Development and Testing of a 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

Background:

Data collected on tree canopy light interception and yield 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 one place and yield data from another—either a single tree or a whole row.

Recently, mounting the lightbar onto a vehicle has been demonstrated to allow more rapid and comprehensive assessment of the orchard canopy PAR interception. The platform is a Kawasaki Mule with a lightbar that can span an entire row (up to 32 feet), an advanced data logger, and a LIDAR unit for mapping canopy shape attached. With this setup, it is possible to gather data at a high rate of speed. Based on studies of other crops, a method has been devised for using a suite of sensors to assess water stress in almond trees. It is based on using an array of sensors designed to estimate midday stem water potential using leaf temperature, wind speed, ambient temperature and humidity, leaf orientation, and incident PAR. Results from the 2011-2013 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 will be continued in 2014.

Overall, this project has the potential to significantly improve orchard management and planning by providing a basis for better estimating productivity and crop water needs. Furthermore, it should also help researchers better understand the role of canopy light interception in yield variability.

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For More Details, Visit

- Poster location 47, Exhibit A and B during conference; or on the web (after January 2014) at www.almondboard.com/researchreports
- 2012.2013 Annual Report CD (12-HORT13-Lampinen); or on the web (after January 2014) at www.almondboard.com/researchreports
- Related Projects: 13-HORT2-Lampinen; 13-PATH1-Browne; 13-PREC2-Brown; 13-HORT11A-Sanden; 13 HORT17-Shackel/Sanden/Fulton/Doll;