



California Almond and Drought

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The Scope of the Almond Growing in California

Spanning 500 miles throughout the Central Valley

100% of U.S. production

~ 6,500+ growers, 100 “handlers”

- 50% of growers have 50 A or less
- 90%+ are family owned & run

Over 80% of worldwide production

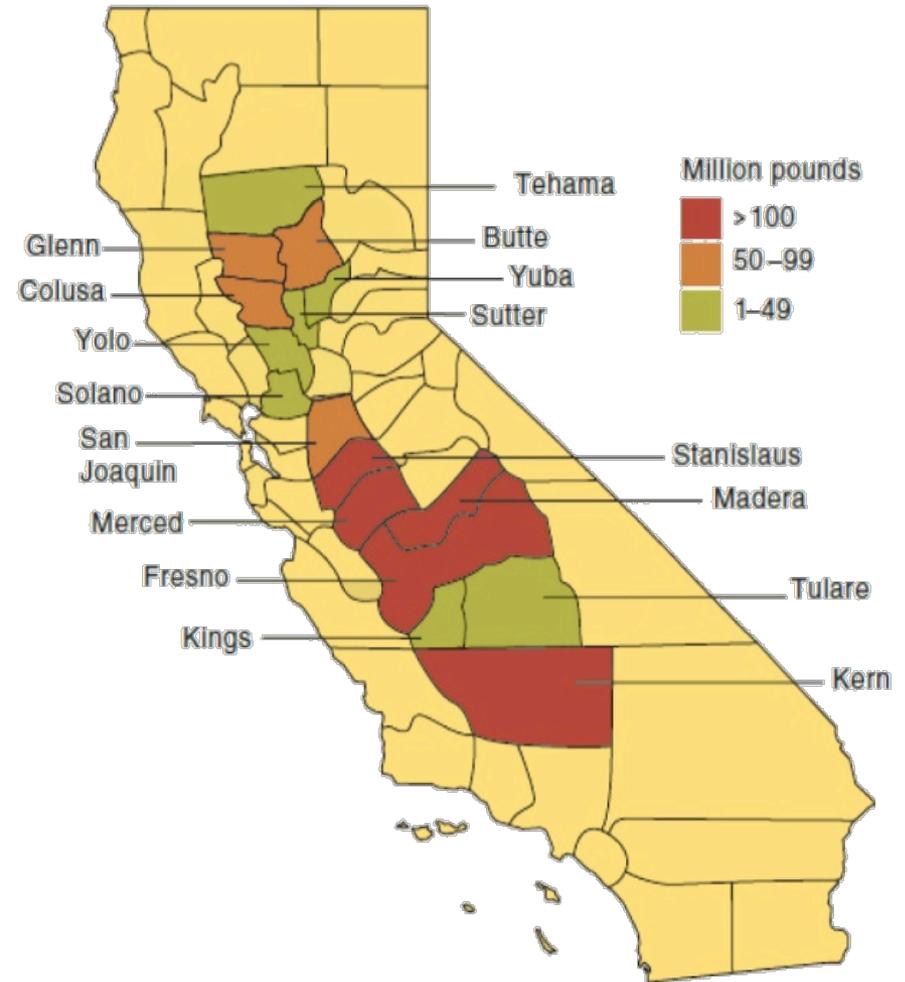
Top U.S. horticultural crop in export value

2012 farm gate value \$4.8 billion

ABC is a grower-enacted “Federal Marketing Order” established in 1950

- Represents growers and handlers (processors)

