Precision Agriculture

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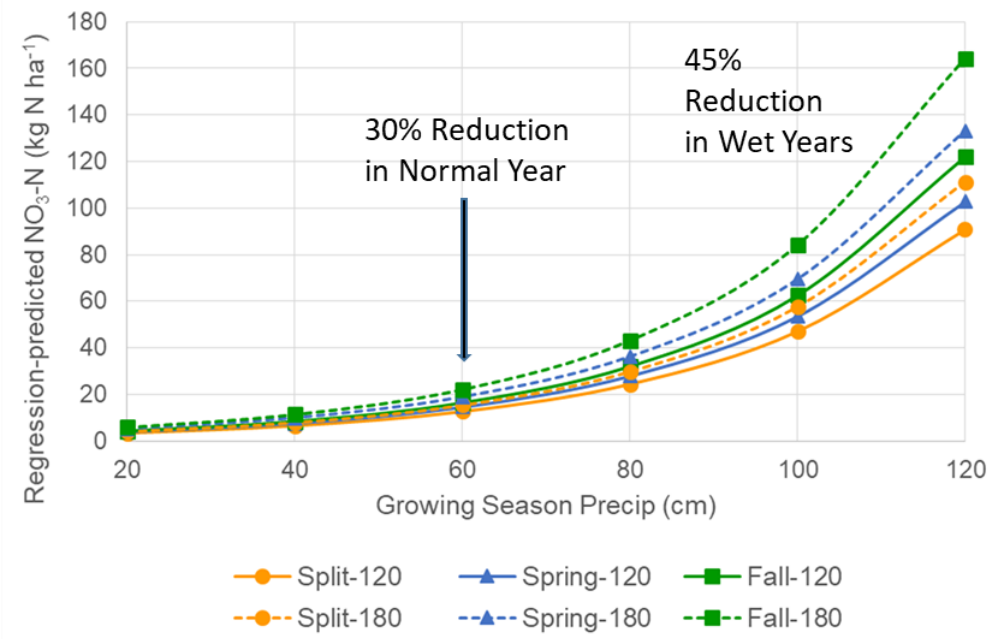
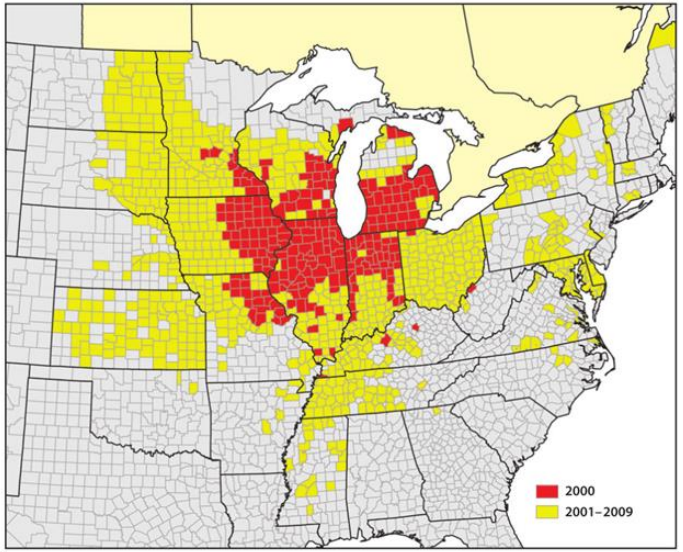
Precision Agriculture

- A management practice applied at the right rate, right time, and right place
  - Variable rate fertilizer, irrigation or herbicides
- Increased profitability
- Increased efficiency of inputs
- Reduced environmental pollution and better soil health



