# Water Resources for Agriculture

## Will the well run dry?



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When the well's dry, we know the worth of water, said Benjamin Franklin two centuries ago. It's hard to imagine the U.S. well running dry—more than 4.2 trillion gallons of water fall as rain, snow, sleet, or hail on the 48 States each day. That's over 20,000 gallons a day for each American.

Over 99 percent of the earth's vast water resource is of little use to mankind—it is either salty or is locked up in polar ice caps. The fresh water we use moves through the water cycle, from atmosphere to land and sea and back to the atmosphere. Less than 1 percent of the earth's total water supply is stored in lakes and rivers, as soil moisture, or in aquifers (underground layers of porous rock containing water). That's a valuable 1 percent; it's the part that's used for almost all human needs, and agriculture is the biggest user.

Despite the growing keen competition for water among various rural, urban, and industrial uses, America's water supply does seem assured, at least to the year 2000. That supply will likely continue to support the world's most modern and technologically advanced agricultural industry—*but, in areas of low precipitation, the supply and quality of water may limit the rate of economic growth.*

**How We Get It**

The 4.2 trillion gallons of precipitation falling on us each day translates into an average of about 30 inches of water a year. This ranges from an average of 10 inches in many areas of the West to about 100 inches in the Olympic Peninsula area of the Northwest.

Of these 30 inches of precipitation

- 21 inches evaporates from land or water surfaces or transpires from plants. Some 40 percent of the 21 inches is lost through evaporation; the rest of it forms the lifegiving moisture for most of our crops and forests.
- The other 9 inches of precipitation is natural runoff. It amounts to about 1.2 trillion gallons a day which accumulates in lakes, streams, and rivers. Runoff has many uses, including irrigation and water power, and is considered the renewable supply each year.

We also have groundwater reserves equal to about 30 years of runoff.

Our annual water runoff—the renewable supply—does not change much. But, while our population has grown about 62 percent since 1940, withdrawal against this supply has almost tripled.

We can help solve some problems of water supply and quality by using treatment plants for waste water, recycling water in industrial plants, and building additional storage and treatment facilities. Water supplies can be increased through weather modification, desalinization, modifying the evaporation of water from reservoirs, and watershed management.

Weather modification promises increases in local supplies, particularly in mountainous areas, at a relatively low cost. Desalinization is still too costly to be economical, especially for agriculture. Monomolecular film has been used somewhat successfully to reduce evaporation from reservoir surfaces, but it tends to be destroyed by wind and wave action. Management of vegetative cover can increase runoff in a watershed but it tends to increase erosion. The wise, efficient, and conservative use of water in effect increases available supplies and is a good alternative to direct efforts to develop additional supplies.

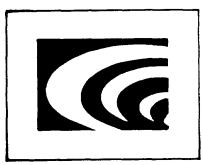
**Will the Well Run Dry?**

As a Nation, we use only a small part of the water available to us. Water consumption in 1965 was just 6 percent of our renewable sources; it is estimated that it will reach 9 percent in 1980, and 11 percent in the year 2000. So, there will be plenty, in an overall sense. But there may be trouble in store for some regions; poor water quality and limited quantity could hold back economic growth.

- Water quality problems are serious in parts of the Northeast and some areas of the West. For example, about half of the irrigated area in the 17 Western States now has salinity problems caused by poor soil drainage characteristics or by insufficient water use in irrigation, or sometimes by both.
- Limited supplies threaten the West and Southwest. In the lower Colorado River region—where population is rapidly growing —water demand already outreaches existing water supplies. In the Central Plains, some areas are also depleting groundwater supplies.

The way we have developed our water supplies impacts profoundly on the location and productive capability of U.S. agriculture. Because of changes in farm policy and irrigation development, cotton production has tended to shift from the Southeastern States to the Mississippi Delta, the High Plains of Texas, and Arizona and California. Potato production has tended to shift from Maine and other Eastern States to the Pacific Northwest because of the comparative advantage that irrigation has given this region.

Sightly more than 36 million acres of cropland were irrigated in 1969 in 17 Western States and in Mississippi, Arkansas, Louisiana, and Florida. This figure may increase by nearly 5 million acres by 1980 and 7 million acres by the year 2000, as authorized Federal projects and privately financed irrigation systems are installed. One of the problems of irrigation development is that while additional agricultural production capacity is created, competition among water uses intensifies as urban, industrial, and recreational demands for water grow.



Continued economic development will bring about the need to adjust patterns of water use, particularly in arid regions. Higher levels of growth may well hinge upon increasing the efficiency of water use and reallocating supplies among agricultural, municipal, industrial, recreational, and waste disposal uses. Water devoted to recreation is expected to receive high priority in many rural areas, since recreation enterprises may generate more economic activity than agriculture. In fact, higher valued uses compete strongly with agriculture for limited water supplies in regions beset by water shortages. The number of these conflict areas will continue to grow.

Water is ample but we cannot afford to waste it. In the future, agriculture—mostly irrigation—will continue to be the main use for water. Other uses, especially for steam-electric power, will also grow rapidly. The increasing competition for water among agricultural, urban, and industrial uses will make the management and development of water resources an important issue in public policy.

For a more detailed examination of our land and water resources write for:

- *Farmland Resources for the Future, AIB-385.*
- *Our Land and Water Resources, Current and Prospective Supplies and Uses, MP-1290.*
- "American Agriculture: Its Capacity to Produce," *Farm Index.*

Send your request to: ERS Publications Services, Room 0054-S, U.S. Department of Agriculture, Washington, D.C. 20250.

## Who's Using All That Water?

Rural people are the biggest users. Nearly 85 percent of all water consumed is used in rural areas—for agriculture, homes, industry, and other purposes. Agriculture is the largest single user in the rural areas—in fact, in the whole Nation. It accounts for at least half and, in many cases, nearly all water consumption in 13 of the 18 water resource regions of the conterminous 48 States. There is a large and still growing demand for irrigation water.

One out of 10 U.S. farms and ranches is irrigated.

- In the arid West, irrigation often makes the difference between high and low production and, of course, high or low farm income.
- In the East, irrigation can prevent crop failures, increase yields, and improve product quality, even during average rain years.
- Water is also used in agriculture for frost protection and to control high temperatures on specialty crops.

## Water Problems—From Quantity to Quality

While Americans have plenty of water, it is not always in the right place and the right time. Also, the quality of the water is sometimes so poor that it's useless.

Distribution of water poses important management problems. For any one region or location, precipitation can vary widely from season to season and from year to year. The Northeast, Southeast, and Northwest generally have the most dependable supplies. The least dependable supplies are in the Southwest and the Great Plains. But even in areas of high precipitation and runoff, a series of dry years may occur, resulting in serious drought problems such as those gripping the Northeast from 1961 to 1966.

While groundwater use is vital to the economies of some areas, it tends to decrease as pumping from greater depths becomes uneconomical, or as local reserves are exhausted. Some areas of the Texas High Plains have already exhausted a good share of their groundwater through irrigation, and some farmers in that region may have to go back to dryland farming.

Water quality must also be considered. The two major natural impurities are sediment and dissolved minerals. Moreover, man-caused pollution consists primarily of waste discharge from domestic and industrial sources; sediment and other diffused wastes in runoff from urban, mined, industrial, and agricultural lands; and sediment from logging operations and road construction.

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