenue covers a substantial part of the O&M costs.

An exception to the generally low level of cost recovery reported in the case of most of the countries is the set of countries belonging to the European Union which are bound by the legislation of Water Framework Directive (WFD). The underlying idea under WFD is to treat water as an economic good and move towards full cost recovery of provision of water services. The Member States must ensure that the main water users categories – households, industry and agriculture, contribute to cost recovery of water services provision, including environmental and resource costs, according to the "Polluter-Pays" principle. It also stipulates participation of stakeholders and the public in the management of water resources.

A number of countries have already moved towards 100% cost recovery of O&M and capital cost, while a few others are recovering 100% of O&M cost but less than 100% of capital cost. Still a few others are yet to achieve the target of achieving 100% cost recovery of either the capital cost or of operational cost (Table 3).

TABLE 2. Summary of percentage of cost recovered in some countries.

S. No.	Countries	Which part of cost is the country trying to recover	Proportion of cost actually recovered	References
1	Argentina	O&M	12% of O&M	Easter and Liu 2005b
2	Armenia	O&M		Tsur and Dinar 1995
3	Botswana	O&M	About 40% of O&M	Easter and Liu 2005b
4	California	Some part of total cost (capital + O&M)	1984: 5.5% of capital cost from users; part of O&M	Cornish et al. 2004
5	Columbia	O&M	52% of O&M	Easter and Liu 2005b
6	Italy	Total costs (capital + O&M)	60% of total costs	Easter and Liu 2005b
7	Jaiba project, Brazil	Total costs (capital + O&M)	52% of total costs	Easter and Liu 2005b
8	Jordan	O&M	Approx. 50% of irrigation O&M	Cornish et al. 2004; Easter and Liu 2005b
9	Macedonia	Capital + O&M	Substantial capital costs + full O&M	Cornish et al. 2004; Easter and Liu 2005b
10	Morocco	Capital+ O&M	40% of investment cost + full O&M	Dinar and Mody 2004
11	Nepal	O&M	10% of O&M	Small et al. 1986
12	Pakistan	O&M	30-70% of O&M	Dinar and Subramanian 1997; Dinar and Mody 2004; Easter and Liu 2005b
13	Pakistan	O&M	24% of O&M	Jamal 2013
14	Philippines	O&M	46% of O&M	Easter and Liu 2005b
15	Syria	Part investment costs + O&M	90% of O&M	Dinar and Mody 2004
16	Tunisia	O&M	70% in 1991; 115% in 2002	Chohin-Kuper et al. 2003; Dinar and Mody 2004
17	Turkey	Capital cost recovery, after 10 years. O&M from previous year	1n 1998, 76% of planned budget was collected.	Dinar and Mody 2004

TABLE 3. Cost recovery in some of the OECD countries for surface water delivered on-farm (2008).

• 100% recovery of O&M and capital costs	• 100% recovery of O&M costs, but less than 100% for capital costs	• Less than 100% recovery of O&M and capital costs
Austria, Denmark, Finland, New Zealand, Sweden, United Kingdom.	Australia, Canada, France, Japan, United States.	Greece, Hungary, Ireland, Italy, Mexico, Netherlands, Poland, Portugal, Spain, Switzerland, Turkey.

Source: OECD (n.d.).

Which Revenue?

Concurrent with various complexities associated with defining and measuring 'cost' of providing irrigation water, there are similar intricacies in defining and measuring the other component of cost recovery viz the revenue realized from the sale of water. In the literature on cost recovery for irrigation, the money realized from the farmers, the primary beneficiaries of irrigation water, in the form of irrigation charges is often treated as revenue realized by the government on account of making irrigation water available. However, is this the only source of revenue for the government from the sale of irrigation water? Are the farmers the sole beneficiaries of irrigation water and therefore the sole entities responsible for paying for irrigation water? The experience suggests that while farmers may be the primary beneficiaries of irrigation water, they cannot be regarded as the sole beneficiaries. Who are the other beneficiaries who gain directly or indirectly from the irrigation water made available to farmers? Is the government getting some of its irrigation-related revenues, knowingly or unknowingly, directly or indirectly, from some of these beneficiaries? Apart from the revenues realized from these segments of society impacted directly and indirectly by the availability of irrigation water, what are the other sources of revenue for the government from investments made in the irrigation sector?

We discuss this issue in two parts. The first part relates to identification of direct and indirect beneficiaries who gain from the availability of irrigation water. We then discuss the various sources of revenue for the government related to supply of irrigation water.

Identifying the Beneficiaries of Irrigation Water

Construction and maintenance of irrigation infrastructure involve huge costs and therefore an important concern in making these public investments has always been how the costs of these investments can be recovered and who should pay for them (Sampath 1983; Tardieu 2004). In principle, any cost incurred in providing a service should be recovered from all those who benefit from the provision of these services (Barakat n.d.). So, the first important question is: who are the beneficiaries of irrigation water?

While the primary concern for public investment in irrigation infrastructure is to help farmers adopt technological innovations and increase agricultural production, or to help minimize the impact of erratic weather patterns on agricultural production, this can in no way be regarded as the sole purpose for governments to invest in irrigation. In the literature on cost recovery, the difference between the "cost" of making irrigation water available and the irrigation charges recovered from the farmers in the form of water tariffs is referred to as a subsidy. The rationale behind recovering the cost of irrigation water (in whatever way the cost is defined) from the farmers is that these investments have been made for the benefit of the farmers and the cost of providing irrigation water should therefore be borne by them and recovered from them. It has however long been recognized that while farmers may be the primary beneficiaries of the investments in irrigation, they are rarely the sole beneficiaries. From even the most casual comparison of the economic activity in a region before and after the availability of irrigation water, it would be obvious that the benefits of growth as a result of the availability of irrigation water are reaped not only by multiple segments of the rural population – both farm and nonfarm – but often by residents of urban areas as well (Marts 1956). Some derive these benefits directly, while others derive them indirectly through the benefits of increased agricultural production transmitted to other parts of the society. In addition to the economic benefits accruing to various segments of the rural and urban population, investments in irrigation provide a number of social benefits, such as enhanced food security, lower food prices and increased income-generating opportunities.

The fact that some benefits of irrigation are unintended and that some of these benefits accrue indirectly to nonagricultural sectors – does not make them any less real, less valuable or less important. The argument that it is not easy to identify other beneficiaries or to quantify indirect benefits, or the amounts these indirectly impacted beneficiaries are already paying to the government, does not mean that revenue realized from the direct beneficiaries alone can be treated as the sole revenue from the sale of irrigation water. The difference between the cost of irrigation water and the money recovered from farmers in the form of water tariffs should not be automatically interpreted as a subsidy to the farmers. It is therefore desirable that at least some of these indirect benefits and beneficiaries be identified and properly accounted for, along with direct beneficiaries and the revenue realized from them on account of increased production attributable to the availability of irrigation water.

The number of indirect beneficiaries and the amount of indirect benefits in certain situations could be at least as large as, or larger than, the number of direct beneficiaries and the amount of direct benefits (Garrido 2005). In the Canadian provinces of Alberta and Saskatchewan, for example, it has been estimated that 15 to 20% of the total benefits of irrigation go directly to the farmer, with the remainder to society (Hill 1985). These benefits are from economic activity and employment beyond the farm – benefits derived from irrigation-related activity. Farm benefits often form a small part of the total benefit and projects become feasible only when all the beneficiaries contribute to the cost. When methods are found to access the wealth created by indirect benefits, projects would become more viable (Hill and Tollefson 1994). That this part of the cost should be borne by other project beneficiaries and other indirect users has been emphasized by the Organisation for Economic Co-operation and Development (OECD 2002) and the International Commission for Irrigation and Drainage (ICID) (Tardieu 2004). While appreciating the need to recover costs from all beneficiaries, it is argued that since “it is not easy to identify the ‘end beneficiaries’ other than irrigating farmers, the community as a whole, i.e., the taxpayers could be charged for it” (Tardieu 2004).

The direct benefits and direct beneficiaries have received much systematic study in the literature, and can be estimated within a reasonable margin of error. The procedures for identifying indirect beneficiaries and estimating indirect benefits and how the total benefits of a project have been shared by different segments of the society have been deficient, though some recent studies have attempted to estimate the direct and indirect benefits and identify how these benefits are shared by different sections of the society (Bhatia and Malik 2008). As such, it constitutes one of the most difficult problems in the economics of resource development. This is one of the many key issues which remain to be explored and require further methodological development.

Sources of Revenue to the Government on Account of Irrigation Water

Directly and Indirectly Impacted Beneficiaries

Given that the benefits of water projects accrue directly and indirectly to a wide range of beneficiaries, the basis of cost recoveries or revenue realization from these beneficiaries may also be direct or indirect. In the literature on cost recovery of irrigation, the money recovered from the farmers, the primary beneficiaries of irrigation water, in the form of irrigation charges is treated as revenue realized by the government on account of making irrigation water available. The amount of irrigation charges recovered depends upon the price of water, the tariff regime and the efficiency of the water-supplying agency in collecting fees from the users. Apart from revenue realized in the form of water tariffs, the government occasionally also collects from users of irrigation water a fee in the form of a betterment levy (the incremental portion of land taxes attributable to irrigation investments). The government also sometimes imposes export taxes on crops that are cultivated mainly in irrigated areas. Sometimes governments also impose increased crop delivery quotas at controlled prices. These recoveries from farmers along with taxes collected from exporters also generate revenue for the government.

Indirect cost recovery refers to increases in government revenue attributable to an irrigation project, whose incidence is not borne by farmers in the irrigated area (Barakat n.d.). Some of these revenues could be in the form of taxes collected from industries on increased turnover realized as a result of higher production attributable either directly to availability of irrigation water or arising as a result of consumption-induced income effects linked to the direct and indirect beneficiaries of irrigation water. In fact, some of these beneficiaries have already been paying these charges in the form of direct and indirect taxes; however, due to a lack of clarity on the nature of these beneficiaries and the accounting systems followed by the governments, these charges are typically not viewed and accounted for as payment towards the use of irrigation water. Simply because this is not an easy task using the prevalent accounting systems of the governments does not mean that these increased taxes should be treated as general revenue and not debited against the cost of providing irrigation water. Some policies, such as an export tax on a cash crop like rice or cotton, may contribute both to direct and indirect cost recovery, affecting both producers and processors of the product. Revenue-realization instruments may also be classified as automatic, to the extent that a project may increase government revenue via existing tax instruments, or discretionary, when it pertains to instruments that are explicitly instituted to increase cost recovery.