Operates under supervision of USDA

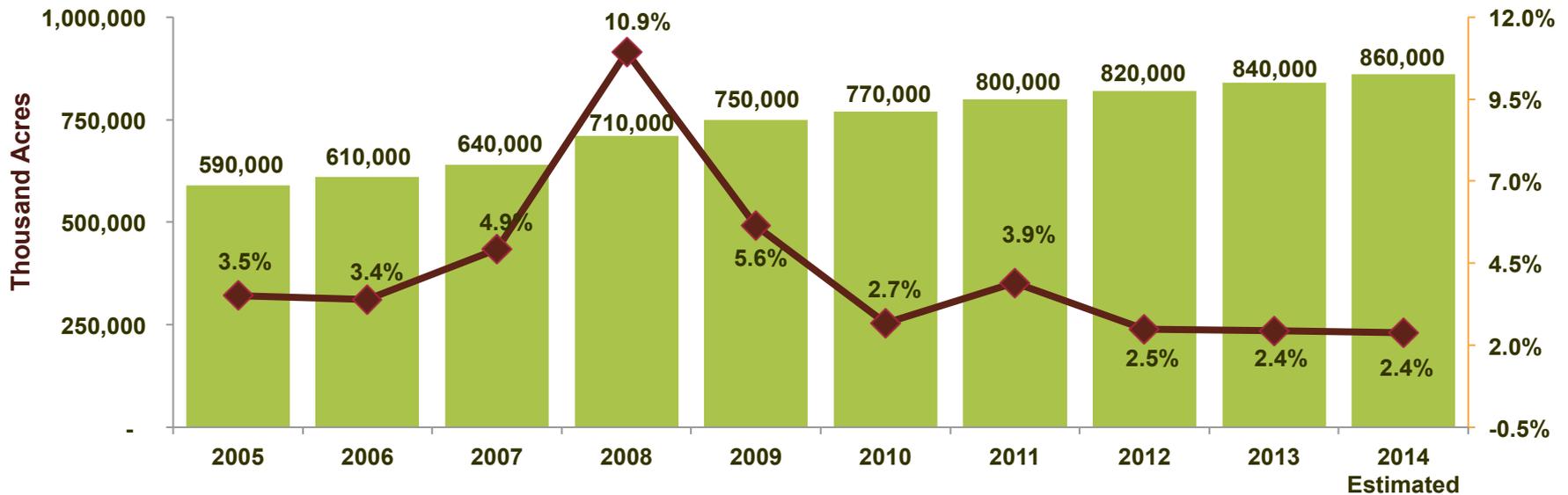


Trends in Bearing Almond Acreage



Almond Bearing Acreage Crop Years 2005 through 2014

■ Bearing Acreage ◆ % Change from previous year



Source: USDA Agricultural Statistics Service, Pacific Region (NASS/PR) 2013 Acreage Report

Research: Irrigation & Nutrient Management

Current Research: Defining a Central Valley Almond Water Needs/Yield Production Function Develop/fine tune

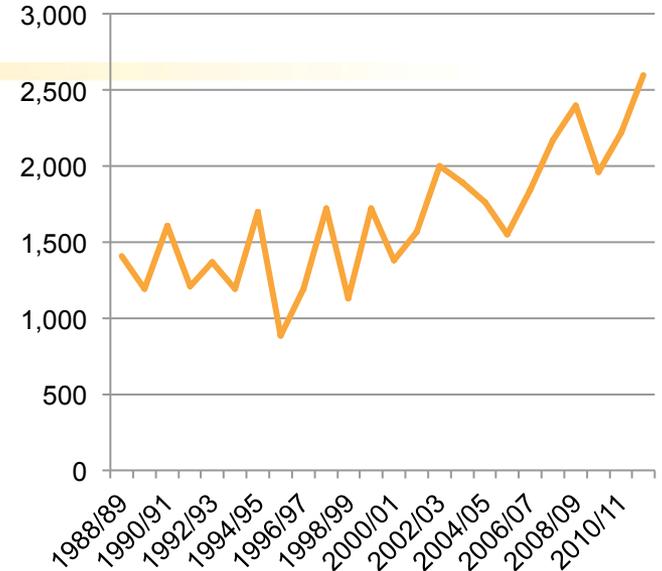
- Regional Evapotranspiration (ETs)
- % canopy ETs
- ROI for high-priced water: Water applied vs. production increase
- Seeking tree water status measures that don't involve taking leaf samples
- Seeking to develop irrigation systems that are account for spatial variability better.