Precision Agriculture: Example Projects

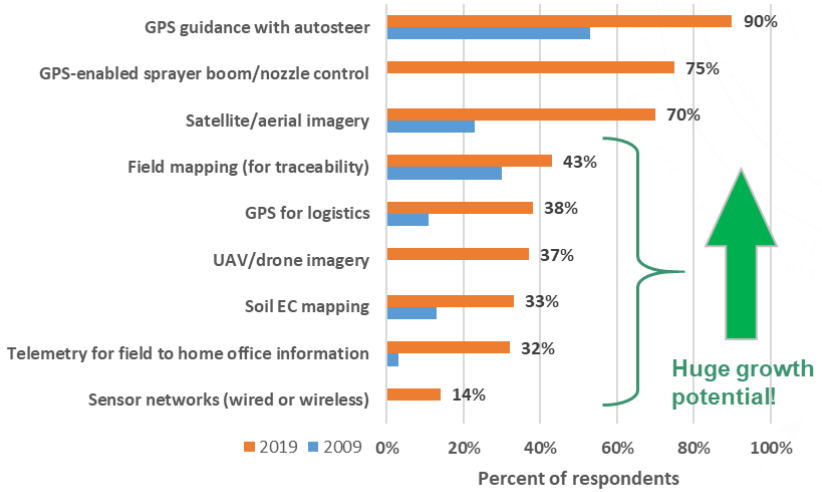
- Variable Rate Nitrogen (VRN) for improved ground and surface water quality
- Soybean aphid detection with remote sensing
- Integrated precision irrigation management
- Job creation and workforce development
  - University-Industry collaboration
- Extension and Outreach to agribusiness and growers



Spread of the soybean aphid in north central USA
Image credit: Ragsdale et al. 2011

University-Agribusiness Collaborations

- Precision Agriculture led to formation of hundreds of companies nationwide who provide services to growers
- Local examples include SoilTeq, Farmer's Edge, Geosys, Sentera, Sentek, EarthScout and Aglytix, with large portfolios by Land O'Lakes and CHS
- These have large impacts on Minnesota jobs and workforce development and placement



Based on annual nation-wide survey by Purdue and Crop Life Magazine

"Our relationship with Professors David Mulla, Carl Rosen, Fabian Fernandez, and Daniel Kaiser has and will continue to have a tangible impact both on technological development at Sentek as well as on end-user applications revolving around our products." Craig Poling, CTO Sentek

Thanks! Questions?

Faculty

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Precision Agriculture Center Leadership