As mentioned earlier, apart from benefiting, directly and indirectly, various parts of rural and urban society, availability of irrigation is also associated with a number of other social impacts. Enough empirical evidence is available to demonstrate the linkages between some of these variables and irrigation, notably the impact on poverty reduction, employment generation, lowering of food prices and food security. Some of the available evidence suggests that returns to education are much higher in irrigated districts than in nonirrigated districts (Pritchett 2001). While financial quantification of these impacts is beset with methodological problems, the financial implications of these impacts are likely to be even greater than the direct and indirect economic gains demonstrated above.

Other Sources of Revenue

Additionally, there are several other sources of revenue to the government from the supply of water:

First, irrigation systems, which consist of dams, reservoirs, main irrigation canals and their distributaries, water bodies formed by seepage, drainage canals and often drainage water storage, offer a diversity of water bodies for fish production. Since the dependence on the canal water in fish farming systems is very high, one can consider these ponds to be an integral part of the irrigation system. There are a number of examples from several countries – India, Pakistan, Turkey, Uzbekistan, etc., where irrigation systems are being used for fish production. There is no organized effective data collection system which could assist in determining factors contributing to sustainable use of irrigation systems for fisheries or even the quantity of fish caught in these water bodies. Traditional inland fisheries are managed by an auction system and there is limited licensing of natural water bodies. Also, the fishing rights for each compartment are annually auctioned by the respective agency owning and maintaining the system. Fish production thus provides an important source of revenue.

Second, some irrigation projects, even those not forming part of a multipurpose project, have provided opportunities for generating hydroelectric power, a nonconsumptive use of water. In addition, in locations where the gradient and quantity of water available are conducive, canal drops can often be used for hydroelectric plants. The economics of hydroelectric power generation depend upon the prevailing water and power availability policies, and the priorities given to the use of water between the two purposes. In energy-scarce economies, hydroelectric power can provide a valuable adjunct to an irrigation project. The value of hydropower is likely to be higher in situations of easy water availability, where the conflicts between its use for irrigation and power generation are low, and acute power scarcity is prevalent.

Third, irrigation reservoirs, dams and canals offer opportunities for water-related sports and offer other recreational options. This helps in promoting tourism. The government derives large revenues from these structures which must be duly accounted for in government accounts as revenues from irrigation.

Fourth, economists have generally advocated the use of pollution taxes as a means to address environmental externalities. Following the "polluter pays" principle, the externality problem in general is sought to be addressed by imposing environmental levies and taxes on the polluter. In line with this principle, the polluter should pay, or the governments should recover, in addition to the cost per unit of water, an additional charge per unit of water equal to the external damage cost imposed on others (MacDonald et al. n.d.). However, in view of the complexities associated with identifying the polluters it is not known if any country imposes pollution taxes and recovers them from the beneficiaries of irrigation water; however, if it were feasible to do so, this would add to the revenues of the government and need to be accounted for.

Last, apart from the quantifiable revenues to the irrigation providing agency, there are a number of other benefits to the government in general, which are difficult to quantify in monetary terms. Enough evidence is available to substantiate that the availability of irrigation water is associated with rural development, a reduction in poverty, improved food-grain availability and food security, lower food-grain prices, improved hygiene and sanitary conditions, improved returns to education, etc.

What is Being Estimated: Cost Recovery of Project or of Services?

Given so much mix-up in our understanding about what constitutes cost and revenue and how these costs and revenues are estimated and apportioned between different services the project provides, it is not known how the available estimates of cost recovery are derived. Often, the researchers have failed to carefully distinguish between cost recoveries of a project from that of service with the result that it is not clear if the available estimates of cost recovery refer to a project, a service or a mix of the two. While in some cases the cost recovery of a project and of irrigation service may be the same, in other cases the two may differ. If a project provides just one service, say irrigation water, the cost recovery of project and cost recovery of irrigation may be roughly similar. However, if a project supplies water for multiple services such as irrigation water, drinking water, water for industry, etc., then the cost recovery of project would differ from cost recovery of a specific service such as irrigation water. For estimating cost recovery of the project one would need to add the revenue from all the three services to arrive at project revenue and compare this aggregate revenue against the project cost to arrive at the measure of cost recovery. If one were to derive cost recovery for a single service such as irrigation in a multiple use project, then the revenue from the service must be compared with the cost attributable to irrigation service and not the entire project. Quite often, analysts have ignored this distinction while defining and measuring cost recovery for irrigation with the result that the derived estimates of cost recovery are often at variance with its actual measure. We illustrate this with an example.

Consider a project providing water for three services – irrigation, drinking and industry. It derives a revenue of USD 1,000 from sale of water for drinking (15% of total water), USD 1,200 from sale of water to industry (20% of total water) and earns USD 800 from sale of remaining water (65%) to irrigation. The annual project cost, howsoever, it may have been defined, is USD 4,000. Thus:

Cost recovery of the project = (1,000 + 1,200 + 800)/4,000 = 75%

Cost recovery of irrigation (as often measured) = 800/4,000 = 20%

This practice of measuring cost recovery of a service by comparing the revenue realized from the service against the total annual project cost is on account of the fact that in project accounts such a cost allocation of the project cost into different services is not done and therefore there is no way of knowing how much cost can be allocated to different services. For the sake of illustration to demonstrate what difference adoption of cost allocation between different services can make in deriving more efficient measures of cost recovery, let us assume as a first approximation that the project costs are allocated to services in the same proportion as water is allocated to different services. Irrigation which accounts for 65% of water is thus allocated 65% of the project cost amounting to USD2, 600. Now if we were to compare the revenue from irrigation against cost attributable to irrigation, the cost recovery will be as follows:

Cost recovery of irrigation (as it should be measured) = 800/2,600 = 30%

Due to constraints on availability of disaggregated data and overlooking of conceptual differences, the available estimates on cost recovery have often failed to make a distinction between cost recovery of a project and that of a service.

TOWARDS IMPROVING COST RECOVERY

Notwithstanding the conceptual and measurement problems associated with attributing and measuring costs and revenue, cost recovery in water resources projects in a majority of the countries is dismal. Efforts at improving cost recovery essentially need to focus on reducing or more efficiently spending the cost incurred and/or in increasing revenue realization. There are several avenues for doing so. In what follows we discuss briefly some of the opportunities for improving cost recovery.

More Efficient Spending of O&M Funds

The quantum of funds allocated for O&M of a system and how the available funds are utilized determine how well the system is physically maintained, how efficiently it can supply water and what difference it can make to improvement in cost recovery. As discussed earlier, a majority of the countries are targeting to recover only O&M costs of the system. To assess opportunities for more efficient use of O&M funds it is important to understand what constitutes O&M costs, how requirements for O&M funds are determined, how the available funds are currently being spent and then explore opportunities for their more efficient use.

What are O&M Costs and How are they Determined?

Operations costs refer to the costs associated with the operation of a system and include such items as staff costs, management costs and electricity for water pumping (for lift irrigation). Maintenance costs refer to the expenses incurred on actual maintenance of the irrigation system to keep it in working order. Maintenance and renewal costs thus are the costs of maintaining assets in order to provide a good service until the end of their useful life. While on initial considerations, the estimation of O&M costs would appear to be straightforward, in practice this may not always be the case. The O&M costs of a project depend on several factors - size, design, use pattern (multiple vs single purpose), location, age, the physical condition of the system, the quality of construction, the nature of the institution operating and maintaining the system, etc. Due to these differences in characteristics of different projects, the O&M costs of projects will differ from project to project. Often efficient estimates of O&M funds required are not available for a majority of the projects. Separate data on funds required for O&M individually are also generally not available. While some countries keep separate accounts for O&M, often the two are put together as O&M costs in public-accounting systems. Sound data recording and bookkeeping for O&M, however, are of crucial importance in irrigation (Tiercelin 1998) and lack of availability of proper disaggregated records often hampers estimation of these costs.

In general, the O&M costs of a system are expected to be met from revenue collected from the users of services provided by the system. Given that commonly the financial requirements for meeting the O&M costs far exceed the modest revenue frequently collected as ISF from users of water, the project authorities have to depend on budgetary support from the government to bridge this gap. In the absence of any information available on O&M cost requirements of different systems, the common practice in countries with large irrigation systems, is to use some measure of an "efficient" or a "yardstick" cost for O&M (Vaidyanathan 1992). In India, the normative budgetary provisions for O&M costs of irrigation schemes are of late being made on the basis of recommendations of the Finance Commission. Based on the latest norms worked out by the 13th Finance Commission, the suggested norms for 2014-15 work out to INR 1,500 per hectare (ha) for utilized and INR 750 per ha for unutilized potential for major and medium irrigation projects (GoI 2009). The norms remain the same for all the systems irrespective of the revenue collected as user fee from users of services provided by the system, the physical condition of the system, or the O&M requirements of the system. The budgetary support provided for O&M may thus differ by an unknown order of magnitude from the actual O&M cost requirements of the system. No funds are normally available for meeting the deferred maintenance costs.

In Pakistan the yardstick for estimating requirements of maintenance funding was prepared for the first time in 1937. Subsequently, the increase in maintenance funding did not keep pace with the inflation, and drastic cuts in O&M funding had been applied from time to time in view of the financial constraints. This resulted in deferred maintenance with a visible cumulative effect. The revision of the yardstick during 1963 provided funds for maintenance but did not provide funds for making up the deferred maintenance. The revised yardstick also did not account for the additional physical needs triggered by the overuse of the system due to trespassing. The yardsticks were revised in 1982 and again in 1992. These revisions also did not provide for deferred maintenance needs and only partly covered the growing rate of physical deterioration.

A similar situation as described above for India and Pakistan prevails in most of the other countries with large irrigation systems. In the absence of any systematic procedures for estimating the actual O&M requirements of the systems, the budgetary allocations are made on an ad-hoc basis determined generally on the basis of financial resources available with the government and not on the basis of actual requirements. The funds allocated for O&M by the government and those collected from water users in the form of cost recovery are determined independently of each other.

Gap between Realistic and Actual Funding for O&M

Given the ad-hoc way in which the needs for O&M fund requirements are estimated and financial resources are allocated in the government budgets, serious questions arise relating to the adequacy and availability of funds for O&M and the efficiency of their use. For example, public-sector irrigation agencies are typically overstaffed and most of the funds allocated for O&M activities, actually go towards paying the salaries of staff, leaving very little money for the actual maintenance of the system. Further, as corruption is a factor in these institutions, the actual remaining money spent on maintenance may be less still, thereby affecting the quality of the maintenance provided which ultimately gets reflected in the quality of service provided to the users and the willingness of the users to pay for the service. Few data are however available to assess the gap between the funds required and actually available for O&M.

