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WATER CHARGES:
A TOOL FOR IMPROVING IRRIGATION PERFORMANCE?

by

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Water Charges: A Tool for Improving Irrigation Performance?

1. Introduction

Over the past several decades, governments in many countries have made large investments to build, rehabilitate, and upgrade irrigation facilities. Concomitant with the increase in irrigated area has been a rise in the magnitude of the recurrent costs for operation and maintenance (O&M) of the irrigation facilities. Many governments have found the resulting budgetary demands burdensome, particularly in light of the economic and budgetary pressures facing them in the 1980's. One response has been to reduce the funding for O&M to levels that are likely to lead to a gradual deterioration of the irrigation infrastructure.

Not surprisingly, this recurrent cost problem has received considerable attention in recent years (see e.g., ADB/IIMI, forthcoming; Devres, Inc. 1985; Easter 1985; Small et al 1986; Westgate 1985). All too often, however, the problem is viewed from a narrow perspective of "how to increase cost recovery from farmers," perhaps combined with a concern about "how to get farmers to be more efficient in their use of water." But more important, in my view, is the role that financing policies could play in improving the quality of irrigation services provided to the farmers, while at the same time reducing the government's fiscal burden. In this paper, I address the questions of in what ways, and under what circumstances, policies towards water charges may create the potential for improvements in public sector irrigation performance.

Before we can proceed with an examination of these questions, however, we need to clear away some verbal debris that both reflects and encourages confusion and a lack of clarity and precision in our thinking on these matters.

First, we need to clarify the difference between cost recovery and irrigation financing in the context of public sector irrigation. I suggest that the following definitions may be helpful:

> Irrigation Financing: The internal (domestic) generation of funds or other resources which are used to pay for the costs of providing irrigation services.
>
> Cost Recovery: The internal generation of funds which flow to public agencies as a result of the government's provision of irrigation services.

Although the above definition of irrigation financing excludes the mobilization of external funds for irrigation, the term is still a very broad one, encompassing all approaches to the acquisition of domestic resources to be allocated for irrigation construction or O&M. Some, but by no means all, of these approaches would involve cost recovery. Funds flowing to the

government as a result of cost recovery, on the other hand, need not -- and indeed frequently are not -- used for irrigation financing. The common assumption that increased cost recovery means improved funding for irrigation O&M is often incorrect.

It is also useful to distinguish between direct and indirect methods of financing and of cost recovery.

> Indirect Methods: Methods of financing or of cost recovery which do not involve payments by the water users specifically for irrigation services.
>
> Direct Methods: Methods of financing or of cost recovery which involve payments by water users specifically for irrigation services. These payments may be termed water charges.[4]

Many indirect methods of irrigation cost recovery exist (such as land taxes, domestic marketing taxes, export and import taxes and trade restrictions); however, these cost recovery mechanisms generally have no inherent potential to improve irrigation performance, and so are not considered further in this paper. Indirect financing mechanisms (such as funding irrigation O&M from general taxation or from the receipts of economic activities not directly connected with irrigation) are also largely excluded from consideration in this paper, except where they have clear linkages to water charges.

Finally, it is important to make a distinction between two types of water charges, namely water prices and area-based fees.

> Water Prices: Charges for irrigation services which vary in accordance with decisions of water users regarding the amount of water to use.
>
> Area-Based Fees: Charges for irrigation services which vary in accordance with decisions of water users regarding the area and type of crop to irrigate, but not in accordance with decisions regarding the amount of water to use.

It is frequently asserted that water charges will enhance the farmer's efficiency of water use. But only water pricing -- a relatively rarely used mechanism -- has the potential to do this, because it is the only type of charge that links a user's total cost of water to his water-use decisions. Area-based fees, if they are differentiated by type of crop, may influence water use through their effect on a farmer's cropping decisions. But the importance of such an effect on the total efficiency of water use is likely to be negligible unless the differential is much greater than is possible with the present structure of water charges in most Asian countries. The

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[4] The Asian Development Bank prefers the term irrigation service fee, to emphasize the idea that the charge represents a payment for a specific service, rather than a tax.

common assumption that water charges will lead to more efficient use of water is thus often incorrect.