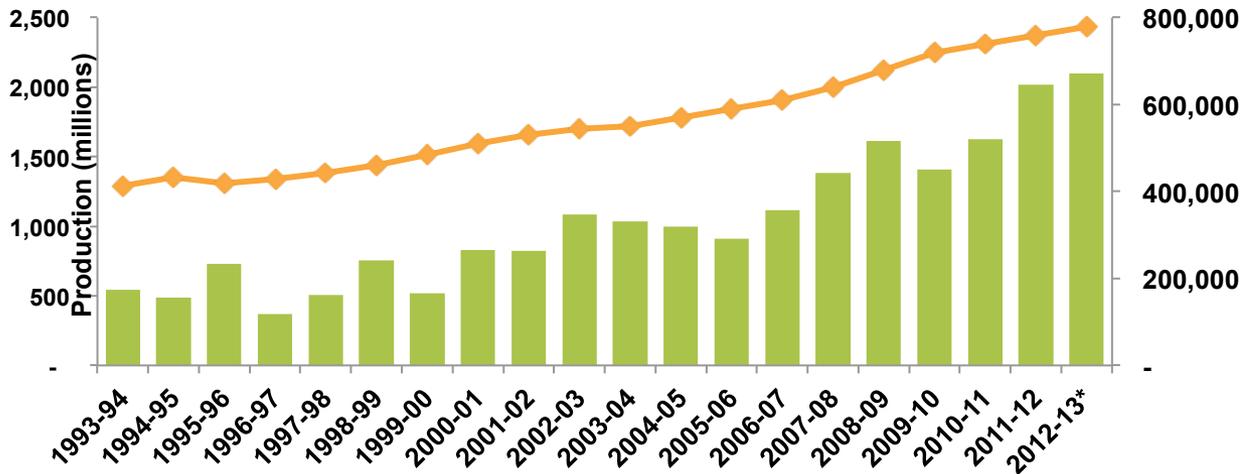
Bearing Acreage Increasing, More Efficient Production

- Almond growers now use 33% less water per pound of almonds produced due to shifts in management practices.
- 70% of almond orchards use micro-irrigation systems.
- 83% of growers use advanced technologies to schedule their irrigation based on the tree needs, and soil or weather conditions

Average Yield/A (Lbs.)

