Advancing the Science and Application of Site-Specific Crop Management

by Bruce Erickson

The North Central Education and Research Activity Committee for Site-Specific Management (NCERA-180) met January 5 and 6, 2007, hosted by the University of Florida. Attending the meeting were over two dozen individuals representing companies and universities working in the area of precision agriculture, gathered for the purpose of information exchange. Work at Purdue University presented to the group is detailed in the annual report for 2006, posted on the Site-Specific Management Center website (www.purdue.edu/ssmc, click on Impact/NCERA180). The following are highlights presented by others participating:

Equipment Compatibility Issues Nyle Wollenhaupt is the Agronomy Manager for AGCO Global Technologies for Agriculture, and spoke regarding an issue that has long been a constraint to the adoption of site-specific technologies—compatibility issues among equipment components from various manufacturers. In the long run, he feels neither farmers nor individual manufacturers profit from insular approaches to equipment design. Just as standardization of PTO and three-point hitches occurred for mechanical farm systems, cross compatibility has been sought for electronic equipment. ISO 11783 is designed to provide an open, interconnected system for on-board electronic systems, and deals with software issues as well as plugs and cables. ISO is an acronym for the International Organization of Standardization http://www.iso.org, and ISOBUS refers to "binary unit system."

William Rudolph, of Midwest Technologies/Spraying Systems says they periodically participate in "plug fests," meetings where equipment is brought in to test manufacturer's claims of component compatibility. Rudolph also reported on progress their organization is making in terrain compensation systems—accounting for roll, pitch, and yaw in automated steering systems, and their efforts in developing low-cost systems and ones that are easier for operators to set up and use.

New Technologies Veris Technologies is introducing an on the go soil spectrophotometer. The setup includes a light source, a sapphire window for the sensor, and white and black references for automated, on-the-go calibration. Correlations among various soil properties and their spectra vary, but soil carbon is generally highly correlated and Veris sees a great potential in verifying and cataloging soil carbon levels, according to Veris' Eric Lund. Veris commercialized the first on-the-go soil pH sensor and manufactures and sells soil electrical conductivity sensors. For more information, go to http://www.veristech.com/.

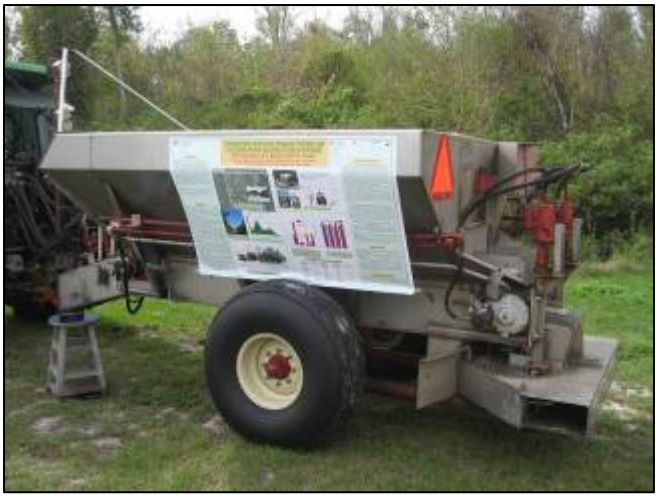
Crop Modeling Crop growth models are one of the best ways to help to explain within and among-field variability from year to year as weather changes, according to Jim Jones of the University of Florida. He noted that there can be exceptional spatial variability in rainfall, and reported some very accurate results comparing crop models to actual yields, although he admits it is impossible to account for all possible factors and their interactions. Soil water is a major yield-influencing factor that has been especially difficult to quantify in crop growth models. Dr. Jones showed graphics quantifying the impact of weeds, diseases, and soil water in various portions of crop fields.

Experimental Design Donald Bullock of the University of Illinois is often asked the question from commercial producers: "Should I plan for a good year, an average year, or a bad year?" When field plot studies can encompass any of those types of years, it may become difficult to interpret the results to make recommendations for crop management. Bullock presented his research affirming that two or three years of testing can often provide enough information to be useful in long-term decision-making. He went on to say that interpretation of spatial information often must be done through a different lens, and some of the best work that can be applied to agriculture is coming from fields not considered traditional sources of expertise in the interpretation of crop responses, such as agricultural economics.

Site-Specific Representation at Scientific Meetings Newell Kitchen, University of Missouri, reported that 50-60 papers per year with a precision ag component are presented at the American Society of Agronomy International Meetings.

Funding Issues for Site-Specific Management and Other Agronomic Research Harold Reetz is the president of FAR, the Foundation for Agronomic Research. This organization is concerned about the lack of funding of crop management and soils related research, which has been falling for over a decade. FAR is taking some novel approaches to get the word out, including a compelling video message that features Dr. Reetz. A sample of their marketing campaign is linked from their home page at http://www.farmresearch.com/.