Potential Effects of Water Charges on Irrigation Performance

Water charges may create conditions favorable to enhancing irrigation performance through their effects on (a) the availability of funds for O&M, (b) the accountability of system managers; (c) the extent of cooperation and involvement of the water users in O&M; (d) the efficiency of water use by farmers (if the charges take the form of water prices); and (e) the quality of investment decisions.

Availability of Funds for O&M. The efficient operation of irrigation facilities is frequently hindered by low funding levels for routine O&M. If funds are allocated through a government budgetary process, it is likely -- especially during periods of general fiscal austerity -- that the amounts provided for O&M will be inadequate for satisfactory performance. Alternatively, funding for O&M may be based on charges paid by water users, so that the level of funding for O&M can be made independent of general government budgetary constraints. If this results in increased funding for O&M, a significant improvement may be possible in the performance of existing irrigation facilities.

Accountability of System Managers. Financing policies based on water charges create the possibility of increasing the degree to which irrigation managers are accountable to water users, not only for financial and managerial decisions regarding O&M, but also for the overall performance of the irrigation system. If an irrigation agency receives a sizeable portion of its funds from the farmers to whom it is providing water, the agency's managers are more likely to be concerned about the quality of irrigation services provided in order to enhance their ability to collect the water charges.

Cooperation and Involvement of Water Users in O&M. Water users may cooperate more actively in O&M if financial policies cause them to feel that they, rather than some remote government agency, own the irrigation facilities. To encourage this, a government might provide a mechanism whereby, prior to any new government investment in irrigation development or rehabilitation, agreement is obtained from the water users to accept a clearly defined financial responsibility for a portion of the capital costs. For this to be effective, the potential water users would need to be involved in the planning and design process. Cooperation of the water users in O&M may also be enhanced if a system of water charges is structured such that the amount of payment required can be reduced if the users take direct responsibility for certain components of O&M.

Efficiency of Water Use by Farmers: If water charges are to result in more efficient use of water by farmers, they must be in the form of water prices, rather than area-based fees. But systems of water pricing generally require the ability to measure water volumetrically, although in some situations water pricing might be based on the length of time that water is

delivered (if rates of flow are generally not subject to large and unpredictable fluctuations) or on the number of irrigations (if the amount of water received during each irrigation is relatively stable). Because of technical and administrative difficulties associated with controlling and measuring water, pricing in gravity irrigation systems characterized by large numbers of small farmers growing irrigated rice is generally economically infeasible, and is seldom attempted.[5] Furthermore, even if water pricing were possible, its benefit in terms of increased water use efficiency by farmers would be much less than is sometimes suggested. Much of the current "wastage" of water can be attributed to poor supply control rather than to excessive demand in the absence of water prices. But effective supply control -- itself a pre-requisite for a system of water pricing -- can be expected to greatly reduce the amount of water "wastage," thereby reducing the additional gains that could be expected from any subsequent attempt to introduce water pricing.

Quality of Investment Decisions: Improving the quality of investment decisions can increase the performance of irrigation both by resulting in project designs which are more consistent with the needs of the water users, and by avoiding the construction of projects of dubious economic viability. Water charges can affect the quality of investment decisions, but only if there is an institutional linkage between the investment decision process and the financial status of the individuals or agencies making the decisions. If water users know that they are expected to pay a water charge which will include a component for the capital cost of the irrigation facilities, and if they have a voice in the investment decision, this linkage exists at the level of the individual water user. Such a situation typically prevails in the case of farmer-managed ("village" or "communal") irrigation systems. For this linkage to exist at the level of the irrigation agency, two conditions must be fulfilled. First, the officials of the agency must know both that the agency is responsible for repaying for a portion of the capital costs and that these funds must be obtained from water charges to be collected from the farmers. Second, the agency must be involved in the process by which the investment decisions are made.