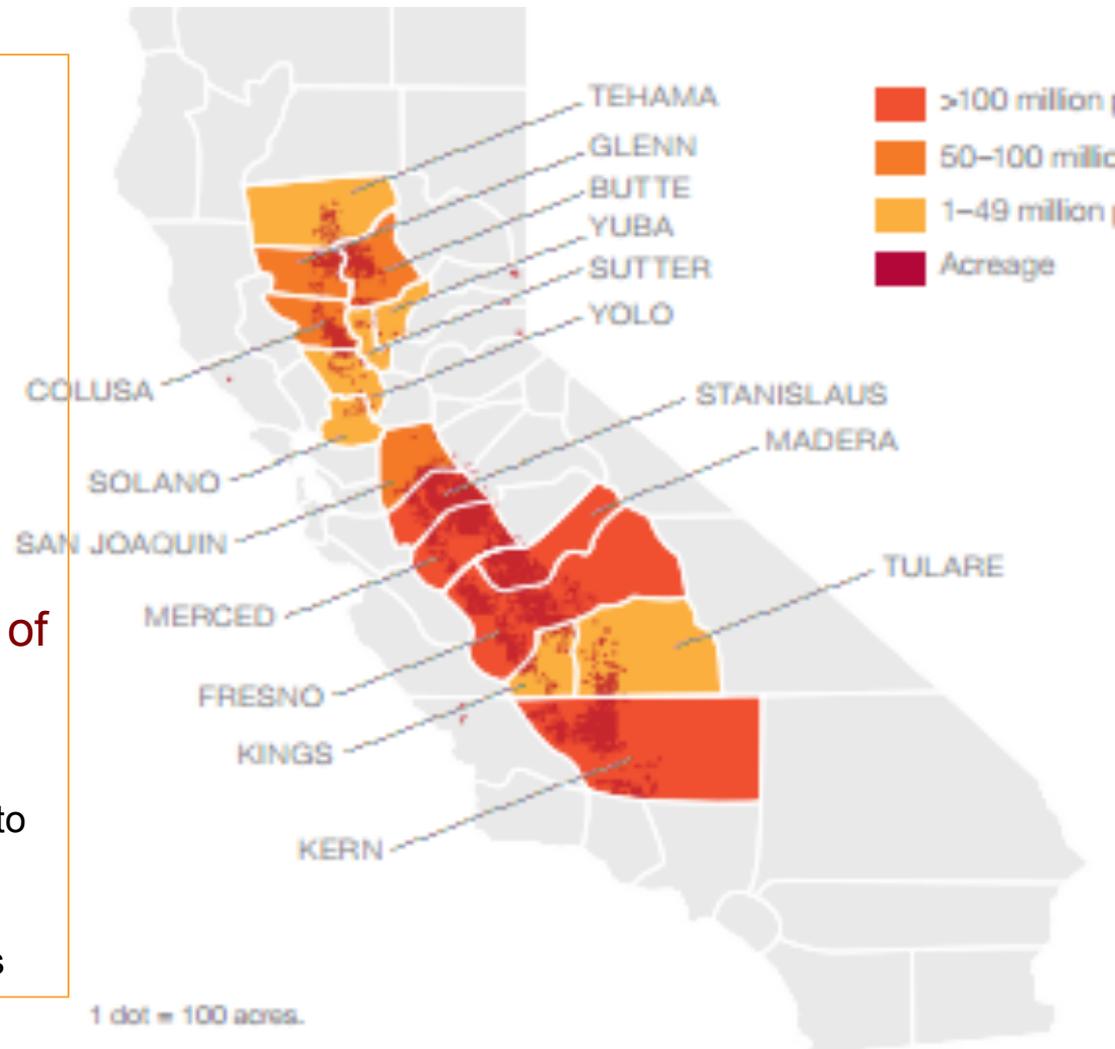


■ Production (Million Pounds) ◆ Bearing Acres



Drought Impacts on Almonds:

- 200,000-250,000 A in zero allocation (West Side)
- Increased use of ground water
- Buying water where possible, VERY HIGH PRICE
- Following annual crops
- Taking older, less productive orchards out of production.
- Apply % of water available as % of Etc over season
- Yields
 - 2014: currently on track to be similar to last year
 - 2015? Very stressed trees do not produce buds. So no bloom = no nuts next year.



Drought Impacts on Yield

Table 3. Nut weight, # nuts/tree, yield and statistical results for 2009 and 2010 (non-pruned trees only).

2009						
Irrigation	Nut weight		Nuts / tree		Yield	
	(g/nut)	(% control)	(#)	(% control)	(lbs/ac)	(% control)
40	1.16 a	100	7649	100	2441.3	100
10	1.03 a	90	6807	89	1892.2	78
5	0.96 a	84	7804	102	2021.8	83
0	0.71 b	62	5235	68	1030.0	42
2010						
Irrigation	Nut weight		Nuts / tree		Yield	
	(g/nut)	(% control)	(#)	(% control)	(lbs/ac)	(% control)
40	1.38	100	8148 a	100	2257.7 a	100
10	1.32	96	4404 ab	54	1349.3 ab	53
5	1.43	104	3217ab	40	1006.4 b	39
0	1.32	96	852 b	10	319.4 b	12

Ken Shackel et al, Drought Survival Strategies for
Established Almond Orchards. ABC Annual Report 2011

Where do longer term weather and climate predictions fit in?

Weather variability is a part of a grower's business.

Growers would like better tools to help predict irrigation needs, both on a daily/weekly level as well for the season.

Harder to see how they will use longer term predictions in their planning.

Main issue is how to communicate changes in variability or trends as variability is the nature of their business