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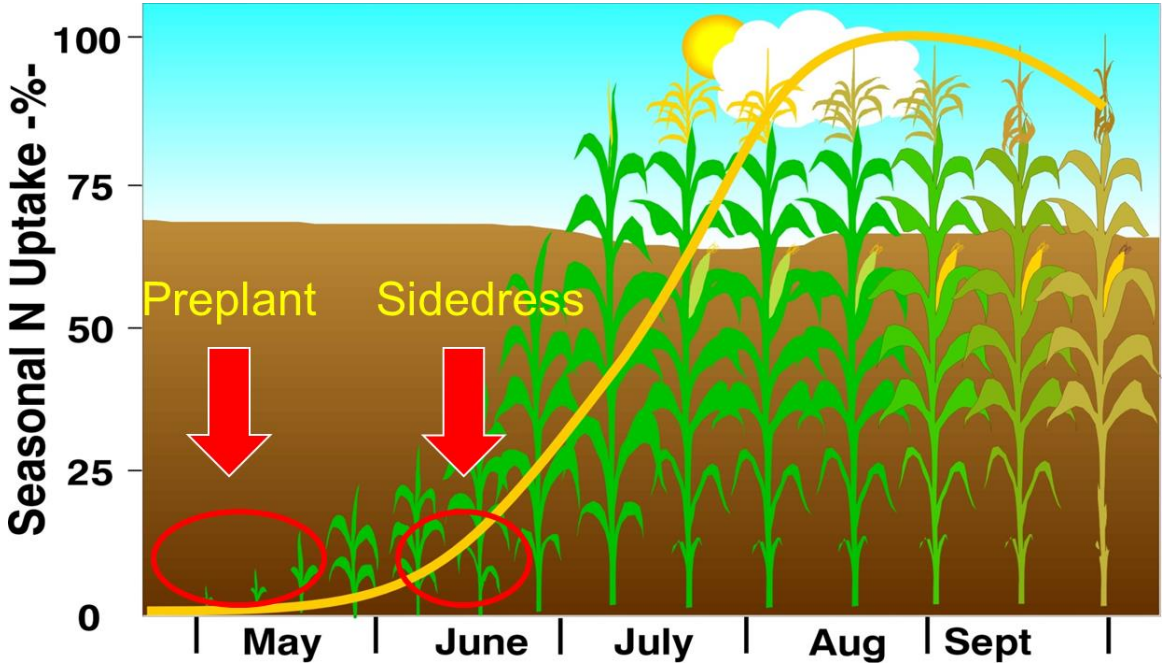
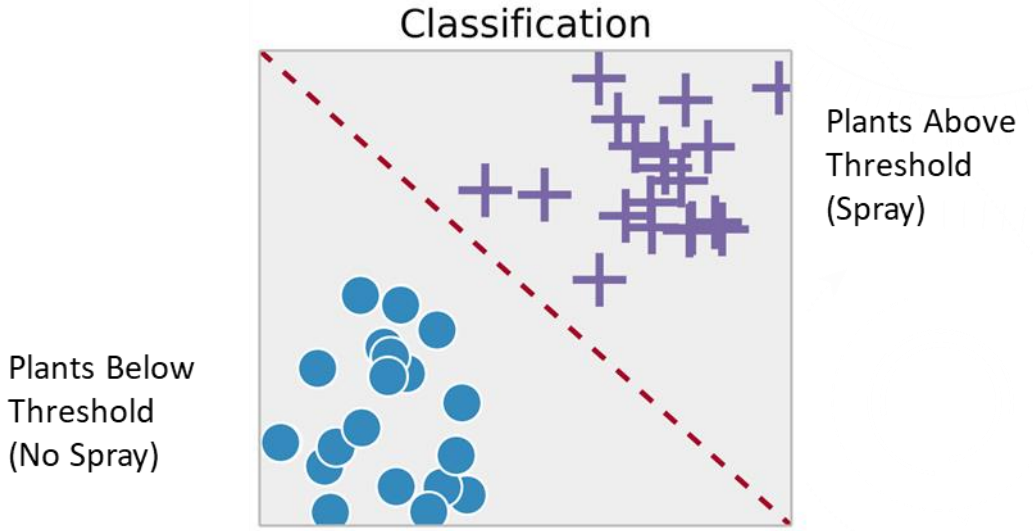
Variable Rate Nitrogen (VRN)

- Match side-dress N fertilizer application to crop growth patterns
- Use remote sensing to detect N deficiency in leaves



Remote Sensing Combined with Machine Learning Identifies Infestations Above Threshold

- Yield losses up to 40%
- Drones can be used to scout entire fields for soybean aphids
- Fields can be sprayed before aphids cause widespread crop damage



Integrated Precision Irrigation Management

- Nitrogen fertilizer practices (rate, timing, splits, spoon feeding, etc.), forms of N (anhydrous, urea, slow release)
- Water management practices (irrigation scheduling, variable rate irrigation)
- Vegetative management practices (cover or catch crops, perennial crops, cropping systems)

Extension and Outreach Activities

- The University of Minnesota Extension has several ongoing programs that are very effective at delivering information about precision agriculture to nutrient management decision maker audiences
  - Online and in-person delivery
  - On-farm demonstrations
- Our face to face programs are designed to reach a broad audience, including agribusiness professionals, growers, agency personnel and the public
  - Ag Professionals transmit this training to thousands of growers

Robotics in Precision Agriculture

- Unmanned ground vehicles (UGV)
- Unmanned aerial vehicles (UAV)

Use of UAVs in Minnesota agriculture could lead to a thousand new jobs and nearly $150 million being pumped into the economy.
(Dept. Employment Econ. Development)