Some of the available data from Pakistan point to the wide gap that exists in O&M funding. In Pakistan, it was estimated that in 1992-93, the shortfall in O&M funding ranged from 24 to 33%. The projected O&M funding gap rose to between 29 and 49% in the next 5 years (Table 4). The data available thus clearly brings out that O&M allocations have been far short of the requirements and the issue of inadequate maintenance funding continues to perpetuate.

TABLE 4. Pakistan: Realistic O&M needs vs actuals.

Year	Realistic O&M needs (PKR millions)	Demand by PID (PKR millions)	Actual O&M funding (PKR millions)	O&M funding gap	
				(PKR millions)	(%)
1993-94	4,624	4,060	2,374	1,2650	49
94-95	5,058	4,940	3,311	1,747	34
95-96	5,514	5,024	3,654	1,860	34
96-97	6,011	5,031	4,319	1,692	28
97-98	6,552	5,001	4,625	1,927	29

Notes: PID = Power and Irrigation Department.

Pattern of Spending of O&M Funds

Notwithstanding the general financial gap that exists between financial resources available and those actually required to meet the O&M costs of irrigation projects, it is important to analyze how effectively and efficiently the available resources are spent.

Depending on the system of financial accounts practiced in a given country, the concepts of O&M cost and working expenses (WE), in relation to irrigation projects, may imply either the same meaning or one with a slight variation. While some countries equate working expenses with the O&M costs alone others also include additional incidental expenses also in the working expenses. In the literature on cost recovery in irrigation the concepts of working expenses and O&M costs have been used interchangeably. Quite often it has been difficult to distinguish between the two concepts due to nonavailability of detailed breakup of information on different components that constitute either WE or O&M. Assessing the efficiency with which available financial resources for meeting O&M costs are spent requires access to detailed breakup of resources spent on different components that make up O&M costs. Usually, such breakup of data into different components is not available in many countries. We have had access to some disaggregated data in respect of two South Asian countries: India and Pakistan. In what follows we take a closer look at the way the available financial resources for O&M are spent.

Working Expenses in India

In India, the budgetary expenses on infrastructure projects are classified into capital expenses and working expenses. In the case of major and medium irrigation projects, the capital expenditure refers to the money spent to acquire or upgrade physical assets such as construction of concrete and masonry dams, reservoirs, spillways, canals and distributary networks of the irrigation project during the financial year. The term “working expenses” (WE) denotes the gross budgetary support to implement infrastructural projects. The WE refers to “non-plan” expenditure incurred on direction and administration, machinery and equipment, maintenance and repair and extension and improvement of completed projects, training, research, survey and investigation, and other expenditures during the financial year. Similarly, the gross receipt (GR) is the revenue receipt on account of water charges and other levies as imposed by the state Government from time to time.

Trend in Allocation for Working Expenses, Capital Expenses and Gross Revenue

The annual capital expenditure on major and medium irrigation projects has followed an increasing trend during the period 1990-91 to 2006-07 (Table 5; Figure 3). The annual capital expenditure increased from INR 28.5 billion in 1990-91 to 265.4 billion – a more than ninefold increase at current prices. During the same period the annual working expenses increased fourfold – from INR 24.5 billion to INR 96 billion. The gross receipts from major and medium projects increased almost sevenfold - from INR 2.2 billion to INR 15 billion.

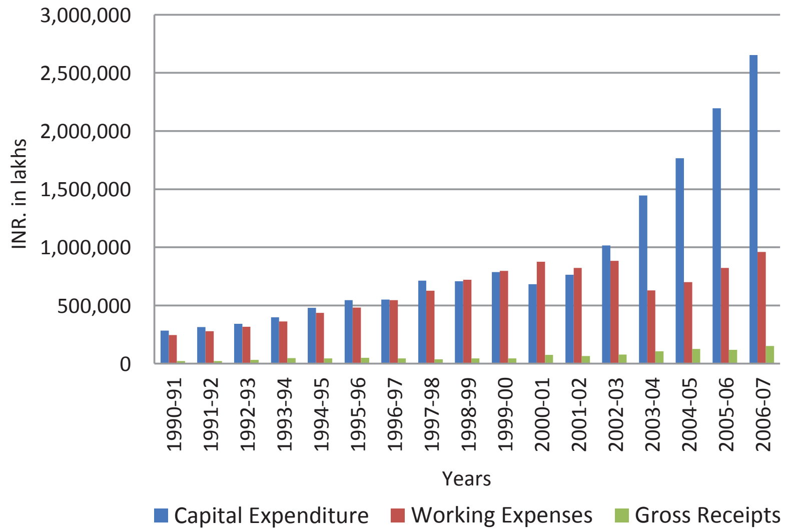
The share of WE in total budgetary allocations (CE + WE) remained in the range of around 50% for a fairly long period of time during the period from 1990-91 to 2001-02. From 2002-03 onwards the share of WE declined very substantially even though the total financial allocations continued to increase during the period. During this period the allocations for capital expenditure were much higher than those for WE. Though the GRs during this period have generally shown an upward trend, the proportion of GR as a proportion of WE has varied from a low of 5.8% to a high of 18% during 2004-05. The GR as a proportion of total financial outlay during the year has remained quite low – from 3 to 5% during the entire period.

TABLE 5. Growth in capital expenses (CE), working expenses (WE) and gross receipts (GR) from major and medium projects - India 1990-91 to 2006-07 (INR billion).

Year	CE	WE	CE+WE	GR	WE as % of (CE+WE)	GR as % of WE	GR as % of CE	GR as % of (CE+WE)
1990-91	28.5	24.5	53.0	2.2	46.3	9.1	7.9	4.2
1991-92	31.3	27.9	59.2	2.3	47.1	8.2	7.3	3.8
1992-93	34.2	31.6	65.8	3.2	48.1	10.1	9.4	4.9
1993-94	39.8	36.3	76.1	4.8	47.7	13.2	12.0	6.3
1994-95	48.1	43.5	91.6	4.4	47.5	10.2	9.2	4.9
1995-96	54.6	48.2	102.8	5.0	46.9	10.3	9.1	4.8
1996-97	54.9	54.5	109.4	4.6	49.8	8.4	8.3	4.2
1997-98	71.4	62.6	134.0	3.6	46.7	5.8	5.1	2.7
1998-99	70.9	72.2	143.1	4.4	50.4	6.1	6.2	3.1
1999-00	78.7	79.8	158.5	4.6	50.3	5.7	5.8	2.9
2000-01	68.2	87.6	155.8	7.5	56.2	8.6	11.0	4.8
2001-02	76.5	82.4	158.9	6.5	51.9	7.9	8.5	4.1
2002-03	101.6	88.5	190.1	7.8	46.5	8.9	7.7	4.1
2003-04	144.6	62.9	207.6	10.5	30.3	16.6	7.2	5.0
2004-05	176.5	70.2	246.7	12.6	28.4	18.0	7.2	5.1
2005-06	219.6	82.2	301.8	11.9	27.2	14.5	5.4	4.0
2006-07	265.4	96.0	361.5	15.0	26.6	15.7	5.7	4.2

Sources: GoI 2010 and authors’ calculations.

FIGURE 3. India-capital expenditure, working expenses and gross receipts for major and medium irrigation (MMI) (1990-2006).



Allocation of Working Expenses

The detailed breakup of WE on major and medium irrigation projects into its various components is available only at the aggregated Five-Year Plan period for three consecutive Five-Year Plans – VIII (1992-97); IX (1997-2002) and X (2002-07) (Table 6). An examination of the allocation of WE into its components indicates that the three components – direction and administration, maintenance and repair and, other[2] expenditure (mainly on account of extension and improvement of completed projects and expenditure on unapproved projects) dominate expenses under working expenses in successive plans. The share of the component "Direction and Administration" increased substantially from 8.4% in 1992-97 to 22% in 2006-07. The expenses on maintenance and repair as a proportion of total working expenses declined from 46% in VIII Five-Year Plan period to a mere 2% during the X Plan period. In absolute terms, the above values would imply that as against INR 214 billion allocated for WE during the period 1992-97, INR 98 billion was spent on actual system maintenance and repair. However, during the period 2002-07, out of INR 400 billion allocated for WE, only INR 8 billion was spent on system maintenance and repair (Table 7).

TABLE 6. Proportion of allocation of working expenses on major and medium irrigation projects in India into different components over three plan periods (1992-2007).

Period	Direction and administration	Machinery and equipment	Maintenance and repair	Training	Research	Survey and investigation	Suspense	Other expenses	Total
Eighth Plan (1992-1997)	8.4	1	46	0.3	0.7	1	0.3	42.3	100 (214)
Ninth Plan (1997-2002)	14.1	0	37	0.2	0.66	1	0.04	47	100 (385)
Tenth Plan (2002-2007)	22	1	2	0.2	0.8	1	0.00	73	100 (400)

Source: CWC 2010, Table 2.1, p.7; Values in parentheses denote actual expenditure in INR billions.

[2] There are some conceptual issues related to classification of expenditure debited to "other expenditure". The expenses remaining after allocating to other heads of expenditure are debited to "other expenditure". Nonavailability of further details of expenses debited under "Other expenses" constrains our further exploration of this head of expenditure.

TABLE 7. Financial expenditure on WE and repair and maintenance of the system.

Period	Total money spent on WE (INR billions)	Percentage WE spent on maintenance and repair (%)	Financial expenses on maintenance and repair (INR billions)
Eighth Plan (1992-1997)	214	46	98
Ninth Plan (1997-2002)	385	37	142
Tenth Plan (2002-2007)	400	2	8

Thus, in India, over the years there has been a substantial increase in budgetary allocations for meeting the working expenses, with annual allocations increasing fourfold (at current prices) from about INR 24 billion to INR 96 billion over a period of one and a half decades. However, the allocations for WE, when viewed in terms of proportion of total budgetary support for capital and WE, have declined very substantially from about 50% till early 2000 to about 26% in more recent years. The increase in budgetary allocations for working expenses has not been accompanied by corresponding increases in money being spent on maintenance and repair of the system. In fact, increased allocations for WE have actually led to a steep decline in money being spent on system maintenance. In contrast, there has been a very substantial increase in allocations for meeting the cost of salaries and employees' benefits.