The Importance of Institutional Arrangements

The likelihood that the potential effects of water charges identified in the previous section will actually be realized depends on the institutional arrangements establishing responsibilities for four processes: allocating resources to irrigation; utilizing these resources to implement irrigation services; obtaining resources from irrigation beneficiaries; and controlling the resources so obtained. The key distinction is between situations characterized by full or partial financial autonomy and those characterized by financial dependence. With financial autonomy, an irrigation agency has at least partial responsibility for all four processes. In particular, it

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[5] It has recently been reported that water pricing is being successfully used in irrigation projects in China (Ye and Dong 1986). This contrasts sharply with the experience in other Asian countries, and bears further examination.

has control over resources which it obtains from water users, and thereby also controls the allocation of all or most of the resources devoted to irrigation O&M.[6] With financial dependence, an irrigation agency has no control over any funds collected from the water users, and is thus primarily dependent on resources allocated to it through the general government budgetary process.

The importance of the institutional distinction between financial autonomy and financial dependence is highlighted in Table 1. With the unimportant exception of water pricing in the case of financial dependence,[7] none of the potential benefits of water charges on irrigation performance can be expected to occur in the context of financial dependence. While it cannot be asserted that these benefits will necessarily occur when financial autonomy prevails (because of other intervening factors which may exist), the institutional arrangement of financial autonomy creates the potential for their realization.

Financial dependence prevails in many Asian countries, including Bangladesh, India, Indonesia, Malaysia, Nepal, Pakistan and Thailand.[8] Financing policy in Sri Lanka has also been one of financial dependence; however, recent policy changes with respect to water charges -- including the implementation of a water charge with the provision that funds collected in a given project are to be used for O&M in that project -- represent a potential move in the direction of financial autonomy.

Financial autonomy prevails in a number of other Asian countries, including China, Japan, the Philippines, South Korea, Taiwan and Vietnam. It also exists at the level of the tertiary irrigation facilities in Indonesia. In addition, financially autonomous irrigation agencies are found in other parts of the world, including France, Greece, Mexico and the United States of America. Financial autonomy usually involves decentralized responsibility for irrigation services, which may be provided through local irrigation or land improvement districts or associations, as in China (Nickum 1982), Japan (Kimura 1977; Kelly 1982; Okamoto et al 1985), Korea (Small et al 1986; Wade 1982), Mexico (World Bank 1983), Taiwan (Abel 1976; Bottrall 1978]), and the USA (Adams 1952; U.S. Congress 1983); through irrigation companies, as in France (Pelissier 1968; Bergmann 1984) and the USA (Revesz and Marks 1981); or through irrigation cooperatives, as in Greece (Bergmann 1984).

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[6] Financial autonomy can exist in varying degrees, and is almost always partial, particularly when the cost of irrigation development is considered in addition to the O&M costs. Therefore, the term "financial autonomy" does not imply total financial self-sufficiency.

[7] Water pricing itself is unusual, but when it does occur, it is generally in the context of financial autonomy.

[8] This section draws upon information presented in Small et al, 1986, vol 2, and on ADB/IIMI, forthcoming.

An exception to this pattern of decentralized authority under financial autonomy occurs in the Philippines, where a semi-governmental corporation, the National Irrigation Administration (NIA), is responsible for constructing and operating national irrigation systems throughout the country. Although in the past the NIA received much of its funds from annual budgetary allocations from the Government of the Philippines, a few years ago this financial support for O&M was reduced and then terminated. Thus the NIA has increasingly being forced to conduct its operations within the budget constraints of revenues earned from its corporate activities. This has caused the NIA to place much greater emphasis on the collection of water charges from the farmers than had previously been the case.

Financially autonomous irrigation organizations generally impose water charges for O&M services. But they frequently also rely on indirect financing, in the form of secondary income, to reduce the level of the direct water charges which they must impose. Secondary income of an irrigation agency results from a variety of economic activities in which the agency engages, or from assets which it owns.

