Agricultural Irrigation in This Drought: Where is the Water and Where Is It Going?

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In the midst of its fourth year of drought, California now faces an estimated reduction in surface-water availability of 8.8 million acre-feet (maf) out of 29 maf in agricultural applied water statewide. However, groundwater, the buffer water supply during drought, is replacing about 6.2 maf of surface water via additional pumping. This increased groundwater pumping is in addition to the 1.5 maf of annual average groundwater overdraft in the Central Valley. The net reduction of 2.6 maf in the total supply in 2015 may result in about 564,000 acres fallowed statewide, or about 120,000 more acres than last year's fallowing estimates.

California's historical climate is prone to deep and long-lasting droughts. Even in normal years, most of the precipitation occurs during the winter in the northern, eastern and coastal parts of the state, whereas most of the water demand occurs in the summer in the southern Central Valley and the largely urbanized areas on the coast. As a consequence, California has one of the most engineered water supply systems in the world that includes dozens of surface-water reservoirs, aqueducts, pumping stations and other infrastructure, with the Sacramento-San Joaquin Delta as the hub.

Water sources for agriculture in the Central Valley include the Central Valley Project, the State Water Project, local stream diversions, and groundwater pumping. Figure 1 shows the approximate breakdown of water supply for an average year.

Water condition reports from the California Department of Water Resources (DWR) this year indicated slightly higher precipitation in the Sacramento Valley compared to last year (75% versus 56% of the average by June 18), and reservoirs were around 50% of historical average storage by this time of the year. However, the reservoirs in the San Joaquin Valley and Tulare Lake Basin are near all-time lows and precipitation was only 45% of the historical average.

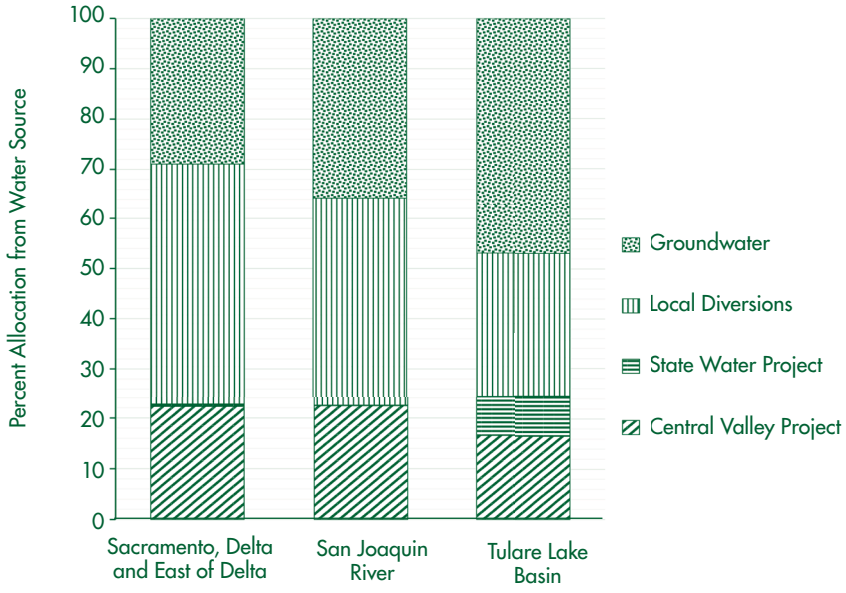
The drought impacts are especially severe because California's population and share of permanent crops have both increased. Furthermore, the lack of water in 2015, together with impacts of additional groundwater pumping that occurred in 2014, may lower the water table levels enough to decrease pumping capacity in some areas.

Every year, the state and federal water projects announce deliveries to water districts. Likewise, local water districts across the state inform their member farmers about expected water allocations. Growers, in turn, make planting decisions based on these expected water deliveries.

In the early spring of 2015, ERA Economics conducted a survey of irrigation districts to assess the expected water deliveries for the irrigation season. The total water shortage is expected to be close to 8.8 million acre-feet (maf) statewide. Farmers and irrigation districts are able to partially offset some of the surface water shortage by pumping additional groundwater. Additional groundwater pumping in 2015 is expected to be 6.2 maf, resulting in a net water shortage of 2.6 maf. The map in Figure 2 shows a breakdown of net water shortages by basin.

The region most affected by water availability is the Tulare Lake Basin, which includes parts of Fresno, Tulare, Kings, and Kern counties. This area has the lowest precipitation and relies heavily on water imports from other basins and groundwater pumping, yet it provides more than 50% of all agricultural revenues in the Central Valley. The

Figure 1. Water Sources for the Central Valley in a "Normal" Year



Source: Author's calculations using CA Department of Water Resources land and water use data