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Why the price chain for federally-developed irrigation water doesn't promote conservation.

By R.G. Taylor, A.M. Michelsen and R. Huffaker

Growing municipal, industrial, recreational and environmental water demands are taxing the limited water supplies in the West. Traditionally, increased water demands have been met by developing additional water supplies using dams, impoundment reservoirs, and canal systems. However, the dam building era is over due to a combination of financial, environmental, and political factors as well as the fact that all "good" sites are already developed. Consequently, attention has turned to developing additional water by conserving existing supplies. Irrigated agriculture, con-

suming 90 percent of existing supplies, receives the most attention as a possible source of conserved water because it is the highest-volume and lowest-valued water user (see "Water by the Foot," p. 14). The extent to which agricultural water users can be induced to conserve water depends on the chain of prices linking the Bureau of Reclamation (water wholesaler), irrigation districts (market intermediaries), and irrigators (final water consumers). This price chain is of particular importance because the Bureau of Reclamation (BOR) is the largest irrigation water supplier in the West.

How well has this price chain worked to encourage agricultural water conservation?

The First Link — Federal Water Pricing

The expense of early water development in the West exceeded the financial capabilities of individual farmers, cooperative associations of farmers, and state and territorial governments. These interests successfully lobbied the federal government to finance water development with fees based on cost recovery and the ability of water users to pay. Fee structures were established by the

Water by the Foot

Irrigation water values vary with area, crop, and production and market conditions. Over the past decade, average values have been estimated at between \$25 and \$75 per acre-foot. Values at the margin of economic use are considerably less. BOR irrigation districts charged an average of \$12 per-acre foot delivered. Residential water users in the southwest United States paid an average of \$670 per acre-foot at the tap.

Reclamation Act of 1902 (32 Stat. 388) and were continuously modified, the latest significant change coming with the Reclamation Reform Act (RRA) of 1982 (43 U.S.C. §390). The RRA required irrigation districts to prepare a water conservation plan and introduced "full-cost" pricing for a portion of the water that BOR delivered to irrigation districts. Irrigation districts have been, and continue to be, slow to respond in part because of shifting rules and uncertain timetables for implementation.

A 1991 lawsuit challenged BOR's compliance with RRA. In settling the suit, BOR agreed to prepare an environmental impact statement (EIS) that considered alternatives including the adoption of pricing policies to encourage conservation and stringent irrigation district water conservation plans. The preferred alternative in the EIS, subsequently adopted by BOR in 1996, was "no action" (BOR 1996). The status quo was preserved with respect to: (1) preparation, submission, and enforcement of district water conservation plans; (2) pricing between

BOR and irrigation districts; and (3) pricing between districts and irrigators. Thus, fifteen years after passage of the RRA, BOR abdicated responsibility for water conservation and in doing so transferred the responsibility to irrigation districts. BOR issued a vague water conservation policy recommendation saying "districts [should] consider incentive pricing as part of their water conservation planning efforts." Under RRA and subsequent policies, implementation of conservation incentive pricing by irrigation districts is voluntary. BOR has no specific authority or enforcement mechanism.

Whereas BOR policies and regulations recommend incentive pricing between irrigation districts and irrigators, BOR actually establishes water prices for the first link in the chain. From the beginning of the reclamation program in 1902, BOR has based its charge for the water it supplies solely on repayment requirements for the costs of construction and operation and maintenance of a project's facilities (canals, dams, and other facilities that provide water to irrigation districts). The price or charge for BOR supplied water continues to be established with respect to recovering capital and operating costs.

BOR water pricing leads directly to two pricing problems that distort incentives to conserve water. First, since BOR pricing is based only on cost recovery, it fails to incorporate opportunity costs or the value of water that would reflect scarcity and provide conservation incentives. Moreover, BOR is legally precluded from setting water charges to reflect water resource scarcity. Second, water project storage and distribution system

costs are largely fixed — they do not vary with the quantity of water delivered. To recoup project costs, BOR prices water to approximate average per unit costs, as opposed to charging the increasing marginal cost that reflects increasing water scarcity.

Despite BOR policy to establish conservation pricing, the crux of the matter is that the U.S. Congress has yet to authorize the agency to price water at more than facility reimbursement costs. Responsibility for conservation pricing has



Running Over:

BOR is legally precluded from setting water charges to reflect water scarcity.

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been shifted to the next link in the chain, the irrigation districts.

The Second Link — Irrigation District Water Pricing

Irrigation districts are intermediaries between the Bureau of Reclamation and final water users. An irrigation district enters into a water supply contract with BOR and promises to repay facility construction, operation and maintenance costs in exchange for water delivered to the irrigation district's conveyance system. In contrast to utility companies that operate to maximize shareholder returns, irrigation districts are nonprofit, farmer owned and managed cooperatives. Irrigation cooperatives establish and administer a water rate structure to satisfy multiple objectives that include cost recovery, efficiency, and equity. But, do irrigation districts set rate structures that realign BOR water prices to provide conservation incentives? The answer is revealed by irrigation district rate structures (the effective water price paid by farmers) and district incentives to allocate water use efficiently.

