# ISSUES IN WATER ALLOCATION: WHO GETS TO USE HOW MUCH FOR WHAT?

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Nationally when compared to all other water-using sectors of the United States economy, irrigated agriculture accounted for almost half of all withdrawals of freshwater, and more than 80 percent of all consumptive use of freshwater in 1975. Because of its conspicuous role as the predominant user of water in the United States, irrigated agriculture has become the focus of much scrutiny and policy discussion as the combined pressures of population and economic growth create stress on the nation's water resources and on the nation's fiscal resources.

What issues must be resolved as growth in population and economic activity generate competition with agriculture for water resources? What are the implications for public policy? What should be the role of public policy education in context of these issues and their resolution?

## Water and Irrigation

The United States has roughly 422 million acres of cropland. Of the 51 million acres of agricultural land under irrigation, about 41 million acres in cropland. Thus, about 10 percent of the nation's harvested cropland is irrigated. About 90 percent of this irrigated acreage is located in 17 western states. Most western states irrigate at least half their harvested cropland. In the east, only Florida approaches that proportion and 12 other eastern states irrigate only 1 percent or less of their harvested cropland.

The concentration of irrigated acreage in the west is not surprising. The primary purpose of irrigation is to compensate for lack of rainfall and lack of rainfall characterizes the arid climate of much of the west. Rainfall in the east is generally abundant. Irrigation in the east, therefore, serves a different purpose — as insurance against temporary drought or compensation for the poor ability of some soils to retain water.

The outlook for irrigation in the United States is dominated by an inherent disparity between water supply and irrigation demand. Ag-

riculture accounts for 90 percent of consumptive water use in the west used to irrigate about 40 million acres. But renewable water supplies available locally are inadequate to satisfy that level of water demand for precisely the same reason that water demand for irrigation is so strong in the first place — it doesn't rain much in the west relative to the moisture requirements of most crops.

Largely because of irrigation, water consumption in the west exceeds mean annual streamflow in central and southern California, most of Arizona, New Mexico, eastern Colorado, and the western parts of Texas, Oklahoma, Kansas, and Nebraska. This shortfall in renewable supplies has been met in part by groundwater withdrawals — withdrawals that exceed recharge in an average year by more than 20 billion gallons per day.

The result is a depletion or mining of available groundwater supplies. The areas where groundwater mining is known to be occurring on a large scale include the southern Ogallasa Aquifer Region of western Texas, Oklahoma, and Kansas; the Gila River Basin portion of southern Arizona; and several of the agricultural valleys of central California.

Groundwater mining has received greatest attention in areas where growing urban populations are dependent on declining groundwater reserve. The governor of Arizona testified in 1976 before a congressional committee examining the need for the huge Central Arizona Project to construct canals to carry water from the Colorado River to Phoenix and Tucson. He reported that Arizona confronted a water emergency — withdrawals from groundwater in the Phoenix area exceeded recharge to the aquifer by two and one-half times, and water withdrawals from groundwater in Tucson (which is strictly dependent on wells) exceeded recharge to the aquifer by five times. The Central Arizona Project has been termed a rescue project. Similar proposals to rescue irrigated agriculture on the high plains of Texas have been rejected.

In eastern states, especially in Florida and in coastal areas, withdrawals from aquifers at rates exceeding freshwater recharge can cause the interface between freshwater and saltwater in aquifers to move inland and upward. The result is usually a reduction in freshwater capacity in the aquifer. A transition from freshwater depletion to freshwater recharge cannot readily flush salt out of the aquifer once saltwater intrusion has occurred.

### Irrigation Subsidies

Agricultural development in the west received a boost from the federal government with passage of the Reclamation Act of 1902. Designed as an economic development program, the Act provided that funds from sale of public lands be used for irrigation development in the west. By 1982 water from 150 Bureau of Reclamation projects

irrigated nearly 12 million acres in 17 western states — using 326 storage reservoirs, 355 diversion dams, 14,320 miles of canals, and 34,290 miles of laterals.

Historically, irrigation water from Reclamation projects was provided at prices considerably below the total cost of delivery. The resulting subsidy to irrigated agriculture was addressed by the Reclamation Reform Act of 1982 which limited the federal subsidy on project water to farms of less than 960 acres.

With the prospect that foreign and domestic demand for United States agricultural products will remain soft for at least the remainder of the 1980's, renewed interest has emerged in the apparent inconsistency of federal programs that, on the one hand, are designed to restrict production and raise prices and farm income and, on the other hand, are designed to increase productive capacity of the agricultural resource base. A recent United States Department of Agriculture (USDA) study ordered by Congress produced a suggestion that full-cost pricing of irrigation water and limits on water use would be rational measures to reduce program inconsistency.

A perverse question of fairness arises. Is it fair to induce irrigated farming in arid areas, induce families for two or more generations to stake their livelihood on farming with federally subsidized water, and then abruptly "change the rules" in a manner that threatens financial hardship for individual farms involved?

**Water Rights Issues**

Steady growth in population and economic activity in the Upper Colorado River Basin and throughout the southwest has placed growing stress upon the water institution of the region. The nineteenth century influx of Anglo population included many miners whose operations in the upper reaches of the region's watersheds usually required the storage and diversion of streamflow to locations some distance away from the main water course. In order to secure their claims to water for this purpose, miners evolved the prior appropriation system of water rights. This system was also compatible with the needs of farmers and was eventually codified into the laws of the western territories and states.

In more recent years, Indians have issued competing assertions of rights to water. These claims are usually lumped together, in discussion of water rights issues, under the term "Winters Doctrine rights". The Winters Doctrine was enunciated in a 1908 opinion delivered by the United States Supreme Court in the case of Winters versus the United States. The essence of the doctrine is that the United States, in creating Indian reservations, also reserved waters appurtenant to reserved lands sufficient for the purposes of the reservation. This has been construed to include sufficient water to irrigate all the irrigable acreage on the land.