Working Expenses in Pakistan

For Pakistan we have had access to the breakup of data on working expenses into its components for the last 5 years 2008-09 to 2012-13 (Table 8). Over this short 5-year period although the allocations for total working expenses have increased (at current prices) by 34% the proportionate expenses incurred on repair and maintenance have declined from 42 to 34%. The proportion of expenses spent on employees has increased from about 51 to about 60%. The operating expenses have remained at almost the same 6% level all through this 5-year period.

TABLE 8. Components of working expenses in Pakistan, absolute and percentage figures (2008-09 to 2012-13).

Years	Operating expenses		Employee-related expenses		Maintenance, repair and other expenses		Total	
	(PKR millions)	(%)	(PKR millions)	(%)	(PKR millions)	(%)	(PKR millions)	(%)
2008-09	480	6.6	3,700	51.2	3,050	42.2	7.230	100
2009-10	497	5.8	4,990	58.2	3,090	36.0	8.577	100
2010-11	552	6.0	5,514	59.2	3,240	34.8	9.306	100
2011-12	598	6.2	5,800	59.8	3,300	34.0	9.698	100
2012-13	598	6.2	5,800	59.8	3,300	34.0	9.698	100

Due to conceptual differences and lack of more disaggregated data it is not possible to strictly compare the proportionate expenditures being incurred on different heads of working expenses in India and Pakistan. However, in both the countries, the proportionate allocations for system maintenance have been declining over the years and the allocations for staff salaries and employee benefits have been increasing. Thus it is not only that the financial resources available for system maintenance fall far short of the requirements, whatever is available is being spent inefficiently in that most of the money goes for payment of salaries. The money spent on actual maintenance is far less and the gap between resources required for maintenance and actually spent would be much larger than resources available aggregately to meet WE and those actually spent on WE.

Increasing Water Tariffs

The basic principle for determining user charges is that users must pay for the cost of the service. Irrigation water pricing in almost all the countries, more so in developing countries, however does not follow this basic principle for determination of user charges. Irrigation water pricing has generally followed a public goods supply model. Irrigation water is often being supplied either free of charge or invariably being charged at a level much below what it costs to supply the water. In a majority of the countries there are no uniform sets of principles for determining even these low levels of irrigation water rates. The criteria for fixing irrigation water tariffs have varied not only from country to country but also sometimes within the same country between different regions, different projects, types of irrigation systems (storage vs diversion schemes, lift vs gravity flow schemes, etc.), between different crops, between different seasons, etc. Compounding these criteria are several other considerations that go into determining the level at which irrigation water tariffs are usually fixed. These include such considerations as: benefits derived by farmers from irrigation, ability and willingness of the beneficiary to pay for water, adequacy and capacity of the system to supply water on demand, crop-water requirement, simple tariff structure, etc.

Whatever the criterion followed or considerations taken into account in determining irrigation water pricing, water tariffs are consistently far below the cost of supply of irrigation water. The tariffs once fixed are not revised for years with the result that the gap between cost of supply and revenue realization keeps on increasing. There is need for raising the irrigation water tariffs to generate additional resources for system maintenance and improving the availability of water supply.

An important argument often advanced for keeping the water tariffs far below their cost of supply and for not raising the water tariffs is the lack of paying capacity of the farmers to pay for higher cost of irrigation. Some of the data available from India enable us to examine this argument more closely. To make an assessment of the paying capacity of the farmers we present in Table 9 data on irrigation charges as a percentage of net value of output, gross value of output and total operational cost of production (per ha) for paddy in a few of the important states in India.

From Table 9, it is evident that irrigation charges currently form a very small part of the cost of production as well as revenue generated from the output produced by the use of irrigation water. These figures do provide evidence that there is no lack of ability of the farmers to pay for the irrigation water. In fact, as the XII Five-Year Plan of the Government of India states "…, more than 50 percent of the farmers in major irrigation projects are willing to pay extra charge for assured water supply indicating that access to water is more important than its cost. It is the lack of willingness to charge rather than lack of ability or willingness to pay that is keeping the irrigation water tariffs at low levels. There appears enough scope for raising additional revenue through raising of water tariffs in irrigation."

TABLE 9. State-wise irrigation charges as a percentage of net value of output, gross value of output and total operational expenses of production (per ha) for paddy, 2009-10.

S. No.	State	Irrigation charges as a percentage of net value of output	Irrigation charges as a percentage of gross value of output	Irrigation charges as a percentage of total operational cost
1	Andhra Pradesh	2	1	2
2	Bihar	14	6	8
3	Haryana	7	5	12
4	Gujarat	8	5	11
5	Punjab	4	3	8
6	West Bengal	9	5	7
7	Maharashtra	3	0.7	0.8
8	Madhya Pradesh	3	1	3

Source: CACP 2012.

Improving Collection Efficiency

Quite often in large water resources projects, there are a substantial number of users for whom the bills are not raised and therefore are never collected.[3] Additionally there are those users of water who illegally use the water and are therefore outside the formal system of payment of bills. Efforts to cast the net wide and force all such nonpayers to pay for water offer an important avenue for raising financial resources. An associated avenue for raising the revenue comes from improving the collection of bills from those users for whom the bills are raised but do not get collected. This is referred to as collection efficiency. Collection efficiency essentially indicates the efficiency with which the bills assessed and raised are collected from the users of water. The collection efficiency is thus measured as the ratio of amount of money collected to the amount of bills raised expressed as a percent. The collection efficiency is thus measured as follows:

Collection efficiency (%) = revenue actually collected or realized/ money value of bills raised

It is however important to note that the measure of collection efficiency does not tell us anything about the sufficiency or adequacy of the bills raised or of the amounts collected. A higher collection efficiency also does not necessarily imply larger amounts of money collected – it simply is a ratio of what ought to be collected and what has actually been collected. An increase in percent collection efficiency could come about even if there is a decline in both the amount of bills raised and the amount of money collected.

The detailed data on collection efficiency and how it has been changing over time is not available for many countries. The aggregated data on collection efficiency for a given point in time available from some of the available country level studies, supplemented with some of the current project level data collected from a few projects as part of the present study, reveal wide variation in collection efficiency across countries/projects (Table 10).

[3] We could not get any estimate of how big this proportion is and the ratio of those for whom the bills are raised and those for whom the bills are not raised even if they are not illegal users of water. Informal discussions suggest that in large irrigation projects this proportion could be very high.

The above estimates of collection efficiency relate to a single point in time. It is however important to examine if there is any systematic trend in collection efficiency and whether the aggregated country level collection efficiency figures represent fairly the situation prevailing in different regions/projects in the country. Nonavailability of disaggregated time series often constrain exploration of this question.

We have had access to some spatially disaggregated time series in respect of the two important countries of the region – Pakistan and India. The Pakistan data provide information on collection efficiency for the decade of 2000 to 2009 disaggregated according to the four broad geographical regions as also at the aggregated national level. In the case of India we have had access to State-level disaggregated data (for important states) for a much longer time period spanning over almost two decades 1991-2008.

TABLE 10. Collection efficiency in some countries.

S. No.	Country	Collection efficiency (%)	Year	Source
1	Argentina	70	1997	Easter and Liu 2005b
2	Armenia	27	1992	Tsur and Dinar 1995
3	Bangladesh	3 to 10	1998	
4	Columbia	76	1996	Easter and Liu 2005b
5	Brazil (Jaiba project)	66	1995	Easter and Liu 2005b
6	Macedonia	42	2000	Cornish et al. 2004; Easter and Liu 2005b
7	Morocco	70-73 52-58	1990-97 1997-2000	Dinar and Mody 2004
8	Philippines	58	1995	Easter and Liu 2005b
9	Syria	Impressive		Dinar and Mody 2004
10	Turkey	76	1998	Dinar and Mody 2004
11	Kyrgyz Republic, (Aravan Akbura)	70-80	2013	Project authority
12	Tajikistan, (Khojabakirgan)	60-70	2013	Project authority
13	Ethiopia (Arno Irrigation Scheme)	100	2013	Project authority
14	Ethiopia (Tikurit Irrigation Scheme)	98	2013	Project authority
15	Ethiopia (Fentale Irrigation Scheme	15	2013	Project authority

Collection Efficiency: Pakistan

The disaggregated regional-level time series data on collection efficiency in Pakistan show significant variations in collection efficiency across regions. Sindh Province has performed the best in terms of recovering the assessed amount of Abiana, where collection rate has ranged between 76 and 98% during the decade 2000 to 2010 (Table 11; Figure 4). In the most important Punjab Province the collection efficiency has varied over a wide range – between 42 and 87% with cost recovery showing no systematic pattern over the years. The recoveries have been lowest in Balochistan Province.

Drawing conclusions about the performance of different regions based on percent collection efficiency based on percentages of revenue collected to assessed, as mentioned earlier, could sometimes be deceptive. Thus even though in terms of percentage recovery, Sindh appears to have done well; however a closer examination of the data reveals that both the assessed and collected amounts in Sindh have declined over this period and the decline in amount assessed has been higher than the amount collected, resulting in higher percentage of collection efficiency. Similarly in the case of Punjab which witnessed an increase in percentage recovery of Abiana from 42% in 2004-05 to 86% in 2009-10, the reduction in gap between revenue collected to that assessed has not seen any appreciable improvement in revenue collected, but this has come about due to a reduction in amount assessed resulting from the introduction of a flat rate system in Punjab during 2003 (GoP 2012).

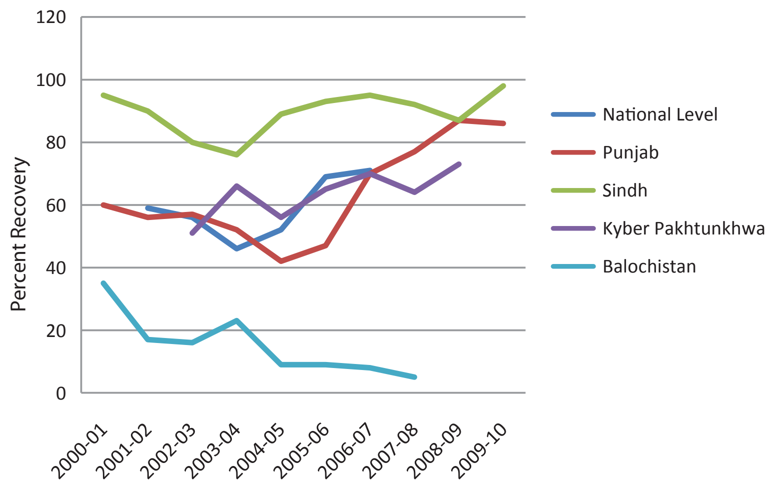
TABLE 11. Collection efficiency - Pakistan and its four regions.

