

Winter Water Management in Almond Orchards

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PROJECT SUMMARY

Objectives for current year:

- Conduct field studies to test the effectiveness of winter/late spring irrigation as a sustainable groundwater recharge strategy
- Document any negative or positive effects of winter irrigation on almond yield and/or root development
- Determine the threshold level of dormant tree water stress (SWP) indicating the need for pre-bloom irrigation in dry winters

Background and Discussion:

California is in the fourth year of a severe drought, and during drought years, groundwater is used to make up for the reduced availability of surface water supplies. California has also experienced a rapid expansion of high value, perennial tree and vine crops, and a parallel transition from flood and furrow irrigation to more efficient drip or micro-sprinkler irrigation systems.

All of these factors have led to a reduction in groundwater recharge, and in some parts of the state groundwater levels have exceeded historic lows. Hence the sustainability of water management and agricultural production in California is at risk, particularly from the threat of a latent but steady decline in both groundwater quantity and quality. In order to improve water supply reliability for agricultural production, comprehensive coordination of land use and water resources is needed. One largely unexplored approach is to apply excess surface water, when and where available, to almond orchards. These orchards would then serve as temporary infiltration sites to recharge groundwater, and the “banked” groundwater could then be used to satisfy economic water demand during dry years, leaving the available

surface water for use to respond to critical environmental needs such as enhanced environmental streamflow. A key assumption of this approach however, is that almond trees will tolerate saturated or near saturated soil conditions (“too much water”) during dormancy and/or late spring.

Hence there is a critical need to conduct research to document the effect of this approach both on groundwater levels as well as tree health. An equally important question is whether winter irrigation is necessary during dry years, that is, whether dormant almond trees are negatively impacted by “not enough water” during dormancy.

Three field sites are being instrumented to document the movement of applied water beyond the root system, and to document root health and tree productivity during and after the recharge period (winter/late spring of 2015/2016). These results will be reported in 2016.

With respect to dormant tree water stress, a preliminary study was conducted in 2014/15, in which potted trees were subjected to wet or dry soil conditions during dormancy. In this study, some dormant trees were dried to an SWP of -30 bars, substantially more stress than the levels we have observed in the field (-2 to -4 bars). Most flowering began before SWP had reached -4 bars, but on average the dry soil trees had reduced flowering compared to the controls. In some cases however, individual trees were able to open flowers at an SWP as low as -15 bars, indicating that flowering itself may be relatively resistant to water stress. All trees were irrigated at the end of flowering, but the only trees to set fruit were the trees which had been fully irrigated throughout.

These preliminary data indicate that a reduced yield may result from low water availability to almonds during dormancy and/or flowering.

Project Cooperators and Personnel: Roger Duncan, David Doll, and Elizabeth Fichtner UCCE- Stanislaus, Merced, Tulare Counties respectively; and Bruce Lampinen, UC Davis

For More Details, Visit

- Poster location 70 Exhibit Hall A + B during the Almond Conference; or on the web (after January 2016) at Almonds.com/ResearchDatabase
- Related Projects: 15-HORT17-Shackel/Sanden/Fulton/Doll; 15-PREC5-Volder; 15-HORT22-Shackel