LOCAL IRRIGATION AGENCIES

By Richard L. Revesz and David H. Marks

INTRODUCTION

Throughout the Western United States, agricultural areas dependent on irrigation are experiencing limitations on available water supply due to excessive ground-water depletions, to decreases in surface water availability due to interactions with depleted ground water and, in general, to demands for water exceeding readily available supplies. In response to this problem, a considerable amount of engineering literature has been developed on ways to manage and control the distribution of water for irrigation.

In most cases, these have been "supply" models (3,6,7,8,12,15,16,18). Also, these studies view local irrigation agencies as centralized institutions, which make all important decisions concerning the allocation of both surface and ground water in accordance with principles of economic efficiency. As such, they miss two important points: first, farmer demand may well be a function of the types and attributes of supplies available and, thus, policies of demand modification are as important to consider as management alternatives as those of supply increase. Second, because of externalities caused by the actions of individual farmers, institutional mechanisms are needed to implement such plans. During a recent study for the United States Office of Water Research and Technology involving the estimation of farmers response to and acceptance of various policy options to limit water demands, it became clear that problems in the institutional arrangements, necessary to deal with externalities, severely limited the effectiveness of most management models for the conjunctive use of surface and ground water.

These models assume that comprehensive management entities exist. This view is particularly convenient for the study of rational ground water development because it provides a simple method for "internalizing" externalities. These externalities arise from the "common pool" nature of ground water resources, which give a rational irrigator an incentive to pump ground water since the benefits of this water will usually outweigh his share of the adverse consequences


Note.—Discussion open until March 1, 1982. To extend the closing date one month, a written request must be filed with the Manager of Technical and Professional Publications, ASCE. Manuscript was submitted for review for possible publication on September 17, 1980. This paper is part of the Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, ©ASCE, Vol. 107, No. WR2, October, 1981. ISSN 0145-0743/81/0002-0329/$01.00.
of aquifer depletion. Naturally, these externalities can be eliminated by giving an irrigation agency the power to enforce an optimal plan for ground-water withdrawals.

The assumption of centralized control is inconsistent with the legal status of ground water as a mineral resource, in some areas, because of the attitudes of fierce independence of individual farmers (1,4,5,9,14,19).

This paper, which presents a historical discussion of the circumstances surrounding the emergence of irrigation institutions in the Western United States, classifies these agencies according to their attributions and reviews their formation processes and modes of operation. In this way it seeks to provide a realistic framework for future mathematical modeling of the supply of irrigation water. Among the questions that it attempts to answer are:

1. To what extent do local irrigation agencies control surface and groundwater allocations?
2. To what extent do these agencies "conjunctively manage" surface and groundwater resources?

**Historical Perspective**

In the Western United States, irrigation agencies have been formed for economic and political reasons. In the nineteenth century, economic rationality prompted the formation of water organizations because of the indivisibilities in the physical facilities used to store and transport water. Wells, pipes, canals, and reservoirs exhibit decreasing average costs over a wide range of scales. In general, an individual user can efficiently provide for his own supply only if he transports the water over a relatively small vertical or horizontal distance. Thus, land promoters increased the value of the land they were selling by constructing water systems based on gravity diversion from an adjacent river (4).

During the first half of this century, the formation of large water wholesalers, such as the Water and Power Resource Service (formerly the Bureau of Reclamation), the Army Corps of Engineers and State Department of Water Resources, acted as a catalyst for the emergence of irrigation agencies. Precluded by their charters from dealing with individual farmers, the large water suppliers were forced to sell their water to local agencies, which in turn, distributed it to the farmers in their basin.

