**IRRIGATION MANAGEMENT PAYS**

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How do you decide when to irrigate your orchard? Do you wait until your neighbor is irrigating? Do you irrigate because the top of the soil is dry? Do you use your shovel or auger and check the soil moisture before irrigating? Are you taking advantage of the weather based, soil based, and plant based options available to help you optimally manage your irrigation to avoid tree stress and economic losses?

In **weather based monitoring**, we use evapotranspiration (ET) information presented as water use per day and/or week to determine how fast the water is being depleted. This information is available as long term, average estimates that can be helpful in developing an irrigation schedule or as tracking real-time estimates that can be used to assist with determining when and how long to irrigate. These values are particularly useful for low volume systems where the goal is to run the system long enough to replace daily water use. A mature walnut tree with no cover crop in mid-July can use over 100 gal/tree/day of water.

You can develop an evapotranspiration-based irrigation schedule using historical or real-time values. We have a worksheet in our office to help you determine your irrigation set times using historical ET data. You can obtain real-time ET data by visiting the CIMIS website at http://www.cimis.water.ca.gov or for the northern Sacramento Valley at http://cetehama.ucdavis.edu (see attached CIMIS daily report and weekly soil moisture loss report).

There are many choices available for **soil based monitoring** tools that either detect and indicate soil water content or the degree of tension that soil-water is held by the soil and available for uptake. Although these tools can be used alone, we have found it most useful to use in conjunction with plant based monitoring. Locally, we have found both methods critical for timing irrigations, especially in those orchards with a soil limitation and/or high water table. The soil moisture monitoring has helped to determine how deep water penetrates after irrigation and to determine seasonal water extraction trends in the root zone.

What is **plant based monitoring**? Over several years now, UC specialists and farm advisors have been researching plant based irrigation and demonstrating how pressure chambers measure stem water potential and what these numbers mean regarding tree stress and irrigation needs. The sum of four environmental influences determine plant water stress: soil moisture, wind, humidity, and direct sunlight. A plant based monitoring system allows you to measure what the plant is experiencing not just one of the environmental stresses. We use a pressure chamber device (better known as the pressure bomb) for measuring the degree of water stress within the plant. Water is under tension within the plant and as water evaporates from the leaves, replacement water must be pulled in from the soil. It becomes harder for the plant to extract water

from the soil as it dries increasing the tension within the plant. The pressure chamber allows us to measure how much tension the leaf is experiencing and the degree of water stress.

Through research, we have developed stem water potential (SWP) values for walnuts and peaches that indicate when the tree is stressed and needs irrigating. I have used the pump-up pressure chamber for irrigation research and also found it an invaluable tool for helping diagnose and correct water stress or over irrigation problems in some local orchards. Many of you have seen this device at some of my meetings and more growers and PCAs are using them every year. If you want more information on the pressure chamber go to <http://fruitsandnuts.ucdavis.edu/crops/pressure-chamber.shtml>.

**What are the costs of water stress?** Several UC researchers have worked on irrigation management and the effects on yield and quality in various tree crops. A draft publication, “The Effect of Water Stress on Walnut Tree Growth, Productivity, and

Economics” by Allan Fulton and Rick Buchner, UC Farm Advisors in Tehama County, addresses what happens to walnut trees when water stressed. They applied varying levels of water stress to Chandler walnut trees over a four year period. Essentially they found that shoot growth was uninhibited and yield was not reduced by maintaining midday SWP values at -4 to -7 bars. Where walnut trees averaged -8 bars and below (more negative) over the season, fruitfulness (nut load) was reduced. Over four years, Chandler walnut on Paradox rootstock with the least water stress averaged over $1400 per acre per year more due to higher in-shell yield and higher crop value due to lighter kernel color than trees with higher levels of water stress. Our research indicates that in many walnut orchards, SWP values at -7 bars indicate a need to irrigate. Growers should determine the SWP indicating a need to irrigate in their own orchards.

This publication also describes the various water management tools and lists websites and address of where to order them. This draft publication is available from our office or

online at http://cetehama.ucdavis.edu and I recommend it for walnut growers.

Our plant based irrigation research on peach trees, although preliminary, indicated that we maximized fruit size by maintaining trees at -7 to -7.8 bars in a microsprinker irrigated orchard. Peach trees should not be water stressed in August which can lead to more double fruit the following year.

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