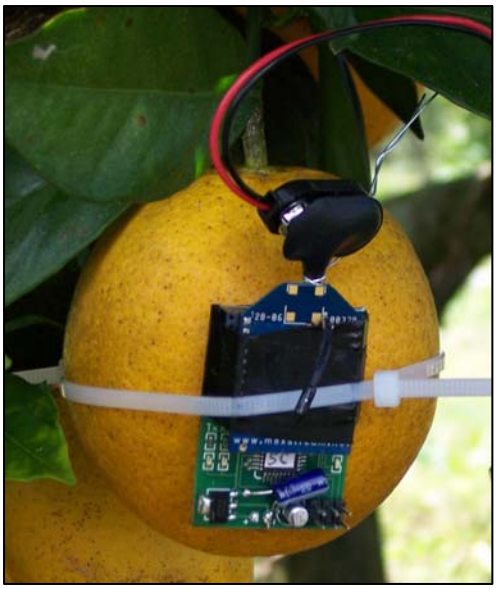
Site-Specific Management in Citrus Crops The University of Florida Citrus Research and Education Center http://www.lal.ufl.edu/ supports the development needs of the state's citrus industry. Researchers there are working on a number of precision technologies designed to improve crop marketability, reduce grower costs, and lessen the environmental impact of citrus production.



Sensors mounted on the mast between the tractor and fertilizer spreader provide tree size information to vary fertilizer rates (image courtesy Balaji Sethuramasamyraji).

Granular fertilizer spreaders are a common way to apply nutrients within orchards. Arnold Schumann explained the use of a precision granular fertilizer spreader equipped with sensors to detect tree height and density. Sensors are mounted on the tractor pulling the fertilizer spreader and the information is processed to vary the rate, on the go, of the fertilizer spreader. Smaller trees get less fertilizer, larger trees get more, and no fertilizer is spread where there are missing trees.

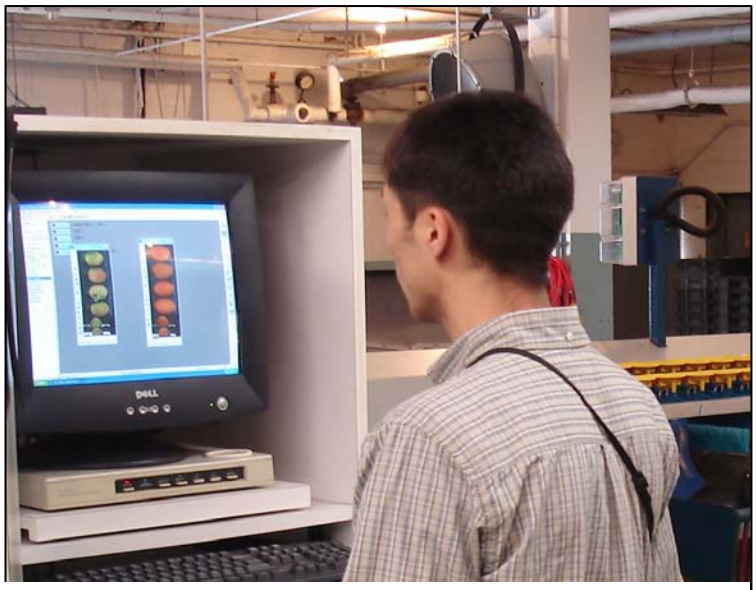
Reza Ehsani demonstrated the use of a wireless mesh sensor network capable of measuring light, temperature, motion, and a wide variety of other factors in agricultural fields. These ZigBee



Networked wireless sensors have opened new possibilities in monitoring crops (image courtesy Reza Ehsani).

technology type sensors offer the advantage of relatively low power use, and are capable of communicating with each other up to hundreds of meters apart, opening the possibilities for new and novel opportunities in monitoring soils, crops, pests, and weather.

For fruit processing, John Schueller and the CREC staff showed an automated system that weighs, sizes, and analyzes the spectral reflectance of individual fruit as input for sorting. Accurately categorizing fruit into the most appropriate marketing class can provide significant profit opportunities for Florida citrus growers.



The Citrus Center staff demonstrated how fruit can be individually analyzed by spectral sensors to categorize for optimal marketing (image courtesy Harold Reetz).

Upcoming Meetings

InfoAg Mid-South 2007 will be held February 7-8 at the Bost Extension Center, Mississippi State University, Starkville, MS.

InfoAg Northwest 2007 is February 20-21 at Three Rivers Convention Center, Kennewick, WA.

InfoAg 2007 is July 10-12 at the Crowne Plaza, Springfield, IL. See http://www.infoag.org/.

2nd Asian Conference on Precision Agriculture, August 2-4, 2007, Pyeongtaek, Korea.

The Ninth International Conference on Precision Agriculture will be held in the summer of 2008 in Denver, Colorado, a new location after being held (every two years) since 1982 in Minnesota. Raj Khosla, Assistant Professor and Precision Agriculture Extension Specialist at Colorado State University is leading the planning and organization efforts. The last two "Minnesota conferences" were organized by David Mulla, University of Minnesota, and before that by Pierre Robert.

To Learn More About NCERA-180 The objectives, procedures, expected outcomes, activities, and other information regarding the committee for Site-Specific Management may be found at: http://nimss.umd.edu/homepages/home.cfm?trackID=7776.