In recent years, the major cause for the formation of irrigation agencies has been the rapid decline of ground-water levels. Ground-water depletion results from what hydrologists call "the 'common pool' problem" and is an excellent example of the "tragedy of the commons," a theory formulated to explain the depletion of pastures in medieval England. The common nature of these fields encouraged a rational herdsman to keep as many cattle as possible in them since the benefits he attained from the sale of each additional animal outweighed his share of the negative effects of overgrazing. However, this same conclusion was reached by every rational herdsman sharing the commons and the unrestrained addition of cattle led to the destruction of the fields. Thus, "freedom in the commons brings ruin to all" (13). The "commons" problems of declining water tables include increased operating costs, which vary proportionately with pump lift; large capital costs to deepen wells and install larger
pumps; and intrusion of brine in the aquifers and subsidence is a major problem in the large San Joaquin Valley in California. As much as 4–6 ft, has caused significant problems (i.e., raising of canal linings, building foundations collapsing).

Until very recently, the decline of ground-water levels led to the formation of agencies interested primarily in obtaining additional surface water. In the last few years, agencies charged specifically with the management of ground water have emerged. For example, the Kansas legislature authorized the formation of ground-water management districts in the state on July 1, 1972. Its Nebraska counterpart took the same action on August 23, 1975. However, many states are reluctant to pass laws limiting rights of farmers to pump water on their property.

Thus, local irrigation agencies, charged with the responsibility of supplying water to individual farmers, have arisen for a wide variety of reasons. These institutions may be easily classified into three distinct groups:

1. Public irrigation districts;
2. Mutual or cooperative irrigation companies.
3. Commercial water companies.

Public Irrigation Districts.—Irrigation districts, also known as water conservation districts, water districts, water improvement districts, and conservation districts are government organizations that have legal status as political subdivisions of the state in which they lie (1,10) but, which operate outside the jurisdiction of the established state and local governments.

Public irrigation districts may be formed in two ways: (1) The first is by special state legislation that approves the creation of a district, defines its area, function, organization, and financial authority (5) and (2) the second, possibly only the states that have general enabling legislation permitting the formation of institutions by public request, is through a special petition by local landowners. The former mechanism has been used extensively in the past, the latter is more popular today.

Where districts are formed by private initiative, an individual, or a group of landowners, presents a petition to the governing body of the county. The petition defines the boundaries of the proposed district, which may only include lands that will benefit directly from the agency’s operation, and the proposed sources of water. The petition is accompanied by a list of signatures. Upon receipt of the petition, the county government organizes public hearings in which interested parties discuss the merits of the proposals, and requests a feasibility study from the State engineer. If the approval of the county supervisor is obtained, the county government calls an election in which all the landowners within the boundaries of the proposed district may vote. A major deviation of this rule occurs in California, where the electorate consists of all registered voters (5).

The agency is formally constituted if a majority vote is cast in its favor. Subsequently, a board of directors, an assessor, a tax collector, and a treasurer are elected. In all cases, the newly formed board of directors hires an engineer to prepare a plan of works and estimate their cost. In general, the construction is financed through bond sales, and these have to be approved (usually by a two-thirds majority) by the eligible voters in the district. The day-to-day
operation of the agency is carried out by a chief engineer and ditch tenders, and is financed by ad valorem assessments on the land, exclusive of improvements, and through water tolls.

Public irrigation districts belong to a group of organizations designated "special district governments," which include school districts, and housing and port authorities. Labeled the "dark continent of American politics" because of the lack of attention paid to them by political scientists, special districts fill a vacuum created either by the inability of a general government to circumvent constitutional limitations of its tax and debt limit, or by constituent resistance to the expansion of the functional jurisdiction of the state or county. Thus, while a general government is prevented from expanding functionally once it reaches its tax or debt limit, residents of the same area are not legally prevented from organizing a special district that will possess the power to levy taxes or to incur debt, or both (5).

An 1865 law in the Territory of Utah was the first legislative act authorizing the creation of irrigation districts in the United States. A similar act was passed in California in 1872, and between that date and 1887, special acts of the state legislature created a large number of other districts (19). The formation of special irrigation districts in California received a big boost with the passage of the Wright Act in 1887. This act permitted citizens of towns having 500 or more electors to propose and approve by election the formation of an irrigation district. The proponents of this measure hoped that a district's assessments would finance irrigation works and, at the same time, produce the subdivision of large land-holdings into relatively small tracts (4). In 1896, after a decade of litigation in state and federal courts, the U.S. Supreme Court upheld the constitutionality of this law.

