Precision Ag – A Midwestern Look at Cotton Production

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Precision Ag Technologies

- Yield Monitors
- Georeferenced Sampling
- Guidance Systems
- Control Systems
- Sensor Technology
- Remote Sensing
- GIS Advancements
Yield Monitors

- Grain yield monitors have been commercially available since the early 90’s and are an accepted commodity.
- They will become standard equipment on new combines by default.
- Key uses are:
  - Diagnosing Crop Production Problems
  - On-Farm Research
  - Determining Spatial Yield Potential
Diagnosing Crop Production

Wire worm infestation

Crop drowned
On-Farm Research

- Has the potential to expand knowledge about individual farms
- Comparison of varieties, tillage practices, fertility rates, etc.
- Not as easy as it may seem
  - What do you want to know?
  - Why do you want to know it?
Spatial Yield Potential

- Many nutrient recommendation models require the use of a crop yield goal
- Development of a nutrient recommendation map may require the use of a yield goal map
- How can you generate variable yield goals?
Processing Yield Monitor Data

Start with multiple yield maps on the same field.
Do they need to be the same crop?

Normalize each year and average the maps.
Does yield stability matter?
Sensor Technology

- Sensing needs and adjusting application rates on-the-go
- No need for a map of last year's yield, fertility, etc.
- Does the crop need nutrients?
- Are there weeds present that need to be sprayed?
Sensor Technology

- Greenseeker
  - N-management
- Veris Technologies
  - Soil EC Sensor
  - Mobile Sensor Platform
    - w/ pH Manager
Sensor Based Nitrogen Management
Integrating Crop Sensors and Yield Monitor Data

- We know that the response to N varies spatially across the field.
- We also know that response to N varies each year.
- Can we incorporate other information (yield monitor data) that we have to aid nitrogen decisions?
- Use yield monitor data to determine yield potential zones and crop sensors to determine seasonal N needs.
Wheat Transect

![Graph showing transect distance and response indices with NDVI values ranging from 0.0 to 0.7 and transect distance ranging from 0 to 800 ft. The graph includes lines for RI1, RI2, NR, FP1, and FP2.]
High yielding zone where the NDVI is greater in the N-Rich strip and nitrogen was recommended.

Low yielding area where NDVI between the N-Rich strip and farmer practice are similar. No extra nitrogen was recommended.
Remote Sensing

- It will be the savior of precision ag technologies
- There have been some niche applications, but widespread adoption has not occurred
- However, cotton is the crop that has shown the most promise for remote sensing applications
What’s Different About Cotton?

- Growing corn is like racing cars
- Cotton is indeterminate
- Variable Rate Opportunities
  - Nitrogen
  - Growth Regulators
  - Defoliants
Yield and Remote Sensing

Yield

NDVI
## Cotton Management Concept

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<th>Zone</th>
<th>N-Rate</th>
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Estimating Canopy Closure

![Graph showing NDVI values over time with different percentages for Over Row, Row Middle, and Ratio.](image)
Sensing Cotton Height

Cotton Sonar Height Study

\[ y = 0.93x + 2.16 \]
\[ R^2 = 0.93 \]

**Stages**
- 17 Leaf
- Square Growth Midpoint
- White Bloom
- Flowering (5-7 days)
- Boll Developing
Sensor Based Defoliant Application

NDVI values show large differences in vigor across the field. NDVI values below 0.4 (light yellow) have much less leaf area than higher values.

Map of on-the-go prescription rates sent to the sprayer’s rate controller by GreenSeeker. Customer set only 2 rates - 12.5 and 15 gallons per acre
Precision Agriculture

- Mechanization of agriculture was considered one of the top ten engineering achievements of the previous century.
- The incorporation of electronics and control systems will be one the next great achievement in ag equipment.
Remember, its Evolution not Revolution

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