Years	National level	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan
2000-01	na	60	95	na	35
2001-02	na	56	90	na	17
2002-03	59	57	80	51	16
2003-04	56	52	76	66	23
2004-05	46	42	89	56	9
2005-06	52	47	93	65	9
2006-07	69	70	95	70	8
2007-08	71	77	92	64	5
2008-09	na	87	87	73	na
2009-10	na	86	98	na	na
Average	59	63	90	63	15

Source: GoP 2012.

Note: na = Data not available.

FIGURE 4. Collection efficiency trend: Pakistan.



Collection Efficiency: India

In India also, a perusal of the time series for different states does not show any consistent pattern in collection efficiency either within a state over time or across different states at a given point in time. In general, in States like Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra and Uttar Pradesh, the collection efficiency has generally remained above 60% during most of the years (Table 12; Figure 5). In states like Orissa, Rajasthan, Andhra Pradesh and Bihar the collection efficiency has remained at a much lower level. Bihar and Andhra Pradesh have reported the lowest levels of collection efficiency in recent years. In more recent years, after 2000-01 Maharashtra is the only state which has shown improvement in collection efficiency. For most other states the collection efficiency has either generally followed a declining trend (Andhra Pradesh, Bihar, Gujarat, Kerala, Madhya Pradesh) or a mixed trend with significant year-to-year fluctuations (Haryana, Orissa).

A careful examination of the absolute amounts of bills raised and bills collected present an interesting picture. The performance of Maharashtra outpaces that of all other states. In Maharashtra, during the period from 2000-01 to 2008-09 while the amount of assessed bills increased by about 1.85 times (from INR 4.4 billion to 8.1 billion) the revenue realized increased by 3.44 times (from about INR 2.0 to 6.7 billion). This resulted in increase in collection efficiency from a low of 45% to a high of 83%. In contrast, in the state of Andhra Pradesh during the period from 2000-01 to 2007-08 while the amount assessed remained almost unchanged at INR 3 billion, the amount of revenue realized fell from INR 1.2 billion to 0.7 billion. Bihar also present a similar story with assessed amount increasing from INR 1 billion to 2.1 billion, the revenue realized declining from INR 0.16 billion to 0.10 billion. Haryana presents another case where while the amount assessed increased from INR 0.25 billion to 0.31 billion between the period from 2000-01 to 2007-08, the amount collected declined marginally from INR 0.27 to 0.26 billion.

Thus the cross-country macro data on collection efficiency and disaggregated time series on collection efficiency in Pakistan and India show that the inability to collect the entire amount assessed is a problem in almost all the countries and different regions, though the magnitudes may differ. While the reasons for low collection efficiency could vary from country to country, and year to year, the evidence available points out significant opportunities for improving revenues by bridging this gap.

Improving Collection Efficiency: Do Institutions Matter?

The low collection efficiency, and thereby low cost-recovery, apart from other factors, are likely to be affected by the institutional arrangements that have been put in place to perform the functions of assessing, raising and collecting the water bills from users of water. The efficiency with which such institutions are able to perform these functions depends on the authority (such as power to stop water supply and impose penalty for nonpayment, etc.) vested in these institutions to effectively perform the assigned job. Institutional arrangements in different countries/regions/projects differ. While in some cases both the functions of assessing and collecting the bills are vested in one agency (such as those seen often in systems which have been handed over to WUAs), in others these functions are entrusted to two different agencies.

In India, there is a considerable diversity in the mechanism for the assessment and collection of irrigation revenues. The different states have different systems of assessment and collection of bills. Table 13 (p. 27) gives an overview of different institutional arrangements currently in practice in different states. While in some states, both the assessment and collection of irrigation water revenue are handled by the Irrigation Department, in some others both functions are performed by the Revenue Department. In still some others while one function of the process is performed by one institution the other function is performed by a different institution.

TABLE 12. Collection efficiency: Percent recovery of assessed amount in select Indian states-major and medium irrigation projects.

Year	Andhra Pradesh	Bihar	Gujarat	Haryana	Kerala	Madhya Pradesh	Maharashtra	Orissa	Rajasthan
1991-1992	31	24	62	na	na	84	56	na	na
1992-1993	47	29	63	na	na	75	47	na	na
1993-1994	30	23	76	na	na	87	67	na	na
1994-1995	32	25	74	na	na	74	60	na	67
1995-1996	26	33	79	na	na	95	66	na	67
1996-1997	28	31	84	na	na	92	71	14	67
1997-1998	24	20	75	na	na	79	70	19	67
1998-1999	28	22	71	na	na	83	58	93	71
1999-2000	29	26	67	na	na	118	63	31	78
2000-2001	39	16	77	105	91	46	45	57	69
2001-2002	20	10	65	89	93	113	55	41	18
2002-2003	27	9	71	97	91	97	85	46	17
2003-2004	10	8	56	84	92	146	83	68	58
2004-2005	17	5	61	115	69	115	90	79	na
2005-2006	24	5	62	59	71	80	99	94	na
2006-2007	19	5	61	105	77	42	99	57	na
2007-2008	24	5	56	84	84	33	93	51	na
2008-2009	na	5	Na	na	94	78	83	33	Na

FIGURE 5. Collection efficiency trend, India.

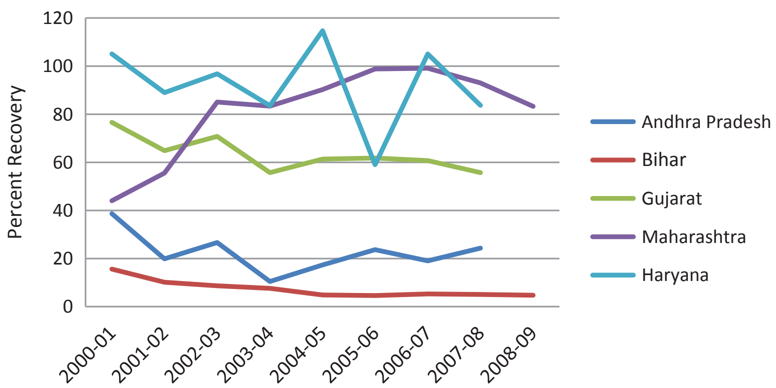


TABLE 13. Institutional arrangements for assessment/collection of irrigation water revenue, India.

Department responsible for assessment/collection	Mechanism adopted in States/Union Territories
1. Irrigation Department does assessment and collection	Assam, Bihar, Chhattisgarh, Gujarat, Goa, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Manipur, Maharashtra, Orissa (for industrial and commercial use) Rajasthan (for irrigation project irrigating more than 809.4 ha [2,500 acres]), West Bengal, Union Territories of Dadra and Nagar Haveli, Daman and Diu.
2. Irrigation Department does assessment but collection is entrusted to Revenue Department	Haryana, Himachal Pradesh, Punjab, Uttar Pradesh, Uttaranchal and Delhi.
3. Revenue Department does both assessment and collection	Andhra Pradesh, Chandigarh, Karnataka, Kerala, Orissa (for major and medium schemes). Rajasthan (for schemes irrigating less than 2,500 acres), Tamil Nadu, Puduchherry.
4. Water rates but no mechanism available in the State	Sikkim
5. Panchayat/Block Advisory Committee	Tripura
6. No water rates and its assessment/collection in vogue	Arunachal Pradesh, Mizoram, Meghalaya, Nagaland, Andaman and Nicobar and Lakshadweep.

Source: GoI 2010.

In Pakistan, the Provincial Irrigation and Power Department is responsible for pricing of irrigation water, annual assessment and recovery of *abiana* (water charges) sometimes directly and sometimes through provincial revenue departments (GoP 2012: p. 14). In Pakistan Punjab, for example, for the purpose of assessing water rates there is an exclusive revenue setup in the Irrigation Department. The revenue wing arranges the initial/final records on which canal revenue is assessed and collected, following an elaborate process. The cropped area of each field is measured along with the complete details of each owner/cultivator, village channel, outlet and field. The data are recorded in the *Khasrah* (Field Measurement Book) and is subjected to checks and rechecks by a tier of departmental senior officials. *Parchas* (demand slips) are prepared for the owners/cultivators with details of the crops and the area finally measured and assessed. These are finally delivered to *Lambardar* (the village headman) for distribution among the cultivators. The *Khataunis* (demand statements) are prepared from the Parchas. The demand statements are prepared by villages/tehsils/districts and are supplied to the civil administration for the collection of water rates. The district administration collects revenue through Lambardars who are allowed to retain a certain percentage of the collected amount.

In the Aravan Akbura Scheme in Kyrgyzstan and the Khojabakisgan Scheme in Tajikistan, canal management organisations issue the bills while WUAs are vested with the responsibility of collection of those bills. In the Fentale Irrigation Scheme in Ethiopia, while tariff rates are fixed jointly by the Fentale Scheme Administration and Irrigation Cooperatives, bills are issued by the Scheme Administration and collection of the bills is done by the Irrigation Cooperatives. In the Tibila Irrigation Project in Oromia, Ethiopia, fixation of tariffs and issuance of bills are the responsibility of the Oromia Water Works Construction Enterprise, whereas collection is done by the scheme administration. In some of the other schemes in Ethiopia such as Arno, Bedene-Alemtena and Tikurit Irrigation Schemes, which have been transferred to farmers, all functions are vested in irrigation cooperatives. Similarly, in Nepal, where the schemes have been transferred to WUAs, such as the Sunsari-Morang, Babai and Khageri Irrigation Schemes, it is the water users' groups which are responsible for issuance and collection of bills.

Efficacy of Alternative Institutional Arrangements in Improving Collection Efficiency

While different countries/regions/projects have set up different arrangements for raising and collection of bills, little evidence or time series is available to show the efficacy of alternative institutional arrangements in improving collection efficiency in a sustainable manner. Limited data – a combination of cross-section and time-series information that we could collect from different states of India adopting different institutional arrangements (Table 12) enabled us to make some preliminary assessment about the efficacy of institutional arrangements in influencing collection efficiency.

The limited data on the amount assessed, amount collected and accumulated arrears over a period of 10-15 years in some of the Indian states suggest that the ratio of accumulated arrears to annual assessment is generally lower in those states where the functions of assessment and collection are performed by two different agencies in comparison to those states where both functions are performed by a single agency (Table 14). Thus in states of Haryana and Uttar Pradesh where assessment is done by Irrigation Department and revenue is collected by Revenue Department the ratio of accumulated outstanding arrears to amount of bills raised is much less than that in other states where both the functions are performed by a single agency such as Irrigation Department (Bihar, Gujarat Madhya Pradesh, Maharashtra, etc.) or by Revenue Department (such as in the states of Kerala, Andhra Pradesh). Thus splitting the responsibility of assessment and collection of water bills between two institutions is likely to improve collection efficiency as compared to a situation where both responsibilities are given to one institution.