Many examples can be cited of the use of secondary income to supplement the water charges levied by financially autonomous irrigation agencies. In China, irrigation agencies are encouraged to undertake a variety of miscellaneous enterprises such as fishing, livestock production, and processing of agricultural products (Ye and Dong 1986; Nickum 1982, p 4). In Taiwan, some irrigation associations in urbanizing areas have found that the conversion of previously irrigated land into non-agricultural urban uses has made part of the canal network unnecessary. These associations have sold the land on which these canals were located and have invested the proceeds to generate income for the association. In the Philippines, part of the funds used to finance O&M activities for the NIA come from secondary income earned from equipment rental, funds on deposit, and a fee charged for managing the construction of new irrigation projects. In Korea, secondary income from interest earnings, sale of water for non-irrigation purposes, and rental of assets provides, on the average, about one-fourth of the total income of the irrigation associations (Small et al 1986). In the United States, the formation of water users' organizations was encouraged by a government policy that gave the associations rights to certain types of secondary income, such as the revenues from grazing permits and from the sale of power generated by hydropower facilities associated with irrigation reservoirs (Thompson 1985). In Indonesia, some water users' organizations have rights to income from specified parcels of land. Officials of the organizations are allowed to cultivate these parcels and retain the income as compensation for their services in lieu of direct payment by the water users.

As noted above, one of the potential advantages of financial autonomy is that it establishes an environment favorable to the creation of financial accountability linkages between irrigation managers and water users. Reports from China provide some indication that this increased accountability does occur. For example, Nickum (1982, p 22) reported that irrigation districts in China, unlike most economic enterprises in the state sector, were not over-staffed, due to the fact that revenues to cover a significant portion of the district's expenditures had to be raised by water charges on the users.

There is also some evidence that water users in China use the threat of non-payment of water fees as a leverage over management (Ibid., p 38). In Vietnam it has been reported that prior to an irrigation season, financially autonomous irrigation agencies sign contracts with the irrigation team of the each cooperative regarding the number of irrigations to be given and the area to be irrigated. After each irrigation, there is an inspection to ascertain whether the results have been satisfactory. If the provisions of the contract have not been met, the water charge to be paid by the cooperative is reduced (Le and Ninh 1986). Accountability of irrigation managers is also encouraged in Vietnam by structuring the water charge so that the amount paid per ha depends on the yield obtained (Ibid.). This gives the irrigation agency a financial stake in the agricultural outcome of the irrigation services they provide -- something which often occurs in cases of private-sector irrigation, but is seldom attempted in the public sector.

Some of the effects of changing to a system of financial autonomy can be observed in the case of the Philippines. The NIA's increased financial autonomy has led to changes in the financial procedures for O&M. On the one hand, efforts have been made to reduce the costs of O&M, in part by turning over certain responsibilities and authority to the farmers. On the other hand, more attention is now given to collecting fees from water users than was the case in the past, and systems of incentives have been established to increase the rates of fee collection. One consequence of these changes appears to be increased recognition of the importance of improving the quality of irrigation services provided to farmers, in order to enhance their willingness to pay the water charges.

Financial Autonomy: Can Farmers Afford It?

As noted in the previous section, financially autonomous irrigation agencies generally impose water charges on the farmers they serve, although the level of the fees is frequently reduced because the agency also has sources of secondary income. This raises the question of what level of charges farmers can reasonably be expected to pay. Or, to phrase the question in terms of the concerns of those responsible for providing the irrigation services, can farmers pay enough to provide the resources needed to continue to operate and maintain the irrigation infrastructure in a satisfactory manner?

Information on communal and private irrigation systems in various countries in Asia -- which are, by their very nature, financially autonomous -- shows that even very poor farmers often pay quite large amounts for good quality irrigation services. In Bangladesh, it is not uncommon for a farmer to agree to pay 25 percent of his dry season irrigated rice crop to the owner of a nearby tubewell who supplies the water. Studies of farmer-managed irrigation systems in Nepal have revealed large amounts of cash and labor paid by farmers (Martin 1986).