Paralleling the Indian Winters Doctrine is the Federal Reserved Rights Doctrine which, simply stated, asserts that whenever the United States sets aside land for specific purposes there is implied a concomitant intent to reserve sufficient water to fulfill the purpose for which the land was set aside.

Increased pressure to recognize federal reserved rights and, especially, Indian Winters Doctrine rights, are significant because they arise after the water within the basin had been fully appropriated by other users. Reserved rights and Winters Doctrine rights are in conflict with prior appropriation system of water law also in place within the region.

### Interjurisdictional Transfers of Water

The inherent temporal and spatial disparity between water demand and water supplies has given impetus to major projects for water impoundments, storage, and transfer. The Central Arizona Project is a large and well-known example. It involved interstate transfers of water and required extensive negotiation and litigation over interstate compacts to resolve water rights and other administrative issues.

Spatial and temporal disparity of water supply and water demand is not just a problem of arid regions, however. Due to the existence of highly concentrated demand, transfer proposals arise in areas of general water abundance in eastern portions of the United States. Transfer of water from one political jurisdiction to another, for example, has been a practice of long standing in the case of water supplies for New York City. The Norfolk area of Virginia has faced resistances to proposals to keep pace with growing urban water demand by importing water from neighboring counties. Florida's "water wars" consist of heated disagreement over the appropriateness of further measures to develop well fields in neighboring rural counties for delivery of water to fast-growing Tampa, St. Petersburg, and other coastal cities.

### Policy Issues and Institutional Reform: Opportunities for Education

Agriculture, along with other water users and water managers, will be affected by a long-term transition from traditions of water abundance to the tradition of greater scarcity that will emerge in response to growth in demand for water. Policy issues must be resolved, and opportunities exist for institutional change to facilitate the transition. In some instances, measures that resolve conflicts without doing violence to generally held concepts of fairness will test the fiber of social, legal, and political systems.

Broadly speaking, the role of extension is to deliver information to decision makers along with educational materials designed to aid decision makers in incorporating the new information into use. Public policy education can help to reduce conflict by reducing uncertainty

about the probable consequences of pursuing one set of policy options versus any other set in the process of resolving policy issue.

Water policy education programs can be patterned after the public policy research and education model outlined as early as 1955 by J. Carroll Bottum and endorsed by the Extension Committee on Policy over the years. This method of extension education on public policy issues uses four steps. Step one identifies the problem, explains the situation, and generally develops sufficient background to permit identification of the problem giving rise to issues of public policy. Step two sets forth all the significant and recognized alternatives which might be suggested for solving the problem. Step three analyzes the economic consequences of each of the significant alternatives. Step four provides for a situation in which the learners, individually or collectively, may apply their values and formulate their own judgment as to which policy alternative to support.

As a practical matter, delivery of a good extension education program on water management and policy is difficult to do on short notice or on an ad hoc basis. Moreover, the task of water policy education is not likely to be "done" in the foreseeable future in the sense that all educational needs are satisfied and all policy issues resolved.

The problem situation underlying water policy issues is complex. Issues vary in context from place to place. Individuals interested in modifying or implementing state or regional water policies discover a need to understand and assimilate terminology, concepts, and factual material from a variety of sources and disciplines.

In other words, step one of Carroll Bottum's policy education approach should probably receive a substantial commitment of applied research and educational efforts. The reasons are obvious. Arguments following or opposing regulation of consumptive water use as a measure to resolve problems resulting from, say, overlapping cones of depression in groundwater aquifers will have little substance without referring to aquifer levels, recharge rates, potentiometric surfaces, correlative rights, conveyance loss, evapo-transpiration, and a host of other topics from several interrelated subject matter areas. Arguments favoring (or opposing) interjurisdictional transfers of water also will be bound in similar terminology. Data will be needed on patterns of water use over time, space, and economic sectors and on the economic feasibility of demand reductions versus the technical and economic feasibility of water supply augmentation, and information will be required on existing rights or entitlements to designated water sources.

From an economic perspective the information needed to develop the problem identification includes data terminology and concepts pertaining to:

(a) economic, engineering, and natural science aspects of water supply;

(b) economic, engineering and natural science aspects of water demand; and
(c) water rights, water law, and water resource institutions.

To assimilate facts in a decision framework, learners require an analytical view of water problems and water policy. Therefore, it is important to portray the legal framework for water rights as a functional mechanism subject to change, rather than as a mysterious, immutible code to be imposed but not questioned. Similarly, attitudes concerning water needs and water requirements must be exposed to the opportunities for tradeoffs inherent in the realities (and relativity) of economic demand. A better understanding of costs related to water supply development will permit learners to weigh the inconveniences of reduction in water demand against the costs of further water supply development. This will allow escape from the frequently imposed technical fix as a response to imbalance between water supply and water demand.

Researchers and extension educators can productively work together to interpret the situation within which policy issues take shape. A series of extension fact sheets pertaining to dimension of water policy issues will serve the dual purpose of publication payoff (upon which the professional reward system is keyed) while creating reference materials of benefit to extension audiences.

Steps two and three of Professor Bottum's approach to public policy education call for a mixture of skill, experience, and professional expertise, part of which must be obtained through close contact with influential figures in the policy arena. Both research and extension specialists must invest the necessary time to establish and maintain such contacts. Realistic policy options cannot be invented in isolation of the personal, social, legal, and political realities of the policy process.

Audiences may include farmers, homemakers, elected officials, or a committee of concerned citizens. The credibility and visibility of the extension educator is on the line each time a group is addressed. It is imperative that all audiences be treated as important audiences, whether or not they are traditional.

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