Recognizing that much more detailed data than are presented here and many more variables that influence collection efficiency need to be accounted for before drawing any firm conclusion about the efficacy of different institutional arrangements in improving collection efficiency, the analysis presented nevertheless provides an initial assessment for which an appropriate institutional arrangement for raising and collection of bills will offer some avenue for improving collection efficiency.

Improving Cost Recovery: An Appraisal Based on Stakeholder Perception

The difference in level of cost recovery across different water resources projects/regions is on account of many factors and the nature of these factors or combinations thereof could vary from project to project. Lack of access to detailed project-level data on underlying factors, in isolation or in various combinations, influencing such differences in cost recovery constrain efforts at trying to understand the roles of different factors in explaining variability in cost recovery across projects. In the literature on cost recovery there are several perceptions about the factors that influence cost recovery; however; quite often either the empirical data to test some of these perceptions is weak or these perceptions are not corroborated by any empirical evidence.

As part of this study we attempted to test the validity of some such perceptions in explaining differences in cost recovery across different regions. Since we did not have access to the detailed project-level data on cost recovery[4] working under differing conditions, we attempted to test the validity of some of these perceptions based on opinion of a cross section of relevant stakeholders – the policymakers, the project managers, the researchers, the field-level officials, farmers – from some of our sample countries. Based on a listing of such perceptions, we set up 12 hypotheses around some of these perceptions. The results obtained are summarized in Table 15 and briefly discussed below.

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[4] We intend to study the influence of some of these factors based on detailed project-level data from a sample of projects in a follow-up study.

The findings of the perception survey show that there is complete unanimity amongst stakeholders on three of the hypotheses and near complete unanimity on two of these hypotheses. There was some degree of disagreement on two other hypotheses while in the case of the remaining five hypotheses there was little commonality of views.

TABLE 14. Efficacy of institutional arrangements in improving collection of assessed bills.

States	Period	Accumulated assessed amount (INR lakhs)	Accumulated amount collected (INR lakhs)	Accumulated outstanding as a percentage of assessed	Institutional arrangement for assessment collection	
Andhra Pradesh	1991-92 to 2007-08	465,891	118,834	75	R	R
Bihar	1991-92 to 2007-08	194,470	27,955	86	I	I
Jammu and Kashmir	1991-92 to 2007-08	577	246	57	I	I
Gujarat	1991-92 to 2007-08	45,041	29,179	35	I	I
Madhya Pradesh	1991-92 to 2007-08	85,358	62,910	26	I	I
Maharashtra	1991-92 to 2007-08	509,018	394,486	23	I	I
Haryana	2000-01 to 2007-08	23,641	20,869	12	I	R
Orissa	1996-97 to 2008-09	4,604	2,308	50	R	R
Uttar Pradesh	1991-92 to 2004-05	140,309	136,009	3	I	R
Chhattisgarh	2000-01 to 2008-09	166,028	59,710	64	I	I
Rajasthan	1994-95 to 2003-04	2,711	12,515	42	I	I
West Bengal	1991-92 to 1999-2000	15,045	863	94	I	I
Kerala	2000-01 to 2008-09	112,952	93,544	17	R	R

Note: R - Revenue Department; I - Irrigation Department.

The three perceptions on which there is complete unanimity of stakeholders are:

- The cost recovery is positively influenced by the nature of crops irrigated by the water made available. The cost recovery is higher in areas/projects where irrigation water is being used to cultivate commercial crops, which give higher value of crop output, as compared to areas/projects where irrigation water is being used for cultivating low-value crops such as cereals.

- The cost recovery is also influenced positively by the status of maintenance of irrigation infrastructure. Since a well-maintained irrigation infrastructure is likely to ensure timely and required quantity of water availability, farmers would be willing to pay for the use of their irrigation water as compared to an ill-maintained infrastructure which does not guarantee an assured supply of the required quantity of water.
- Transparency does influence cost recovery. Transparency in fixation of water tariffs, often implying consultation with the farmers in setting of water tariffs, and utilization of the money so collected from the farmers through levied water tariffs for improvement of irrigation system, does influence cost recovery.

The two perceptions on which there was near complete unanimity of perceptions amongst different stakeholders were:

- The collection of water charges is likely to be greater in projects/regions which are dependent exclusively on availability of canal water in comparison to areas where farmers have access to both surface water and groundwater. If famers do not have access to groundwater, either because groundwater of suitable quality is not available or it is expensive to withdraw groundwater, they are forced to rely on availability of surface water and therefore will be willing to pay for the use of the water.
- The other popular perception on which there is near unanimity amongst stakeholders relates to the role of institutions in improving cost recovery. The stakeholders felt that the nature of institutions does have an important role – cost recovery is likely to be much higher in areas where WUAs manage the affairs of water allocations, setting of water tariffs, collection of bills and maintenance of local supply infrastructure in comparison to those projects/areas where these roles are being performed by other institutions such as Irrigation Departments.

There are two perceptions on which there is some level of divergence of views of the stakeholders.

- The first of these perceptions relates to the influence that the intensity of competition for available water can make to cost recovery. It is hypothesized that the level of cost recovery is likely to be higher in regions/projects where inter-sectoral competition for available water is more pronounced than in regions where such competition is not of much significance. The underlying postulation behind such a hypothesis is that farmers in water-competitive areas are likely to be willing to pay a higher price for their irrigation water when they face competing demand for limited water from the other sectors of the economy, in comparison to those areas/projects where farmers do not face such fierce competition. While five stakeholders agree with the hypothesis, two others do not see the difference that the nature of competition in the use of available water can bring about to cost recovery.
- Somewhat related to the above, the second perception on which there is some level of divergence between stakeholders relates to the influence that the amount of water availability can make to the level of cost recovery. It is hypothesized that cost recovery is likely to be higher in areas/projects which have limited water available for irrigation as compared to areas where water availability is not constrained. The hypothesis is premised on the assumption that access to life-saving irrigation water has a high marginal value as compared to no irrigation, and so long as the marginal returns from the availability of life-saving irrigation are more than the cost of getting the water, the farmers will be willing to pay a higher price for irrigation. The opinion of our stakeholders is however divided on the role of water supply constraints in influencing cost recovery with four stakeholders agreeing with the stated hypothesis and three disagreeing.

TABLE 15. Popular perceptions about improving cost recovery.

Serial No.	Status	Hypothesis	Correct	Incorrect	Can't say/n.a.
1	Nature of crops cultivated	Higher in areas where cash crops are cultivated vis-à-vis in cereal cultivated areas.	8	0	0
2	Condition of infrastructure	Higher in a new/ better maintained/ rehabilitated infrastructure as compared to old systems/where infrastructure lacks maintenance.	8	0	0
3	Does transparency matter?	Higher in areas where farmers are involved in determination of water tariffs and farmers have a say in utilization of collected funds for maintenance as compared to areas where such conditions do not exist.	8	0	0
4	Nature of dependence on surface water	Higher in areas dependent exclusively on canals vis-à-vis areas dependent on canals and groundwater.	7	1	0
5	Nature of institutions	Higher in areas managed by WUAs/ communities as compared to those managed by IDs.	7	1	0
6	Between less- and more-intense competition area between different sectors	Higher in areas where inter-sectoral competition for demand for water is more intense than in areas where such competition is not that intense.	5	2	1
7	Ease of availability of canal water	Higher in areas with restricted (low) water supply as compared to areas with abundant water supply.	4	3	1
8	Distribution of holdings	Higher in areas dominated by relatively large farmers as compared to those with predominantly small farms.	3	3	2
9	Difference in level of water tariffs	Higher in projects/regions with lower rates of water tariff as compared to those with higher water tariffs.	3	3	2
10	Difference in political influence of farming community	Low in areas where farmers constitute a large vote bank vis-à-vis in areas which are relatively more urbanized.	3	2	3
11	Difference in methods of charging	Higher in projects/regions where water rates are charged on the basis of volumetric consumption as compared to those where water rates are fixed on a crop/area/ seasonal basis.	1	0	7
12	Differences in projects/regions where a system of water entitlements exists and trading of water is permitted	Higher in areas where systems of water entitlements are present and water trading is permitted as compared to areas where these conditions are absent.	1	0	7

Of the remaining five popular perceptions tested, there does not appear to be any clear agreement/view. Part of this is due to either lack of much experience on some of these situations or non-applicability/relevance of some of these situations in some of our sample countries. Thus there is no clear view on the following perceptions influencing cost recovery:

- Do size and distribution of landholdings matter? It is not clear if cost recovery is more in areas dominated by large farmholdings as compared to areas which predominantly consist of small farmholdings.
- Does the level of water tariffs matter? It is not clear if cost recovery is likely to be higher if water tariffs are kept lower in comparison to a situation of high water tariffs.
- Does the political clout of farmers matter? It is not clear if the political clout of farmers influences cost recovery. The common perception that politically influential farmers can dictate payment of irrigation fees and thereby influence cost recovery is not shared by our stakeholders.
- Does switching over to charging on the basis of volumetric supply improve cost recovery? Most of our stakeholders did not have any experience with volumetric supply and charging of water and as such were unsure if introduction of such a system will make a difference in cost recovery.
- For similar reasons, as in above, there is no firm opinion if introducing a system of water rights and permitting trading in water influence cost recovery.

Efforts Underway at Improving Cost Recovery

Improving cost recovery in irrigation has been at the center of deliberations on ways to revitalize canal irrigation, and improve both water use efficiency and financial sustainability of irrigation projects. While governments around the world have been experimenting with various options to improve cost recovery, the efforts however have generally yielded little result on the ground.

The Government of India as part of its XII Five-Year Plan, has embarked on an innovative scheme to incentivize states to improve cost recovery in irrigation. In what follows we briefly describe the main features of the scheme and make an assessment of its likely impact in improving cost recovery in irrigation.