This decision paved the way for the formation of numerous irrigation districts in the Western United States. While, at the turn of the century, only California and Washington had active districts of this type, Nebraska, Colorado, Oregon, and Idaho adopted them during the first decade of this century. In 1950, 483 local public irrigation districts were supplying water in 17 of the 19 western states (1,5).

Public water agencies supplying surface water possess the following powers (4):

1. Corporate powers include the rights to sign contracts, construct works, buy and sell water, operate irrigation works, and sue and be sued.
2. The power of eminent domain is subject to certain broad guidelines. They can condemn property needed for designated uses.
3. The power to incur bond indebtedness allows agencies to issue general obligation bonds, or revenue bonds, or both. In all cases, the floating of a bond issue must be approved at an election by the member landowners or eligible voters.
4. The power to fix assessments on their constituents secure and retire bond indebtedness and cover operating expenses. In some cases, the legal uses of these revenues are limited by state laws. In other cases, the establishment of assessments may require the approval of the electorate.
5. The power to establish charges provides for establishment of tolls to pay for the delivery of water or for other services.
6. The power to purchase water permits agencies to enter into short-term contracts with local "overlay" agencies or with the large water supplying agencies, such as the Army Corps of Engineers and state departments of water resources. In general, they may not sell water outside the jurisdiction of their districts. However, they may sell "surplus water" through short-term contracts.

The powers allow public districts concerned primarily with the supply of surface water to have an impact on ground-water depletion. A land assessment imposes a fixed cost on farmers. Thus, the variable cost of surface water, collected through water charges, is less then the total cost of securing this water. If the cost of pumping a comparable amount of ground water fell between the variable and total cost of surface water, an economically rational farmer would prefer surface to ground water, even though, in the absence of a district, the ground water would have been less expensive.

Public irrigation districts that supply water may slow down the process of ground-water depletion by securing additional surface water or by setting high land assessments and low user charges on the water they sell. However, with certain exceptions, they cannot deal directly with the problem of falling aquifer levels. In some states, the legislatures take an active role in protecting groundwater resources. For example, in 1957, the Nebraska legislature prohibited the location of one irrigation well within 600 ft of another and mandated that irrigation wells be registered within 15 days of their completion (17). More recently, the Kansas and Nebraska legislatures have authorized the formation of public ground-water management districts.

In general, these districts have the following powers:

1. Metering to install or to require the installation of meters and to read or to require water users to read these meters.
2. Set standards to adopt and enforce reasonable standards for the conservation of groundwater within the district.
3. Ensure compliance to enter private property to determine conformance with established rules in the use of water.

In addition, these organizations possess most of the power assigned to irrigation districts that supply surface water.

Mutual Irrigation Companies.—Mutual companies are the most common type of irrigation enterprise in the West. In 1950, there were 9,200 cooperative irrigation enterprises in the western states, of which the largest number (2,265) was in Colorado, and the next largest (1,270) was in California. The United States Irrigation Census gives all these companies the classification "mutual." However, they are known by various designations, including "mutual water companies," mutual irrigation companies, cooperative irrigation companies, mutual canal companies, and mutual ditch companies (1). A mutual company is a voluntary, nonprofit enterprise engaged primarily in providing water for its shareholders.

Although there are characteristics common to most mutual companies, these enterprises differ considerably from state to state. To a great extent, the existing variations may be ascribed to the historical conditions surrounding their emergence.
In Colorado, the mutual companies were organized by the holders of water rights gained by prior appropriation. Thus, shareholders are allowed to use the water to which they are entitled on any land served by the irrigation system. This feature of the state’s mutual companies gives its Colorado shareholders the right to sell surplus water to other shareholders in the same basin. This practice, known as “renting,” is described in detail by Anderson (2).

