Mobile Platform for Measuring Canopy Light Interception and Water Stress in Almond

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PROJECT SUMMARY

Objectives:

- Correlate yield and light interception with a mobile suite of instruments designed to measure canopy light interception in almond orchards.
- Develop and test a mobile suite of instruments designed to measure water stress in almond trees.
- Complete and release a working version of the iPhone application on a trial basis (to farm advisors and select growers) to calculate canopy light interception.

Background and Discussion:

Data collected on tree canopy light interception has shown that it is a valuable indicator of an almond orchard's potential productivity. Results suggest that 50 kernel pounds of almond can be produced for each 1% of total incoming midday canopy photosynthetically active radiation (PAR) that is intercepted. These data are also valuable in evaluating new cultivars to assess whether higher yields can be attributed to higher efficiency or whether they simply grow faster.

Traditionally, obtaining the PAR data has been a slow and labor-intensive process based on use of a hand-held lightbar. Consequently, data gathering has often consisted of only limited and small-scale sampling and of collecting PAR data from only a portion of the row where yield data was collected.

Starting about 5 years ago, a mobile platform lightbar was developed on a Kawasaki Mule. It can span an entire row (up to 32 feet), and includes an advanced data logger and accurate GPS. With this setup, it is possible to gather data at a high rate of speed.

A device to estimate midday stem water potential using an array of sensors has been developed. The inputs used are leaf temperature, wind speed, ambient temperature and humidity, leaf orientation, and incident PAR. Results from the 2011-2014 seasons continue to show promise for this technique to be used to predict stem water potential. In addition, data using shaded leaves is promising and this would simplify the measurement process since it eliminates variability due to varying leaf angles to the sun.

An additional method of assessing tree water status by continuously monitoring leaf temperature with a sensor suite and datalogger over the course of the day has also been developed. Testing of this technology was continued with promising results in 2014.

A working version of the iPhone app for estimated midday canopy PAR interception has been completed and will be tested in the fall of 2014. This app will give growers an estimate of yield potential and estimated nitrogen needs based on canopy size.

Overall, this project has the potential to significantly improve orchard design and management by providing a basis for better managing water, as well as estimating productivity and crop nitrogen needs.

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For More Details, Visit

- Poster location 64, Exhibit A + B during the Almond Conference; or on the web (after January 2015) at Almonds.com/ResearchDatabase
- 2013.2014 Annual Report CD (13-HORT13-Lampinen); or on the web (after January 2015) at Almonds.com/ResearchDatabase
- Related projects: 14-HORT2-Lampinen; 14-PATH1-Browne; 14-HORT17-Shackel/Sanden/Fulton/Doll; 13-PREC2-Brown; 13-HORT11A-Sanden