Optimization of Water Use and Nitrate Use for Almonds under Micro-Irrigation

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PROJECT SUMMARY

Objectives:

- Collect a full range of data, from both ongoing field tests and other sources, as inputs for evaluating the computer-based HYDRUS-2D simulation model as an optimization tool applicable to almond research and management.
- To determine optimal irrigation and fertigation practices for micro-irrigation (drip and micro-sprinkler) systems for almond using the HYDRUS tool for a range of soil types.
- Refine and orchard test the tool, piggybacking on existing fertigation rate trials.

Background:

This new, multiyear project is premised on a dictum formulated by Tom Bruulsema and colleagues that optimal fertigation practice can be realized only by focusing on the "4 R's"—the right source, right rate, right place, and right time.

The goal of this research project is to optimize management practices for various micro-irrigation systems, minimizing losses of water (leaching and evaporation) and nitrogen (leaching and denitrification), by using a computer-based modeling methodology for operating micro-irrigation systems in almond orchards.

To refine the modeling tool, additional field data on soil hydraulic properties, soil texture, and soil layering were obtained, and different types of soil-water-plant-atmosphere sensors were installed allowing for continuous monitoring of soil moisture, temperature, salinity, and nitrate concentration.

The model is to encompass all of the complexities associated with the dynamic interactions of water, nutrients, soil, air, and root systems. It will provide orchard managers with management guidelines for tracking—and also predicting—the flow and transport of root water uptake at any time and location throughout the root zone. It also will reveal how and where nutrients move through the root zone.

Another anticipated advantage of using this multifaceted tool will be in the form of resource conservation. It will help to minimize the loss of water from leaching and evaporation, of nutrients from leaching and denitrification, and of yield loss from water stress and salinity stress.

Further, the tool will minimize the loss of time and other resources, thanks to its predictive capacity, which is likely to enhance problem solving. In addition, it has the potential to prove useful in helping growers and the almond industry deal with emerging regulations.

This project is one of several currently being pursued as part of a broad-reaching and interdisciplinary research program focused on fostering nutrient best management strategies for almond and pistachio in California.

Supported jointly by the Almond Board of California, the Pistachio Research Board, and the U.S. Department of Agriculture, this model development hopes to provide a valuable and specialized information and management tool.

Project Cooperators and Personnel: Maziar M. Kandelous, Patrick Brown, Blaine R. Hanson, and David R. Smart, University of California, Davis

For more details, visit

- Poster location 17, Exhibit Hall, Session 2; or on the web (after January 2012) at AlmondBoard.com/AICposters
- 2010 - 2011 Annual Report CD (10-HORT15-Hopmans); or on the web (after January 2012) at AlmondBoard.com/ResearchReports
- Related projects: 11-PREC2-Brown; 11-PREC5-Brown; 11-HORT11/11A-Shackel/Sanden; 11-HORT13-Lampinen; 11-AIR2-Smart; 11-PREC1-DeJong

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