Crop Sensors for Enhancing Crop Production
Smart Input Management

Precision Ag Technology
Allows management at a small scale without sacrificing productivity gained from owning large equipment.

Variable Rate Application
Addressing Variability
- Application based on field and crop variability
- Apply only what is needed
- Deliver inputs more accurately
Approaches to VRA

- **Map-based**
  - Prior data and knowledge of variability
  - Generate Rx map

- **Sensor-based**
  - Direct measurement of the need of plants (or soil)
  - Does not require a positioning system, but recommended for data collection

Crop Sensors Role in Ag Management

4R’s + 1 for Nutrient Stewardship
  - **Right Source**
  - **Right Rate**
  - **Right Time**
  - **Right Place**
  - **Right Records**

- **Accurate Timing**
- **Accurate Placement**
- **Preserve Conservation Structure**

CCA Role

- **Crop Sensors**
  - Direct in-season scouting
  - In-season recommendations
    - Rates and products
    - Farm-based algorithms (build and tweak)
  - Tool to evaluate field variability for farmers NOT using Precision Ag
  - Support variable-rate input (e.g. N) applications
  - Data layer for other site-specific management

Data = Knowledge
Crop Sensor Applications

- Mapping variability
  - Direct crop scouting
  - Basis for variable-rate input application
    - Management zone development
    - Directed soil sampling
  - Proxy for yield maps
- Real-time Application
  - Nitrogen: grain crops, corn, and cotton
  - PGR and Defoliants – cotton
- Others?

Crop Sensors...

- Tool for enhancing input management
- Not a technology for everyone
  - Short term
  - Different type of precision ag technology
- Requires management (time)
  - Agronomic
  - Technical expertise

Diagnosing Crop Production
Directing Crop Scouting
Management Zone
Absence of Yield Maps

- Some similarities to imagery and soil data
- Areas of reduced plant biomass (size) which rest in good yielding areas
- Data layer to help define MZs
- Farmers not using Precision Ag...

Cotton Yield Map

Crop Sensor Map
Cotton – Proxy for Yield Maps
Advancing Science & Technology
Auburn University Biosystems Engineering

N in Cotton with Crop Sensors

- Real-time N has shown mixed results
  - Small plants = low yield
  - Large plants = high yield
  - Better than uniform N
- Success using sensors to map biomass, scout then generate Rx nitrogen maps

Applications in Cotton
Real-time sensing of crop health and vigor

- PGRs
- Harvest Aids

- Green - healthier, larger plants
- Red - smaller plants, less vigor

Apply what is needed to optimize yield and minimize product loss (increase product use-efficiency)

Weed Pressure at Cotton Emergence

Data collected to focus herbicide application later in the season and in 2012.

Problems!
Forage Biomass

Data collected to evaluate possible use for future VR nutrient applications.

But how do I make it work?

CCA Role
Crop Sensors

- Learn field variability quicker
- In-season feedback with subsequent recommendations
  - Rates and products (spatial basis)
  - Farm-based algorithms (build and tweak)
- Value of the data?
  - Smarter recommendations
  - Another data layer for future reference and analysis
  - Improved relationships

Data = Knowledge
CAUTION FOR FARMERS
Walk before You Run

• Grow with precision ag technology
  Guidance + Variable-rate Technology + Automatic Section Control
  (turn-key technologies)
• Must have the technology to adopt crop sensors
• Farmers not prepared to manage (time) crop sensors
• Opportunity for CCA's and retailers

FUTURE
Nutrient Management Plans
• Account for all N and P applied (check book)
• Application timing

N in Corn…
• Timing and N availability
• V6 to V12 (rain after application…)
• Capability to apply at later grow stages (high clearance sprayer)
Hagie Nitrogen Tool Bar (NTB)

- 72-inch clearance
- 40 or 60-ft width

Final Thoughts

- Variety of applications
  - Tailor in-season rates
  - Early documentation
- CCA’s need to play a role
  - Farmers need help
  - Agronomic recommendations
  - Scouting tool
- Future nutrient management (stewardship)
- Exciting new nozzle, flow-based spray technologies to improve management resolution

Precision Ag technologies simultaneously enhance production efficiency and environmental stewardship.