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. Generally the greater the percentage of the available midday canopy photosynthetically active radiation (PAR) that is intercepted the greater the yield. 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 (26 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.

The Mule is also intended to serve as a platform for an advanced instrument suite that will measure crop water status, which is a key factor in managing irrigation. Traditionally, that too has been a slow and labor-intensive process, involving use of a pressure bomb.

Based on studies of other crops, the a method has been devised for combining sensors to assess water stress in almond trees. It is based on using an array of sensors (which will eventually be mounted on the Mule lightbar platform) designed to estimate midday stem water potential using leaf temperature, wind speed, ambient temperature and humidity, leaf orientation, and incident PAR.

In testing the efficacy of this setup, leaf water potential with a pressure chamber also will be measured in trees in the same rows covered by the sensor-based data gathering array.

Overall, this project has the potential to significantly improve orchard management and planning by providing a basis for better estimating productivity. 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 16, Exhibit Hall, Session 2 at the conference; or on the web (after January 2012) at AlmondBoard.com/AICposters
- 2010 - 2011 Annual Report CD (10-HORT13-Lampinen); or on the web (after January 2012) at AlmondBoard.com/ResearchReports
- Related Projects: 11-HORT7-Lampinen; 11-PATH1-Browne; 11-PREC2-Brown;