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Enhancing Adoption of Irrigation Scheduling to Sustain the Viability of Fruit and Nut Crops in California

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Adoption of scientific methods to decide when to irrigate and how much water to apply to a crop has increased over the last three decades in California. In 1988, less than 4.3 percent of US farmers employed some type of science-based technique to assist in making irrigation scheduling decisions (USDA, 1995). An ongoing survey in California, representing an industry irrigating nearly 0.4 million planted almond hectares, indicates adoption rates ranging from 38 to 55 percent of either crop evapotranspiration (ETc), soil moisture monitoring, plant water status, or some combination of these irrigation scheduling techniques to assist with making irrigation management decisions (California Almond Board, 2011). High capital investment to establish fruit and nut crops, sensitivity to over and under-irrigation on crop performance and longevity, and increasing costs and competition for water have all contributed to increased adoption of scientific irrigation scheduling methods. These trends in adoption are encouraging and more opportunities exist to develop improved irrigation scheduling tools, especially computer decision-making models. In 2009 and 2010, an "On-line Irrigation Scheduling Advisory Service" (OISO, 2012), also referred to as Online Irrigation Management (IMO), was used and evaluated in commercial walnut, almond, and French prune orchards in the northern Sacramento Valley of California. This specific model has many features described as the "Next Generation of Irrigation Schedulers" (Hillyer, 2010).
While conventional irrigation management involves simply irrigating as needed to avoid crop stress, this IMO is designed to control crop stress, which requires: (i) precise control of crop water availability (rather than controlling applied water); (ii) quantifying crop stress in order to manage it in heterogeneous fields; and (iii) predicting crop responses to water stress.
The capacities of this IMO include:
1. Modeling of the disposition of applied water in spatially variable fields;
2. Conjunctive scheduling for multiple fields, rather than scheduling each field independently;
3. Long range forecasting of crop water requirements to better utilize limited water or limited delivery system capacity: and
4. Explicit modeling of the uncertainties of water use and crop yield.
This was one of the first efforts to employ a "Next Generation" type computer irrigation scheduling advisory model or IMO in orchard crops. This paper discusses experiences with introducing this model to fruit and nut growers of various size and scale in the northern Sacramento Valley of California and the accuracy of its forecasts of irrigation needs in fruit and nut crops. Strengths and opportunities to forge ahead in the development of a "Next Generation" irrigation scheduler were identified from this on-farm evaluation.