Almond Water Production Function

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PROJECT SUMMARY

Objectives:

- Quantify kernel yield in lbs/inch actual ET (applied water + soil moisture depletion – leaching) under non-limiting fertility levels by varying depths of applied irrigation and total seasonal ET (all sites).
- Quantify the interaction of hull-split Regulated Deficit Irrigation (RDI) on the yield function. Use precision/variable rate irrigation scheduling to maintain uniform RDI plant stress across Hull Split RDI treatment replications (Kern Co. only).
- Using NO_3 and Cl^- movement in the rootzone to determine nitrogen and water use efficiency as a function of applied water (all sites).
- Assess long-term tree health and orchard profitability given differing amounts of applied water and scheduling methods (all sites).
- Assess the impact on ET and yield of "pulsed" vs. continuous irrigation (Kern Co. only).

Background and Discussion:

According to UC publications and trials in the 1980's and 1990's, almond crop water use (evapotranspiration or "ET") for micro irrigated orchards in the Central Valley was estimated to be about 42 inches. Average California yields were less than 1,500 lb/ac, with a 2,500 lb/ac kernel yield considered a rare exception.

In the 1990's, growers began adopting long pruning, closer spacing, and in some cases in Kern County, increased irrigation. Average Kern County yields surpassed 2,000 lb/ac in 2002 and has been around 2,500 lb/ac for 2010-11. A recent five year Kern County trial determined that a vigorous full canopy orchard can use as much as 56 inches of water over the season and produce over 4,800 lb/ac of kernels. ABC funded research has shown that these high productivity levels require a high level of canopy cover (80-90% light interception), and it is clear that for young trees a high water availability is key to early canopy establishment. However, for a mature canopy it is not yet clear whether high water availability and maximum water use are necessary for high yields, or desirable for sustainable orchard management. For instance, many high production orchards also see increased disease problems (e.g., hull rot and loss of lower canopy spurs and limbs), as well as an increased risk of Salmonella.

We have established orchard sites in Kern, Merced, and Tehama Counties, representing a range of environments and soil conditions, and have been imposing irrigation regimes over a fairly wide range of 70 -110% ET (about 27" – 56" seasonal applied water) for three seasons (2013-2015). At all sites, reduced irrigation is always associated with more stress (lower SWP). Nonpareil yields in the 100% ET treatment have varied between about 1,700 and 3,300 kernel pounds per acre, depending on the year and site. Taking into consideration the pre-treatment (2012) yields at each site, there has not yet been a trend of higher yield or higher yield per unit shaded area (%PAR) that is associated with increases in applied water at any site, indicating that irrigation treatments in the range that we are testing may require multiple years to affect almond yields.

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Project Cooperators and Personnel: Patrick Brown, Jan Hopmans, David Smart, Bruce Lampinen, Mike Whiting, University of California, Davis.

For More Details, Visit

- Poster location 67, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2016) at Almonds.com/ResearchDatabase
- 2014 - 2015 Annual Reports CD (14-HORT17-Sanden/Shackel); or on the web (after January 2016) at Almonds.com/ResearchDatabase
- Related projects: 15-HORT22-Shackel; 15-HORT13-Lampinen; 5-PREC5-Volder; 15.STEWCROP-Gaudin; 15-HORT21-Gilbert; 15-PREC9-Shackel/Dahlke; 14-PREC4-Hopmans; 13-HORT11A-Sanden/Shackel; 15-HORT24-Upadhyaya