Two conclusions logically flow from these observations. First, although the payments are large, the benefits that farmers perceive they are receiving from the irrigation services must be significantly greater than these payments. Thus, even if they are very poor in an absolute sense, they have

the ability to pay and be better off than if they did not have access to irrigation. Second, the farmers are willing to pay these amounts because they know that the alternative is to have no access to irrigation. In the case of communal systems, it is also likely that because the farmers own and control the system, they have enough confidence in the quality of the irrigation services to make them willing to make these payments.

For larger irrigation projects with more direct government involvement, the institutional arrangement of financial autonomy can foster a willingness on the part of farmers to pay water charges because it helps establish the conditions whereby farmers know -- at least as a group -- that unless they pay, they will have no access to irrigation. The magnitude of the farmers' ability to pay fees in such projects depends on the quality of the irrigation services provided. In a recent study of five Asian countries, it was concluded that as long as irrigation facilities were performing in a reasonably satisfactory fashion, the direct benefits accruing to the farmers would generally be large enough to enable the farmers to pay for the full cost of O&M (Small et al 1986). The estimated typical benefit recovery ratios (the proportion of the increase in net income attributable to irrigation which is needed to pay the water charges) that would occur if water charges were set at a level to cover the full O&M ranged from 7 to 36 percent for the five countries (Table 2). But the study also concluded that in most cases, the farmers could not realistically be expected to pay, in addition, for more than a small portion of the capital costs, because of the very high benefit recovery ratios implied (Table 2).

The institutional arrangement of financial autonomy provides the possibility of financing the recurrent cost of irrigation services not only from direct farmer payments, but also from secondary income. It may thus be possible to structure farmer payments for irrigation services to incorporate components for both recurrent and capital costs, while limiting the total payment to a level which is reasonable in light of the magnitude of the benefits received.

For example, irrigation service fees paid by farmers in Korea have clearly identified components for O&M and for capital costs, and the irrigation organizations are typically responsible for the full O&M costs plus repaying, to the central government, a specified small portion of the capital cost. But the average amount which farmers must pay is only about 93 percent of the average cost of O&M, with the difference between the amount paid by farmers and the expenditures of the organizations accounted for by secondary income (Table 3). This arrangement has the triple advantage of giving the autonomous agency responsibility for funding the recurrent costs of irrigation; giving it and its farmer members clear ownership rights to the irrigation facilities; and keeping the irrigation service fees at a reasonable level relative to the benefits of irrigation received by the farmers.

Another important factor affecting the level at which a financially autonomous agency must set the water charge is the rate of collection of the water charges. In the case of Korea cited above, rates of collection average over 98 percent, so that there is little difference between charges and

collections. But in the case of the Philippines, for example, the NIA obtains only about 75 percent of the cost of O&M from water charges, even though the actual charge is set at approximately 121 percent of the cost of O&M (Table 3). This reflects the relatively low (62 percent) rate of collection of water charges which the NIA has been able to achieve.

As a final point, it should be noted that with financially autonomous irrigation agencies, the cash burden placed on the farmer to finance recurrent costs can often be reduced by provisions that allow direct contributions of labor for the maintenance of irrigation facilities. This type of "non-cash financing" is a common arrangement in communal or farmer-managed irrigation projects. For very poor farmers for whom cash is scarce, this may be an attractive alternative to a payment only in cash.

Conclusions

Policies for financing irrigation services have the potential to affect the management and performance of irrigation systems. For this to happen, however, appropriate institutional arrangements are needed with respect to establishing responsibility and authority for four key processes: allocating resources to irrigation, implementing irrigation services, collecting resources from beneficiaries, and controlling the resources collected.

If water charges are to have the potential to improve system performance through providing more funding and encouraging better management, a degree of financial autonomy is needed to create a link between the provision of irrigation services and the collection of and control over resources from water users. Likewise, for a financing mechanism to have the potential of improving system performance by encouraging active cooperation and involvement of water users, a degree of financial autonomy is needed to give them a sense of ownership of the irrigation system. Improvement of investment decisions is also possible with financial autonomy, although this is not likely to occur unless the financially autonomous agency also has a voice in the investment decision process. Because water charges seldom involve water pricing, they have much less potential to encourage increased efficiency of water use by the farmers than is frequently assumed.