National Irrigation Management Fund (NIMF) – An Innovative Proposal to Improve Irrigation Management and Institutional Reforms in the Indian Irrigation Sector

Concerned by the low recovery of ISF and the lack of any initiative by states to improve cost recovery in irrigation, the Thirteenth Finance Commission of Government of India (GoI 2009), recommended setting up an incentive linked ISF collection grant of INR 5 billion per annum as central government assistance to be given to states over a period of 4 years. It suggested that the grant be given to different states based on the improvement in performance that different states bring about in their current ISF collection. The Commission formulated detailed guidelines and conditionalities for its disbursal. Following this recommendation of the Finance Commission, the Planning Commission, during the formulation of the Twelfth Five Year Plan (2012-17) therefore recommended that the Government of India establish a non-lapsable NIMF, which will reimburse to each State Irrigation Department a matching contribution to its own ISF collection from irrigators on a 1:1 ratio. Inter alia this will require that:

1. States desiring to avail of this matching grant maintain their own non-plan allocations to Irrigation Departments at the normal rate of growth of the aggregate non-plan budget of the State; that is, ensure that the Government of India's (GoI) matching support is additional to the State's non-plan budget for MMI systems which will now have more resources for regular maintenance and upkeep.
2. States allocate central grant to various MMI systems in proportion to the ISF collection of each MMI system; this would incentivize ISF collection among MMI staff and generate competition in augmenting the incentive provided by the Government of India.
3. At the end of the financial year, States desiring to avail of this matching grant will – through their regulator – present a certified, audited statement furnishing detailed data on the actual ISF collected from irrigators from different MMI systems preferably through an independent Water Regulator (or comparable independent agency). The Central Government will have an independent verification undertaken of the claims on ISF collection (including a scrutiny of a sample of vouchers), based on which a central matching grant will be released each year.
4. To give strong encouragement to Participatory Irrigation Management (PIM), the NIMF will provide a bonus on that portion of each State's ISF collection which has been collected through WUAs, as certified by the State's Water Regulator and verified by an independent agency designated by the Central Government. This bonus will be allowable only if WUAs are allowed to keep 50% of the ISF collected by them and their federations at the distributary level and are allowed to keep 20% of the ISF paid by irrigators. This will expand resources with WUAs and their federations to undertake proper repair and maintenance of distribution systems and increase their stakes in water management.
5. Similarly, to encourage volumetric water deliveries and ISF collection, NIMF will provide an additional bonus on that portion of a State's ISF collection which accrues through volumetric water supply to WUAs at the outlet level under an irrigation service contract with each WUA.
6. Overall, NIMF will act as a catalyst to undertake reforms in the water sector such as improving water use efficiency, participatory-community-based management of aquifers, regulation of groundwater, revamping irrigation/water resources departments and so on.

The Planning Commission hopes that such an Irrigation Management Fund (IMF) which incentivizes ISF collection, with proper implementation, will produce a myriad beneficial impacts. In particular, it will: a) enhance resources available with the MMI system managers to augment and broad-base their staff and their competencies; b) improve the ISF collection ratio; c) generate more accurate data on irrigation potential utilized; d) give a strong fillip to PIM; e) speed up command area development (CAD) and WM; f) encourage rationalization of ISF levels; g) encourage volumetric water supply and pricing; h) foster partnership between irrigation agencies and WUAs; and i) in general, help reduce the gap between irrigation potential created (IPC) and irrigation potential utilized (IPU).

Will NIMF be able to achieve the intended purpose of incentivizing states to improve the ISF collection and bring in other institutional reforms? Will NIMF prove to be a game changer in contributing towards improved O&M and thereby in contributing to revitalization of canal irrigation in India? Given the slow pace at which reforms take place and given that the XII plan has just started, it will only be a few years from now that one would know if NIMF has, at least, been able to move the states in the desired direction. There is however a long way to go – the two most important institutions for enabling its implementation – the Water Regulatory Authorities[5] in different states, and the system of independent verification have yet to be set in a majority of the states. Notwithstanding these institutional constraints, in what follows, we attempt an estimation of the incentives the NIMF is likely to generate for the states and make an assessment of the impact such additional revenue generation is likely to make in incentivizing states to seriously move on the path of improving their ISF collection.

The collection of ISF depends mainly on two factors – the prevailing irrigation tariffs and the efficiency with which these tariffs are collected, that is the efficiency with which the bills based on these tariffs are raised and collected from the users as approximated by the collection efficiency of the raised bills. The governments can choose to increase water tariffs, improve collection efficiency or improve upon both to increase their ISF collection. In a large majority of states the water tariffs have not been revised for years and the currently prevailing water tariffs are out of sync with the 'desired' level at which water tariffs should be fixed. The difference between prevailing and desired water tariffs is very wide. It is thus obvious that the wide gap between water tariffs cannot be bridged either overnight or even during the life of XII plan period of 5 years. The price hike will therefore need to be carried out over a number of years in moderate doses. In fact, even a moderate price hike is likely to be resisted by the farmers unless such a hike follows improvement in conditions of water availability, which most of our worn-out irrigation infrastructure are unlikely to be able to provide at this stage. The usual considerations of willingness and ability of farmers to pay and the possible political fallout of raising water tariffs also need to be factored into in deciding on the quantum of hike in tariffs that is practically feasible.

The second avenue of raising ISF is through bridging the gap, for a given water tariff, between what ought to be collected and what is being collected from the farmers – that is by improving the collection efficiency. While it is difficult to hazard how the increase in water tariffs may impact collection efficiency, we nevertheless assume that with the strengthening of the government machinery entrusted with raising and collection of bills from farmers it is still possible to improve collection efficiency not only at current level of water tariffs but also with increase in water tariffs. As in the case of increase in water tariffs the collection efficiency can also be expected to improve only in moderate doses over a period of time.

Corresponding with the different options available with the governments to improve ISF collection either through raising of water tariffs, improvement in collection efficiency or some combination of the two, we set up three alternative scenarios (Table 16). To allow for a reasonable time for these changes to take effect and for the results to show up, we consider a time horizon of 10 years. We accordingly set up the following three scenarios:

The XII Plan suggests ISF collection during 2011-12 as the base year against which those who make increments in collection of ISF will get rewarded. Similarly, XII Plan stipulates that the eligible increment in revenue has to come in the form of ISF and not in gross revenues so that states do not claim for their increased revenue from other sectors as coming from the agriculture sector. The data on various baseline parameters for the year 2011-12 are still not available. Another important issue to consider is an assessment of the proportion of total gross revenue contributed by ISF since the details of breakup of reported gross revenue coming from irrigation and nonirrigation sectors are not published. Given the data availability constraints we make the following assumptions:

[5] So far only three states – Maharashtra, Rajasthan and Andhra Pradesh – have set up water resources regulatory authorities.

TABLE 16. Alternative scenarios of increases in water tariffs and collection efficiency.

Serial No.	Details
1	Water tariffs are raised every year by 10% from the level of their previous year. Collection efficiency remains unchanged at the level of the base year.
2	Water tariffs remain at the level of their base year during the entire 10-year time horizon. The collection efficiency improves every year by 10% over its previous year subject to a maximum collection efficiency of 100% reached at the end of 10 years.
3	A combination of scenario 1 and 2 above – both water tariffs and collection efficiency are improved by 10% each year over its previous year level – over the 10 year time horizon.

1. Since data for 2011-12 are not available we use data of the latest year available uniformly for all the states viz 2007-08 for water tariffs, gross revenue, collection efficiency as our benchmark against which we assess the increased ISF collection.

2. The data on breakup of gross revenue from irrigation and other sectors in different states are not available. We could get some estimate of this revenue breakup for the state of Maharashtra. For the state of Maharashtra, Maharashtra Water Resources Regulatory Authority (MWRRA) estimates that, of the total gross revenue collected, about 62% comes from industry, 30% from domestic and 8% from agriculture (MWRRA 2009). Thus only 8% of gross revenue is contributed by ISF. In the absence of a similar breakup of gross revenue coming from different sectors in other states we make the following assumption: for relatively more industrialized states we assume that the percent ISF contribution to gross revenue is at the same level (say 10%) as in Maharashtra. In other states we assume that the percent ISF contribution to gross revenue is relatively at a higher level, say at 50%.

3. Since the collection efficiency can vary from year to year, we use the average collection efficiency rates realized in different states in the last 32 years (2005-06 to 2007-08) as baseline collection efficiency rates.

Table 17 gives the state-wise information in respect of some of the relatively more important states on capital outlay, O&M cost outlays and gross receipts for the base year 2006-07. It will be seen that in the base year the gross receipt as a percent of State's O&M expenditure varies between 2.3 and 17.7% while gross receipt expressed as percent of total outlay (capital plus O&M) varies from a mere 0.5 to 8.8%.

Table 18 presents the analysis of the three scenarios (outlined above) for increasing ISF collection in States as intended by the XII Plan. The data for Gross Receipts, Working Expenses and total irrigation outlay of each State have been obtained from GOI (2010). The water rate is approximated by the rates for paddy and wheat only, given that these are the two most widely grown crops under irrigated conditions. From the total gross receipts for 2006-07, the gross receipts from ISF are calculated for each of the States based on the assumptions given earlier for industrialized and nonindustrialized States. The estimated water rates and collection efficiency in year 10 are derived based on cumulative annual increase of 10%. Based on these estimates we calculate the likely gross receipts from ISF (in year 10) in all the three scenarios. As per the stipulations of the XII Plan, States would be eligible to receive a matching grant from the Central Government equivalent to the increase in receipts of ISF from the base year. The estimated incentives to different states in year 10 under the three alternative scenarios are presented in Table 18.

TABLE 17. State-wise gross receipts as a proportion of expenditure (2006-07).

Serial No.	Total outlay (capital + O&M) (INR lakhs)	O&M expenditure for the year 2006-07 (INR lakhs)	Gross receipts (from all sectors) 2006-07 (INR lakhs)	Gross receipts as a percentage of O&M (%)	Gross receipts as a percentage of total outlay (%)
Andhra Pradesh	759,948.62+302, 650.6 = 1,062,599.22	302,650.60	6,881.06	2.3	0.65
Bihar	45,093.7+18,691.09 = 63,784.8	18,691.09	1,290.31	6.9	2.02
Haryana	49,792.2+49,297 = 99,089.2	49,297.00	8,719.19	17.7	8.8
Gujarat	355,657+32,556 = 388,213	32,556.00	2,014.08	6.2	0.52
Madhya Pradesh	106,047.3+28,059 = 134,106.3	28,059.00	2,981.52	10.6	2.22
Maharashtra	503,482+105,376.1 = 608,858.1	105,376.10	44,492.57	42.2	7.3
Karnataka	373,414+7,978.7 = 381,392.7	7,978.70	2,148.37	27	0.56
Orissa	61,774 + 12,390.5 = 74,164.5	12,390.50	4,975.35	40.1	6.7
Punjab	26,385.6+42,786.4 = 69,172	42,786.40	2,014.08	4.7	2.9
Rajasthan	52,988+88,153.16 = 141,141.16	88,153.16	6,056.26	6.8	4.3
Tamil Nadu	14,276.57+53,708.53 = 67,985.1	53,708.53	2,850.55	5.3	4.2
Uttar Pradesh	174,847.27 + 122,616.5 = 297,463.77	122,616.50	14,862.70	12.1	5

Source: GoI 2010.

