The impact of salt on Delta agriculture

The Sacramento-San Joaquin Delta is at the heart of California's agriculture and water. The state's two longest rivers, in addition to several smaller ones, meet in the Delta about 50 miles northeast of San Francisco. These rivers combined drain more than one-third of the state. The vast lowland area of the Delta is distinguished from the rest of the Central Valley by its organic soils, the tidal influence on the stream channels, and the low elevation of the land. About 500,000 acres of land are cultivated in the Delta, of which over 125,000 acres are organic. Corn is the major crop. Other prominent crops, all of which are more salt tolerant than corn, are wheat, barley, and asparagus.

Even though nearly 22.5 million acre-feet of fresh water flow through the Delta in a normal year, water quality is the dominant issue. Two major water distribution systems, the State Water Project operated by the California Department of Water Resources and the Central Valley Project operated by the U.S. Bureau of Reclamation, withdraw water from the Delta for use elsewhere in the state. If water withdrawals become excessive, the salinity of the remaining surface waters will increase as seawater, intruding by tidal action from San Francisco Bay, mixes with the fresh water and as water is reused within the Delta. If the surface waters become too saline, continued irrigation in the Delta will lead to salination.

To determine the maximum permissible concentration of salts in the surface waters without loss in agricultural production, a major research project was conducted by a team of scientists from the U.S. Salinity Laboratory of the U.S. Department of Agriculture and specialists from the University of California Cooperative Extension. The project was cosponsored by the California State Water Resources Control Board and the California Department of Water Resources. The three goals of the project were to: (1) establish the salt tolerance of corn in the organic soils of the Delta; (2) study the salination of organic soils to establish the relation between salinity of irrigation water and salinity of soil water within the crop's root zone; and (3) determine the salt sensitivity of corn at various stages of growth. The first two goals were met by a field experiment, conducted near Terminous, California, from 1979 through 1981. The third objective was met by a series of greenhouse experiments at the U.S. Salinity Laboratory, Riverside, California.

For clarity, the method of measuring the concentration of soluble salts in water needs some explanation. Traditionally, salinity has been measured in terms of electrical conductivity (EC) in units of millimhos per centimeter (mmho/cm). To comply with the International System of Units, we have adopted the measurement of decisiemens per meter (dS/m). One mmho/cm equals 1 dS/m, which is the electrical conductivity of a solution containing approximately 640 ppm total dissolved salts. In Delta surface waters, a typical concentration is 130 parts of dissolved salts per million parts of water. This is equal to an EC of 0.2 dS/m.

After the experiments described here were completed, a series of tests were conducted to establish the amount of water required to reclaim saline organic soils by several different procedures. These results will be the subject of a later report.

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