In the absence of any significant degree of financial autonomy for the agencies that provide irrigation services, water charges may be justified on fiscal or income distribution grounds; however, it is unlikely that they will have any significant positive effect on irrigation performance.

Although the benefits of financial autonomy appear substantial, it is not a simple matter to introduce the institutional changes necessary to create financial autonomy in situations where it has not existed. An attempt to create these institutional changes is likely to result in a transitional stage in which many organizational and financial problems will be encountered. But there is a continuum between absolute financial dependence and complete financial autonomy. Movements in the direction of financial autonomy, where possible, seem desirable.

One argument sometimes given for not encouraging financial autonomy is that farmers cannot afford to pay the water charges that would be necessary to cover the costs of O&M. In light of the large amounts which farmers operating with non-government irrigation facilities frequently pay for water, this argument needs to be examined very critically. If the irrigation services provided by public irrigation systems are of such poor quality that the farmers cannot pay for the costs of O&M from the incremental income they receive from irrigation, then something is seriously wrong with the irrigation system or with its management. And water charges are a key link in a chain of events needed to improve irrigation performance, then charging farmers for irrigation may ultimately turn out to be a way of increasing their incomes.

Table 1. Potential Consequences of Water Charges, by Institutional Context and Type of Charge

Type of Consequence	Institutional Context and Type of Charge			
	Financial Autonomy		Financial Dependence	
	Area-based Fees	Water Prices	Area-based Fees	Water Prices
Improved Funding for O&M	yes	yes	no	no
Improved Accountability	yes	yes	no	no
Improved Involvement of Users	yes	yes	no	no
More Efficient Water Use				
-Better water use decisions	no	yes	no	yes
-Better cropping decisions	yes	yes	yes	yes
Improved Investment Decisions	?	?	no	no

Table 2. Estimated Benefit Recovery Ratios under Alternative Financing Policies in the Five Asian Countries (percent)

Country	Policy			
	Actual	Actual modified to Set Irrigation Service Fees Equal to O&M Costs	Actual modified to Set Irrigation Service Fees Equal to O&M plus Full Recovery of Capital Costs	
			Moderate Capital Cost	High Capital Cost
Indonesia				
low estimate [a]	8	10	56	114
high estimate [a]	21	27	154	313
Korea [b]				
low estimate [a]	26 (54)	27 (58)	141 (297)	203 (429)
high estimate [a]	33 (70)	36 (75)	183 (387)	264 (557)
Nepal	5	10	74	122
Philippines	10	7	43	98
Thailand [c]	9 (30)	31 (53)	155 (176)	279 (300)

a Low and high estimates result from alternative estimates of the net benefits of irrigation.

b Figures in parentheses represent the estimated benefit recovery ratios that would prevail if domestic prices of paddy were allowed to drop to a level consistent with 1983 world prices, while all other prices and input amounts remained constant.

c Figures in parentheses represent the values that would apply if the implicit tax on the farmgate price of paddy were 22 percent, as estimated for the late 1970's in World Bank, "Thailand: Case Study of Agricultural Input and Output Pricing" Staff Working Paper No.385, 1980, p.50.

Source: Small et al, 1986, vol 1.

Table 3. Average revenues earned or collected per ha by irrigation agencies in three Asian countries, as a percent of O&M costs per ha)

	Korea	Nepal	Philippines
1. Revenues from Water Charges			
a. Water charge levied	93	60	121
b. Approximate percent of charges which are collected	98	20	62
c. Total revenues collected [a]	91	10	75
2. Revenues from Supplemental Income	28	0	257 [b]
3. Total Revenues [c]	119	10	332 [b]

[a] Line 1a times line 1b.

[b] Includes interest and management fees derived from and mostly utilized for new construction activities, amounting to 200 percent of O&M costs.

[c] Line 1c plus line 2.

Source: Small, et al, 1986, Vol 1, p 31.

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