A 1986 survey of BOR-supplied irrigation districts showed that 80 percent assessed their members a fixed charge designed to cover BOR supply charges plus the district's own water delivery costs. This charge was usually a per acre assessment, and for almost half of these districts, the fixed charge was the only assessment for water delivery. The second most prevalent rate structure (37 percent of districts) was a tiered structure defined by BOR as conservation pricing.

Figure 1 shows a generalized example of tiered price structures. First tier water deliveries (0 to Q_1) are assessed a fixed charge (P_1) chosen for purposes of cost recovery. Second tier deliveries (Quantity $> Q_1$) are assessed a price (P_2) that is not intended to generate revenue but is explicitly termed a "penalty rate" or "overage charge."

For a tiered rate structure to induce water conservation, the initial block quantities must be set below the economic demand for the water (e.g., D_2). However, in virtually all irrigation districts, the initial block of water quantities was set to cover all but the most excessive water use demanded by farmers in the district (e.g., D_1). Consequently, the associated tiered rate

structures have been ineffective conservation mechanisms. There was no significant difference in demanded water deliveries between districts that used a single fixed charge and districts that used quantity-based water pricing (Michelsen, et al.). A check of these same districts in 1997 showed little change in tiered rate structures. Water prices for the second block, or for the third or fourth blocks in the few districts that have more than two price tiers, remain irrelevant because quantities that would trigger the higher prices are never demanded. Irrigation districts continue to resist BOR's encouragement to implement effective conservation pricing.

The rate structures set by irrigation districts fail to provide the stick for water conservation. The fixed water

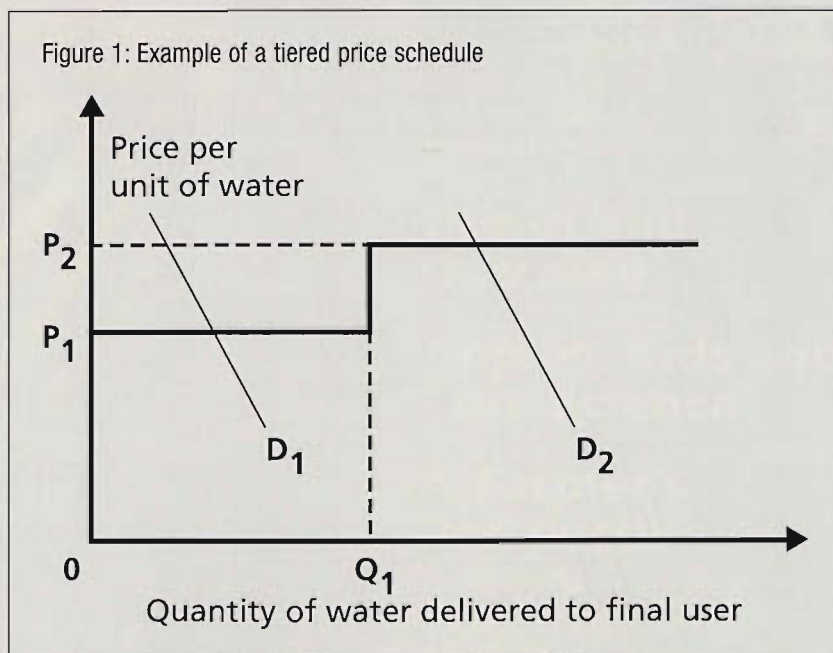
price transmitted to the farmer is the average cost of the district's operations. This price fails to reflect water scarcity, society's opportunity cost of providing water to agriculture. The carrot for water conservation is also absent.

Incentives to use conserva-

tion pricing are missing because irrigation districts and farmers cannot capture gains from water conservation. Throughout the West there is little opportunity for an individual farmer or a district to exchange, lease, sell, or gain from conserved water.

A chain of water prices starting with the Bureau of Reclamation, connecting to irrigation districts, and ending with farmers, links water use decisions in the West. Each link in this price chain fails to signal water scarcity and provide a conservation incentive for efficient water use. The initial price distortion is created by BOR's pricing of water based on legal, political and institutional

The rate structures set by irrigation districts fail to provide the stick for water conservation.



No Reining In:

At every link in the water price chain there is a failure to provide a conservation incentive for efficient water use.

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constraints; not market forces. A subsequent distortion is created by irrigation district pricing structures that assess a fixed rate or a fixed rate plus an ineffective penalty. Increasing marginal cost pricing based on the opportunity cost of water is absent. To provide a conservation incentive, Congress must authorize BOR to initiate the price chain by pricing water to reflect scarcity, not simply cost recovery, and this price must then be transmitted to water users in the irrigation districts. ■

■ For More Information

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