In a majority of the cases the increase in ISF collection is moderate under all the three scenarios. The estimated incentive as percent of total annual outlay for MMI in different States is presented in the last column of the Table 18. The incentives as percent of total outlay vary between a low of 0.1% to a high of 12.3% in different states under different scenarios. However, in more than 90% of the cases the percentage incentives constitute less than 5% of the states' annual financial outlay for the sector. After accounting for additional staff costs that the states would have to incur to improve the collection efficiency, the actual amount of incentives will be somewhat smaller than this.

The estimated small amount of benefits that the states are likely to derive through undertaking these reforms when weighed against the implicit political cost of doing so are unlikely to provide much incentive to states to undertake these reforms. Additionally, the requirements of going through an external independent regulator for assessing the receipts from different sectors might mean too much transparency for a State Irrigation Departments' finances, and may prove to be an additional disincentive. A State deciding to improve cost recovery levels is unlikely to base its decision on such ISF matching grant from the Central government. Instead, it may very well be able to both recover more than the potential grant amount by increasing the volume of water sold to industries without going through the cumbersome process of hiring new staff for collecting ISF and avoid the negative political implications.

Notwithstanding the small amount of financial incentives that the States are likely to derive from undertaking the suggested reforms and whether or not the States undertake these reforms, this innovative approach does provide a very useful approach in moving forward in efforts to improve cost recovery in irrigation.

TABLE 18. Estimated incentives in ISF to different states.

States	Total gross receipts (TGR) (INR lakhs) (2006-07)	Gross receipts from ISF (under assumption 10% in industrialized/ 50% of TGR in non-industrialized States) (INR lakhs)	Collection efficiency (averaged over 3 years)	Approximate water rate	Gross receipts under Scenarios 1, 2, 3	Difference between GR under the scenarios and GR from ISF = Amount of matching grant	Total outlay (INR lakhs)	Amount of grant under Scenarios 1, 2, 3 as a % of total outlay
Andhra Pradesh	6,881	688 (10%)	20% 2005-06 to 2007-08	400	1,785	1,096	1,062,599	0.1
					1,785	1,096		0.1
					4,629	3,941		0.4
Bihar	1,290	645 (50%)	5% 2006-07 to 2008-09	150	1,673	1,028	63,784.8	1.6
					1,673	1,028		1.6
					4,339	3,694		5.8
Haryana	8,719	872 (10%)	80% 2005-06 to 2007-08	120	2,261	1,389	99,089	1.4
					1,090	218		0.2
					2,827	1,955		2.0
Gujarat	2,014	201 (10%)	60% 2005-06 to 2007-08	160	522	321	388,213	0.08
					335	134		0.03
					870	669		0.2
Madhya Pradesh	2,981	1,490 (50%)	50% 2006-07 to 2008-09	120	3,866	2,375	134,106	1.7
					2,981	1,490		1.1
					7,732	6,241		4.6
Mahar-ashtra	44,492	4,449 (10%)	90% 2006-07 to 2008-09	300	11,540	7,091	608,858	1.2
					4,943	494		0.08
					12,822	8,373		1.4
Raja-sthan	6,056	3,028 (50%)	30% 2001-02 to 2003-04	130	7,854	4,826	141,141	3.4
					7,854	4,826		3.4
					20,371	17,343		12.3
Uttar Pradesh	14,862	7,431 (50%)	90% 2002-03 to 2004-05	220	19,274	11,843	297,463	4.0
					8,256	825		0.2
					21,415	13,984		4.7

Scenario 1: Water rate increases by 10%, collection efficiency remains at base level.
Scenario 2: Water rate remains at base level, collection efficiency increases by 10 percentage points.
Scenario 3: Water rate increases by 10% and collection efficiency increases by 10 percentage points.

SUMMING UP AND MOVING FORWARD

As in the case of any infrastructure development, in the case of irrigation infrastructure also there are three basic questions relevant to the financing – of capital and recurring costs of infrastructure – who pays? how much is paid? and how is the money used? In terms of "who pays," there are many reasons why a substantial portion of the costs of public works which provide individual services (such as irrigation water) should be paid for by those who get the service. But in a majority of the countries world over, users of canal water pay a very small part of the bill, which is basically paid by the taxpayer. In terms of "how much is paid," the answer is: much less than the presently configured amount institutions require for rehabilitation and maintenance of the assets and for operations (not to talk of payment towards capital cost). The result is that most infrastructure is in poor shape. In terms of "how is the money used" the answer is that first call is for payment of heavily overstaffed bureaucracies, whose productivity is low and whose appetite leaves insufficient funds for system O&M. This reality has given rise to a vicious circle, in which users are not willing to pay for poor and unaccountable services, which means that insufficient funds are available for O&M, which results in the decline of service quality and whereupon users are even less willing to pay (adapted from Briscoe and Malik, 2006). Breaking this logjam would require addressing all the three questions.

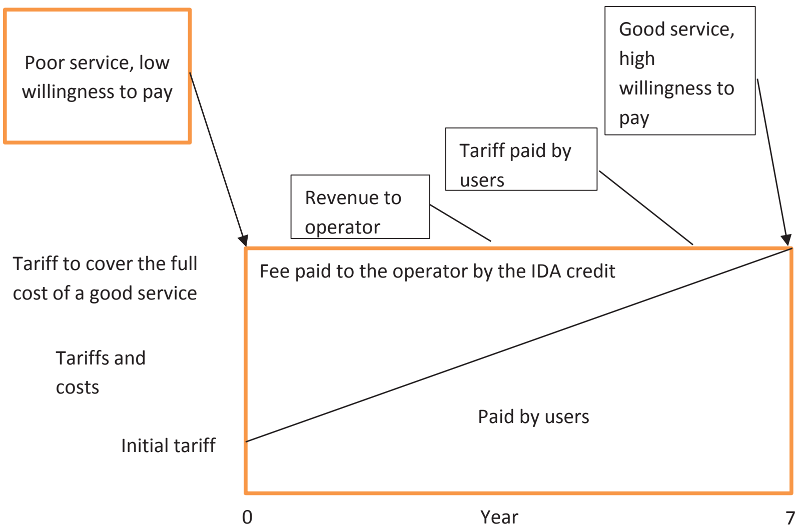
In terms of who pays and who should pay the answer is obvious – not the farmers alone. The net must be cast wide and all the beneficiaries impacted directly or indirectly by the availability of irrigation water and currently paying or not paying must pay for deriving benefits from the availability and/or use of water. The fact that some of them are already paying for this service in a different form to the government and the government accounting procedures do not permit attribution of at least a part of this contribution to provision of irrigation water should not undermine the contribution of water to this payment. Ways must be found to at least notionally account for counting of at least a part of such payments as revenue derived from availability of water. It needs to be underlined that payments received from the farmers as ISF should not be treated as the sole revenue from supply of irrigation water.

In terms of how much is paid and how such receipts can be enhanced, the obvious answer is partly by increasing low water tariffs and partly through improvement of collection efficiency. Irrigation cost at prevailing tariff rates forms a small part of the revenue derived from the use of irrigation water for crop production, and farmers can afford to pay higher tariffs. There is, in fact, a willingness to pay on the part of the farmers to pay higher tariffs provided the services are improved. There is substantial scope for increasing receipts through improvement in collection efficiency of the raised bills. An appropriate institutional arrangement combined with some more powers to the enforcement agencies can help improve collection efficiency.

In terms of how the available money is spent there is a substantial scope for its more efficient utilisation for improved system maintenance by cutting on the cost of salaries of huge and often corrupt bureaucracies in the irrigation departments. There is a need for reallocation of available funds for the irrigation sector by prioritizing O&M of existing infrastructure rather than allocating more and more funds for creation of new infrastructure. There is an increasing realization all round that revitalization of canal irrigation systems and putting the infrastructure and water therein to more productive and efficient use would, as a first step, require rehabilitation of the dilapidated and worn-out systems due to years of neglected maintenance and inefficient operations. Once rehabilitated, it would need to be ensured that the systems are maintained on a regular basis so that the rehabilitated systems continue to provide useful services on a sustainable basis. Unless both components of the revitalization package – rehabilitation of worn-out systems and regular maintenance of the systems once rehabilitated – are considered concurrently as a suite, money invested in one component of rehabilitation package without ensuring required allocations for the other, is unlikely to bring in any significant change from the current scenario in the long run. The two components of revitalization package however have different financial implications. For system rehabilitation the financial requirements are relatively much larger and need to be invested upfront as a lump sum investment in comparison to financial requirements for system maintenance which require an annual stream of relatively smaller magnitude of financial resources.

Figure 6 gives an interesting illustration of the process example of how revitalization has been attempted in an urban water project in Africa, following a transitional financing approach.

FIGURE 6. From low- to high-level equilibrium in Conakry.



Revitalization of irrigation systems will thus require huge amounts of money for both rehabilitation of the systems and their improved O&M. Where will this money come from? Closing the cost-revenue gap is thus the first step in the process of revitalization of irrigation systems. The revenues have to come in line with the costs and there is no such thing as free lunch. In a real world, there are only two sources of revenue to pay for the (rising) costs of these services – taxes or user charges. If the governments are not willing to raise either of these then, there is simply no way forward. Given the current scenario of conditions of irrigation infrastructure and the levels of cost recovery, the financial gap cannot be bridged in a short period of time. For the foreseeable future, budget support (taxpayers' money) for irrigation would therefore need to continue. But it is also obvious that user charges must simply be increased, for a host of reasons. So it is clear that starting with the idea of increasing user charges (for bad services provided by corrupt and inefficient agencies) will be quite reasonably resisted. For this reason, the idea of bringing tariffs into balance with costs must be seen as the third leg of a triangle in which the first two legs must be 'improve services first,' and 'provide those services in an efficient and accountable manner' (Briscoe and Malik 2006). Asking users to pay for the costs of these services can come only after the first two have been clearly done and are so perceived by users. During this transition period the governments would need to provide this bridge financing. The duration of this transition period would vary from system to system, based on the prevailing ground situation.

We are not aware of any irrigation system where revitalization has been attempted following such a transitional financing approach. Providing subsidies for the ‘transition costs’ for moving a low-level to a high level equilibrium (the triangle in the figure) is what the governments and other donors should be supporting (as quoted in Briscoe and Malik 2006).

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