Evaluating the Effectiveness of Surface Renewal and Other Technologies to Determine Almond Tree Water Use and Water Stress

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PROJECT SUMMARY

Objectives for current year:

- Evaluate the effectiveness of the new stand-alone surface renewal (SR) method to accurately quantify almond orchard water use
- Compare stress indices from SR with several other methods to determine best combination for almonds.
- Develop infrared thermometry (IRT) based measurements of ET using the surface renewal technique

Background and Discussion:

Stand-alone surface renewal stations (SR) are being used to quantify site specific evapotranspiration (ET) in a variety of crops (grapes, strawberries, alfalfa, pistachio, almonds). This stand-alone approach has been validated and truthed in vineyards, but has not yet been fully tested for almonds even though growers are relying on this approach to determine their irrigation practices**.** Our original efforts suggested that this technology could be used to not only quantify ET but also detect stress in plants in order to trigger the timing of irrigation events. Although we have continued to evaluate the effectiveness of SR in vineyard irrigation management in commercial vineyards, a similar effort is needed to validate the technology for use in almonds. We are confident that SR effectively quantifies ET; however, its ability to detect stress has been less robust and inconsistent. Here we propose to continue our efforts to optimize SR as a cost-effective irrigation management tool that provides growers with information about both the amount and timing of irrigation events. We propose that SR should be paired with another type of automated measurement and/or model to effectively detect stress thresholds needed to trigger irrigation events. We have combined SR, plant water status, gas exchange, and infrared thermometry (IRT) to address our objectives. In 2017, we collected a full season's worth of data from our station at the weighing lysimeter. Cooperating labs are working together to synthesize results across these efforts.

The final outcome of this work will be to develop a system using SR to determine amounts of water needed that combines another inexpensive and readily available stress indicator to determine when to irrigate. We will compare the ET_C and stress indicator outputs from infrared sensors to those of ET_{SR} across the treatments as well as the other stress indicators that we develop using IRTs. We will work towards identifying why differences are occurring (e.g., input data such as ET_0 from closest CIMIS station, VSIM model algorithms, etc.). In addition, field-data collected in this study can be used to populate VSIM and determine how actual measurements from ET_{SR} affect the stress indicator (K_S) of the model.

The energy balance measurements from SR, water balance calculations from VSIM, and weighing lysimeter data are showing excellent agreement.

Project Cooperators and Personnel: Dr. Ken Shackel, UC Davis

For More Details, Visit

- Poster location 43, Exhibit Hall A + B during the Almond Conference; or on the web (after January 2018) at Almonds.com/ResearchDatabase
- 2016 - 2017 Annual Report (16-HORT28-McElrone-Parry-COC) on the web at Almonds.com/ResearchDatabase
- Related Projects: 17-HORT22-Shackel; 17-HORT17-Shackel; 17-HORT21-Gilbert; 17-HORT31-Bailey; 17-HORT24-Upadhyaya