In Idaho, many mutual companies were organized under the provisions of the Carey Act of 1894. This act allocated funds for the reclamation of public desert land and authorized the states to contract with private construction companies for building irrigation works. These companies were then able to sell “water rights” to the settlers. The Carey Act stipulated that mutual companies would eventually operate the irrigation system. It also made water right appurtenant to the land, thus, precluding intrabasin transfers. In contrast, in central California, mutual companies were formed without federal supervision. In this region, water can be sold or leased for use in any land that may be irrigated in the system (1).

In New Mexico, mutual companies incorporate practices brought to the southwest by the Spanish. For example, under New Mexico’s law, ditches that are neither private nor incorporated but have more than two owners are “community acequias” in the absence of an agreement to the contrary.

A mutual company can be either unincorporated or incorporated. The former, in its simplest form, is merely an informal agreement among a small group of neighboring farmers to operate jointly irrigation facilities. More formal arrangements can be made under “articles of association” that set up a company organization with bylaws to govern the rights and obligations of its members and the management and operation of irrigation facilities.

In 1950, 69% of the irrigation cooperatives operating in the western states were unincorporated. Of these, the largest number (1,957) was in Colorado; the next largest group (994) was in Montana. The widespread popularity of unincorporated companies attests to the fact that institutions based entirely on cooperation among irrigators can operate successfully.

However, unincorporated mutual companies face many disadvantages. In particular: (1) The members of an unincorporated company are joint owners of the irrigation works, and all partners must consent unanimously to incurring debts, executing contracts; (2) individual members may be held liable for the debts of the enterprise; and (3) there is no practical way of compelling members to contribute to the operating costs.

These disadvantages have led to the incorporation of many mutual companies. This procedure consists, in general, of filing “articles of incorporation” with the appropriate state agency. The enterprise then becomes a “body corporate,” with the authority to hold property in the corporate name and to exercise the powers given to corporations in that state. The “articles of incorporation” also specify the following powers to be exercised by the corporation: number and terms of office of its governing body and number of shares of capital stock. They also give the board of directors the authority to enforce regulations concerning delivery of water, care and operation of the irrigation system, time and method of payment for water and duties of the operating employees.

The main benefits that mutual irrigation companies gain through incorporation are the following:
1. The corporation, as a legal entity, can act in its corporate name without first obtaining the consent of all its members.

2. The board of directors, elected by the shareholders, has the authority to conduct the affairs of the enterprise and to enforce the payment of obligations by the shareholders.

3. The company is in a better position to borrow money because it can pledge the assets of the company as collateral.

Unlike public irrigation districts, mutual companies cannot float bonds, do not have the power of eminent domain, and cannot levy land assessments. They are not legally eligible to purchase water from federal and many state wholesalers. Thus, they depend mostly on their own integrated supply. Also, in general, they may not sell water to the outside public. The latter impediment often arises from charter provisions (and state water rights’ doctrines) that makes water rights appurtenant to specific parcels of land held by the shareholders. However, even when provisions of this type are not present, the outside sales become subject to the limitations imposed on privately owned public utilities (4). In fact, if outside sales become important, the mutual company may risk being declared a public utility and, thus, become subject to the set of regulations discussed in the next section.

Commercial Water Companies.—The mechanisms that govern the operation of commercial water companies are relatively simple: individual proprietorships operate, as such, under the general state laws while privately owned public utilities engaged in the water industry are established under federal and state laws governing private corporations.

Privately owned public utilities are especially restricted in that they must acquire franchises to provide services to defined areas and cannot refuse to serve customers in those areas. Also, the rates they charge for the water they deliver are regulated by the public utilities commission of the state in which they operate. However, unlike mutual companies, they have the power of eminent domain and can issue bonds (1,4).

Historically, commercial water companies have played an important role in the development of irrigation, as was discussed before private irrigation companies emerged in the latter part of the nineteenth century, usually in conjunction with land promotions. However, at present, commercial companies do not play a prominent part in the development and distribution of irrigation water.

