

Economic Analysis of the 2015 Drought for California Agriculture

Executive Summary

In 2015 California agriculture is facing its fourth year of severe drought. As in 2014, irrigation districts and farmers are showing more resilience to the drought than many had anticipated.

Groundwater substitution has again greatly reduced crop fallowing and job losses. Water trading and operational flexibility also have significantly reduced the costs of the drought, and preservation of the most valuable crops has helped buffer economic impacts.

However, the effects of drought are unevenly distributed over regions. In some regions with limited groundwater reserves the economic and employment impacts are very severe. In others, there is an increased cost of expanded groundwater use which is partially offset by high crop prices.

Just as the economic impacts of the drought have grown modestly since 2014, continuation of the drought to 2016 or beyond with similar intensity is likely to slowly erode the state's agricultural production and employment.

Table ES-1. Summary of impacts of the 2015 California drought

Description	Impact	Base year levels	Percent change
Surface water shortage (million acre-ft)	8.7	18.0	-48%
Groundwater replacement (million acre-ft)	6.0	8.4	72%
Net water shortage (million acre-ft)	2.7	26.4	-10%
Drought-related idle land (acres)	540,000	1.2 million*	45%
Crop revenue losses (\$)	\$900 million	\$35 billion	2.6%
Dairy and livestock revenue losses (\$)	\$350 million	\$12.4 billion	2.8%
Costs of additional pumping (\$)	\$590 million	\$780 million	75.5%
Direct costs (\$)	\$1.8 billion	NA	NA
Total economic impact (\$)	\$2.7 billion	NA	NA
Direct job losses (farm seasonal)	10,100	200,000 [#]	5.1%
Total job losses	21,000	NA	NA

* NASA-ARC estimate of normal Central Valley idle land.

[#]Total agriculture employment is about 412,000, of which 200,000 is farm production.

Our estimation of economic impacts controls for confounding factors. Changes in irrigation water deliveries, derived from reported deliveries and a survey of irrigation districts, were used to estimate the economic responses of farmers, including additional groundwater pumping, water market purchases, and planting and fallowing decisions.

By using changes in water availability to estimate economic impacts, we avoid problems from ascribing all changes in aggregate economic production and employment to the drought. Changes in business conditions, commodity prices and other factors also affect agricultural revenues and employment, regardless of hydrologic conditions. It is important to control for these factors to isolate the impact of drought. Table ES-1 summarizes our estimates of the impact of the 2015 drought.

California agriculture's resilience to surface water shortages is likely to continue through 2015. The ability to irrigate permanent crops with groundwater or marketed water will largely prevent the sector from more expensive fallowing of higher-valued crops and permanent crops. Some major conclusions:

- Surface water shortages of nearly 8.7 million acre-feet will be mostly offset by increased groundwater pumping of 6 million acre-feet. Groundwater offsets almost 70% of the drought water shortage. Virtually all water shortages will be in the Central Valley.
- Net water shortages of 2.7 million acre-feet will cause roughly 542,000 acres to be idled – 114,000 more acres than the 2014 drought estimate. Most idled land is in the Tulare Basin. Temperature control and other regulations may exacerbate the projected land idling, particularly in future years.
- Direct agricultural costs of drought will be about \$1.84 billion and 10,100 direct seasonal jobs. When multiplier effects are considered, losses to all economic sectors will be as high as \$2.74 billion and nearly 21,000 total jobs.
- The effects of continued drought through 2017 (assuming continued 2014 water supplies) will likely be 6% worse than in 2015, with the net water shortage increasing to 2.9 million acre-feet per year. Gradual decline in groundwater pumping capacity and water elevations will add to the incremental costs of a prolonged drought.
- Increased groundwater overdraft during drought will slowly deplete groundwater reserves at an incremental cost. New groundwater regulations could eventually reverse this trend and force groundwater basins towards sustainable yields. The transition will cause some increased fallowing or longer crop rotations, but will preserve California's ability to support more profitable permanent and vegetable crops through drought.

Suggested Citation: Richard E. Howitt, Duncan MacEwan, Josué Medellín-Azuara, Jay R. Lund, Daniel A. Sumner (2015). "[Economic Analysis of the 2015 Drought for California Agriculture](#)". Center for Watershed Sciences, University of California – Davis, Davis, CA, 16 pp.

Cover photo by Chris Austin