4.13. Options for charging for irrigation water in Iran

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In many countries where water is scarce, agriculture still consumes more than 80 percent of all water. Many people believe that if there were some form of water pricing that discouraged excessive use by farmers, more water would be made available for others, or there would be significantly higher productivity in water utilization due to responsiveness to the cost of water. Water pricing also brings with it the prospect of financing irrigation on a sustainable basis through a program of cost recovery.

4.13.1. Water pricing for financing irrigation through cost recovery

Cost recovery requires several mechanisms to be in place to be effective. Firstly, the true value of recurrent costs for O&M needs to be quantified. This is not as simple as it seems because some costs are periodic and will result in peaks of expenditure every few years. Secondly, a decision is required on how much of the capital cost, and capital replacement cost, should be borne by water users, how much by other beneficiaries, and how much by government in the form of a subsidy. In reality, it proves difficult to determine an accurate figure, although data from Egypt and Haryana, India indicate that O&M costs are in the range of US$0.002-0.003 m^{-3} delivered.

At this level, it is unlikely that there will be a large incentive for water users to consume less. Values of water invariably exceed US$0.02, and typically average US$0.02 m^{-3}, US$0.10-0.20 m^{-3} and may be many times higher, so that the cost of water is a small fraction of the benefits accrued. Further, O&M recoveries are often made on the basis of an areal charge rather than a volumetric one, so there is no real incentive to reduce volume consumed.

4.13.2. Water charges to encourage efficient use

Charging water at a rate that discourages waste is essentially a form of taxation. It also requires a capacity to accurately measure water so as to establish an effective volumetric price that can be charged to the consumer.

Regulatory measures are essential to impose high levels of water charges. The regulation has to cover both the supplier of water, to ensure that agreed delivery schedules and promised volumes are maintained, and on water users to prevent unauthorized tampering with physical structures or coercion of operational staff of the irrigation agency.

Operational requirements are also very high. There has to be a verifiable system of water measurement so that both supplier and consumer can agree on the discharge or volume delivered. This is hard where holdings are small or fragmented, and wholesaling to groups of water users raises a whole set of additional institutional questions about the sharing of water and of payments. This type of arrangement favors "free-riders", who can be wasteful at the expense of other members of the water user organization. There is also pressure on the supplier to develop a quick billing system so that defaulters can have action taken against them as quickly as possible, which will deter future missed payments.

Economic requirements aim either at discouraging waste by billing for all water consumption and hoping the consumer will respond through application of thrift, or by fixing a marginal price that will optimize water delivery and use. We have already seen that the cost of delivering water is many times less than the potential benefit, and prices would have to be set so high as to have a major impact on farm incomes.

Water savings anticipated from trying to get consumers to be more efficient may, in many cases, be illusory. If there is a high degree of recycling within a basin so that water not used in one part can be captured and reused by other people, then reducing farm-level consumption may have no overall effect at basin level. The "saved" water still reaches the downstream user directly, whereas the "wasted" water merely gets there by a more circuitous manner (but may be of lower quality).

4.13.3. The Zayandeh Rud case study

Given the acute scarcity of water in the Zayandeh Rud, and the common perception that irrigation, and particularly rice irrigation, is inefficient, there would appear to be plenty of opportunities for water saving. However, given the high level of reuse, both through surface drains that discharge back to the Zayandeh Rud, or through rapidly increasing exploitation of groundwater, these savings may in large measure be illusory except in the tail-most areas where groundwater and drainage water are both highly saline.

If farmers invest in high technology to try to effect some water savings, then there is an element of investment that must be discounted against current costs of water. Table 4.17 shows that investment of US$1000 ha^{-1} will result in savings between US$0.11 and US$0.14 m^{-3}. Allowing for some degree of sensitivity of the cost of water, we can assume that cost to the farmer will be in the range of US$0.08-0.21 m^{-3}. This compares very unfavorably with the current cost of water, approximately US$0.004 m^{-3}. It would require a 20-fold increase in the cost of water to cover the capital expenditure of the farmer, and would make lower value crops such as wheat unattractive, if not totally uneconomic.

Table 4.17. Costs of reducing water through improving irrigation technology.

	Water demand (m^3/year)	Cost ($/$m^3$)	Delivery reduction (m^3)	Annual capital cost ($)	Annual operational cost ($)	Total annual cost ($)
Two-season use	10,000	0.14	3,175	148	200	348
Single-season use	5,000	0.11	1,587	120	100	220

Note: Assumes on-farm losses reduced from 30 percent to 10 percent, discount rate of 10 percent p.a., life length of 10 years for two-season use and 15 years for single-season use

Looking more closely at the marginal value of water, we find that it changes significantly throughout a single season, and thus it becomes very difficult to set a single figure. It is more practical to use the average value, but even that has difficulties due to uncertainties over crop valuation, cash inputs, non-cash inputs, and whether we look at consumed water or delivered water.

Table 4.18. Average gross and net costs and values for various grain crops.

Crop	Production costs ($)	Yields (t/ha)	Price ($/t)	Gross value of production($/ha)	Net value of production($/ha)
Wheat	420	6.0	120	720	300
Barley	420	6.0	100	600	180
Maize	420	7.0	100	700	280
Rice	1,000	7.0	4,500	3,150	2,150

Given that water still costs roughly US$0.004 per m3 and will amount to some $30 ha^{-1} for most grains, and US$100 for rice, the costs are only about 10 percent of the net value of most grains and only about 4 percent for rice (table 4.18). This makes it virtually impossible to consider volumetric pricing as a mechanism for controlling water use unless the water price is raised many times. Given the price bias towards rice, this is unlikely because the price will still be low in relation to the value of the crop.

Salt balance also plays a role in considering how to price water. Saline water is inherently less productive that fresh water, and so there should be some mechanism for compensating farmers who have access only to saline water. But this adds yet another complicating mechanism into the process which will bring additional institutional stresses.

4.13.4. Pricing vs. allocation

The Zayandeh Rud study illustrates that even if prices and production costs were uniform for different crops, it is difficult to imagine that the price can be set high enough to bring about optimal use of water within irrigation systems. The gross returns per cubic meter are presently many times higher than the cost of water so that there would be severe political and social difficulties in raising water prices to a level that affects water consumption.

The logical alternative is to explore some form of allocation of water. Water rationing between different users is relatively common when water is scarce. Competition, not only between different agricultural users, but also with other sectors means that allocation becomes a critical component of water management at basin, system and field level.

In Zayandeh Rud this is undertaken, albeit inefficiently, by the design capacity of irrigation canals at each regulator. Current management practices run canals at or close to full supply level during seasons of peak demand, and upper-end systems are somewhat constrained in meeting crop requirements under these conditions.

However, there is no clear system of water rights that translates into a transparent water-allocation system, and it appears that this will be increasingly needed in the future. As the share of water for agriculture drops due to the growth of demand in other sectors, the shortfall in different irrigation systems will increase. Tail-end systems will experience greater shortfalls than head-end ones whenever water supply is below normal because head-end systems can take up to the canal design capacity.

Under these systems, we require a two-fold approach: charges for water that cover recurrent O&M costs, and a system of water rights or shares that reflect not only "normal" conditions but also conditions of water scarcity when there is increased need to consider equity and livelihoods as well as production.