As Bain, et al., points out (4), it would appear that commercial water companies, natural monopolies facing a demand that is relatively inelastic in the short run, should be successful. However, they exhibit numerous weaknesses:

1. Although they are the only feasible suppliers of water to the farmers, they are also its only customers.

2. The water companies are often caught between customers who insist upon regular service and sources of supply that are naturally uncertain.

3. The state public utilities commissions are often hostile in setting the water rates.

4. Their limited legal powers (compared to those of public districts) often lead to their replacement by stronger agencies when their customers decide to expand their water supply systems.
For these reasons, commercial water companies have almost disappeared. For example, in California, only one private irrigation company has survived.

**Summary and Conclusions**

Table 1 summarizes the major characteristics of irrigation enterprises and shows the major differences among the principal types of agencies. Most important, it shows that these agencies differ in the way they finance their operations, obtain water supplies and control ground-water withdrawals. Thus, studies which group all agencies into one class and give these the power to

<table>
<thead>
<tr>
<th>Formation</th>
<th>Management</th>
<th>Voting</th>
<th>Outside regulation</th>
<th>Power of eminent domain</th>
<th>Bond issues</th>
<th>Land assessments</th>
<th>Water charges</th>
<th>Profit making</th>
<th>Supplies of water</th>
<th>Direct regulation of groundwater withdrawals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public district</td>
<td>special legislative act or landowner petition</td>
<td>board of directors</td>
<td>all landowners</td>
<td>Public agencies</td>
<td>yes</td>
<td>government bonds</td>
<td>yes</td>
<td>no</td>
<td>own supplies</td>
<td>groundwater management districts only</td>
</tr>
<tr>
<td>Mutual company</td>
<td>articles of incorporation</td>
<td>board of directors</td>
<td>shareholders</td>
<td>none</td>
<td>no</td>
<td>none</td>
<td>yes</td>
<td>no</td>
<td>own supplies</td>
<td></td>
</tr>
<tr>
<td>Commercial company</td>
<td>articles of incorporation</td>
<td>board of directors</td>
<td>shareholders</td>
<td>Public agencies</td>
<td>corporate bonds</td>
<td>Public agencies</td>
<td>yes</td>
<td>yes</td>
<td>own supplies</td>
<td>no</td>
</tr>
</tbody>
</table>

*In California, all waters.

*b Must comply with general State and Federal laws.

*c As long as no important sales to nonmembers take place.

*d Incorporated.

control all surface and ground-water releases provide an unrealistic oversimplification of the actual process of distribution of irrigation water. For example, only public irrigation districts which also control ground-water withdrawals—a small fraction of all irrigation agencies—have the powers to engage in the actions envisaged by these studies. Other public irrigation districts can only control ground-water withdrawals indirectly: by increasing the supply of surface water or by pricing techniques. Mutual and commercial companies may do so only by increasing the supply of surface water.

This conclusion pinpoints the weakness of the phrase “conjunctive management
of surface and groundwater." Indeed, as long as groundwater diversions are unrestricted, the conjunctive nature of the management is very tenuous, since most basin managers may affect only the rate of ground water by indirect means. Thus, conjunctive use "modelers" should modify their proposed objective functions to include only those decision variables controlled by the agency under study.

This paper answers the two questions posed in the introduction, but leaves two important questions partially unanswered:

1. What are the ideal powers of an irrigation enterprise?
2. How should an irrigation agency attempt to alter the water demands of individual farmers?

The first question raises the problem of the tradeoff between efficiency and local control. In general, the operation of water distribution will be more efficient when the irrigation agency controls both surface and ground-water releases. However, the granting of additional powers to these agencies often conflicts with the objective of local control over the distribution system and with the individualism of farmers. This tradeoff could form the focus for a future study on this subject. The second question is clearly a question for further research.

Acknowledgments

This study was carried out with funding from the U.S. Office of Water Research and Technology under grant number 14-34-0001-9430.

Appendix.—References


