Indiana NCR180 Report—2004

Site-Specific Management Center (SSMC)
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Abstract: In 2004 the work of the SSMC focused on disseminating results of site-specific management research at Purdue to the agricultural community, via the website (www.purdue.edu/ssmc), the monthly site-specific management seminar on campus, articles in the trade press and conference presentations.

Publications (all available at www.purdue.edu/ssmc):


**Precision Agricultural Services Survey**

**Principal Investigator:** Jay Akridge  
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**Abstract:** The annual survey of agricultural retailers showed that three-quarters of respondents used precision technologies in some way in their dealership. Dealers continue to adopt precision technologies for internal uses but at a fairly slow rate; grower adoption has continued to expand. Another survey is planned for early 2005.

**Publications:**  
Whipker, Linda, and Jay Akridge, “Precision Agricultural Services: Dealership Survey Results.” Staff Paper No. 04-07, Center for Food and Agricultural Business, Purdue University, West Lafayette, IN, USA, June, 2004.

**Site-Specific Fertilizer Recommendations and Sampling Guidelines**

**Principal Investigator:** Sylvie Brouder  
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**Abstract:** Major concentration involved site-specific data integration, evaluation, and development related to fertilizer recommendations and use efficiency in Indiana cropping systems. Research activities in 2004 emphasized protocols for delineating management zones. Plans for 2005 include evaluation of environmental benefits of N management zones and continued evaluation of soil fertility interactions related to grain quality.

**Publications:**  
**Decision Making in Precision Agriculture**

**Principal Investigator:** Daniel R. Ess  
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**Publications:**  

**Evaluation of Weed Species Spatial Distribution**

**Principal Investigators:** Kevin Gibson, Richard Dirks  
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**Abstract:** A tractor-mounted mechanical vision system for weed detection is being developed to provide highly accurate, detailed maps of weed populations in agronomic crop fields. The system utilizes a Patchen weed-seeker, digital imagery and GPS equipment, with the ultimate goal to combine weed maps with other precision technologies to evaluate the relationship between environmental variables and weed species spatial distribution.

**Remote Sensing Applications in Agriculture**

**Principal Investigator:** Chris J. Johannsen  
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**Abstract:** Annual focus of remote sensing applications included soil landscape dynamics relating to soil variability and soil management zones, yield-influencing factors, automated correction of sensor errors, vegetation damage by insects, flooding impacts on corn and soybeans, and weed anomaly monitoring. For 2005, research related to weed detection, crop residue detection and soil & crop anomaly classification is planned.

**Publications:**  

**Using Remote Sensing to Determine Weed Densities and N Stress in Corn**

**Principal Investigators:** William Johnson, Kevin Gibson  
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**Abstract:** Remote sensing imagery is being used to determine weed densities and to assess N stress in corn. Goal is to determine the effect of weed removal and N application timing on weed growth and herbicide-resistant corn yields. Environmental concerns associated with N fertilizer and soil-applied herbicides are likely to limit their use in the future and growers will increasingly adopt post-emergence management strategies. However, weed-corn competition for N can occur early in the season and weed accumulation of N may suppress corn yields. If successful, this information could be used to provide farmers with data necessary to make more informed decisions regarding fertilizer and herbicide applications.

**Publications:**

**Economics of Knowledge Intensive Agriculture for Crop Farms**

**Principal Investigator:** Jess Lowenberg-DeBoer  
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**Abstract:** Research in 2004 focused on developing better ways for growers and those who advise them to use information from combine yield monitors and other site-specific sources. Studies showed that in corn-soybean systems phosphorous response may be quite stable from year-to-year in large parts of the field, but that nitrogen response varied widely from year-to-year, as well as over space. A study using data from Minnesota indicated that variable rate fertilizer in combination with a uniform rate of manure application may be more profitable than variable rate manure alone. Monte carlo studies demonstrated that it is possible to draw reliable information to guide farm input use and agronomic decisions from the large plot, low replication trials many farmers find logistically attractive. Work is underway with funding from the USDA/CSREES Sustainable Agriculture Research and Extension (SARE) program to test the reliability of large block, low replication trials with farmers in Indiana, Illinois, Kentucky, Arkansas and Arizona.

**Publications:**
Bongiovanni, Rodolfo, and J. Lowenberg-DeBoer, “Precision Agriculture and Sustainability,” *Precision Agriculture*, 5: 359-388.  


Automated Measurement and Mapping of Soil Properties

**Principal Investigator:** Mark Morgan  
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**Abstract:** Rapid measurement and mapping of soil properties has shown potential for improving site-specific management. A model combining geo-statistics, agronomics and economics is being used to demonstrate the potential benefit of high resolution soil pH maps when combined with variable-rate lime application. Similar modeling and data analysis is under development for nutrients potassium and nitrogen. In addition, sensing systems are being investigated for mapping other soil properties including: potassium, nitrogen, and soil mechanical impedance at various depths in the profile. These sensors will ultimately provide the basis for accurate control of variable rate tillage and chemical application.

**Publications:**  


**On-Farm Harvest Timing, Yield Monitor Calibration, and GPS Crop Management Technologies**

**Principal Investigator:** Robert Nielsen  
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**Abstract:** Trials were continued at four outlying Purdue research centers to determine the consequences of not regularly calibrating yield monitors. Two differing hybrids were harvested at three times, beginning at grain moistures in the high 20's and finishing in the mid-teens. Yield monitors were calibrated for both weight and moisture estimation based on plot loads and grain moisture estimates at each harvest. Additional calibrations and corresponding yield data sets were generated for earlier harvest data at the time of the second and third harvests at each location. Failure to calibrate or recalibrate yield monitors for weight and moisture estimations results in erroneous wet weight estimates as well as dry grain yield estimates.

**Using Soil Electrical Conductivity to Delineate Soil Management Zones**

**Principal Investigator:** Gary Steinhardt  
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**Abstract:** The use of soil electrical conductivity (EC) as a means of delineating soil management zones is being investigated. Bare soil areas have been established at the Purdue Agronomy Center for Research and Education in an area with a good Order II soil map, and EC and soil moisture information is being collected weekly (weather permitting). At the Davis-Purdue Agricultural Center in East-Central Indiana, work is in progress to investigate how site-specific long-term yield monitor data correlates with Order I soil survey information. 120 acres of an Order I survey have been completed at the Davis Farm.

**Site-Specific Applications for Grain Quality Traits, Tillage Systems, and Crop Residue**

**Principal Investigator:** Tony Vyn  
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**Abstract:** Primary emphasis is on oil quality and seed nutrient composition of soybean as affected by tillage, soil fertility, fertility management (banding vs. broadcast), and inherent soil variability caused by stratification of soil phosphorus and potassium. Research was initiated in 2004 on automated guidance systems and their role in nutrient banding in corn.

**Publications:**


