Making Better Management Decisions with Precision Ag Data: Today and into the Future

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Comments I’ve Heard

• I have recorded yield data for 5-10 years, what now.

• My yield maps have errors in them, so how can I use them.
Comments I’ve Heard

• I want to compare yield maps across crops and years, and perhaps relate to VR Inputs.

• How can I determine average yield of specific zones in a field?

• My yield monitor OEM software doesn’t do everything I want.
Comments I’ve Heard

“I want to do it my way”

“I want to do it cheap!”
What Are You Going to Do With The Data?

- Yield Mapping
- Soil Sampling
- Variable Rate Application Maps
- General Management Data
  - Farms / Fields / Boundaries
- Incorporating Economics
What Are You Going to Do With The Data?

- On-Farm Research
- Querying Data – Example Based on Hybrid / Variety
- Analyzing Multiple Year’s of Data
- Utilizing Sensor Data, i.e. Soil EC or Crop Reflectance
- Setting Up GPS Guidance Paths
- Machinery Management
Who is Doing the Work?

- Yourself (producer)
- Are you working with a service provider / consultant?
- Are you involved in a government program?
- Are you the service provider / consultant?
Yield Maps and Recognizing Variability

1997 Corn Yield
Yield Maps and Recognizing Variability

1997 Corn Yield

Soil Electrical Conductivity
Historical Aerial Photos from the County FSA Office Note the farmstead and two ponds prior to 1995
Only 95 ton of lime was applied instead of 294 ton if 2 ton/acre was applied as a blanket rate
Variable-Rate Nitrogen Study
Variable-Rate Nitrogen Study

RF6 - 2001 Corn Yield in bu/acre
- 60.6 - 93
- 93 - 112.9
- 112.9 - 128.3
- 128.3 - 143.8
- 143.8 - 162.9
- 162.9 - 193.3

RF6 Data Used For Analysis - Corn Yield in bu/acre
- 61.78 - 93.311
- 93.311 - 110.348
- 110.348 - 122.009
- 122.009 - 135.363
- 135.363 - 155.145
- 155.145 - 193.123

Av-Applied Map - Nitrogen in lbs/acre
- 106
- 127
- 120
Variable-Rate Nitrogen Study

Summary of Field RF6

LSD (0.05) = 18.8

Potential Nitrogen Savings of 4.5 lbs of N per acre
Example On-Farm Experiment – Development of Management Zones

- Use of Soil Electrical Conductivity
Example On-Farm Experiment – Development of Management Zones

- Use of Past Years’ Yield Maps
Example On-Farm Experiment – Development of Management Zones

- Use of Soil Electrical Conductivity and Past Years’ Yield Maps
Example On-Farm Experiment – Development of Management Zones
Example On-Farm Experiment – Development of Management Zones

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<tr>
<th>Productivity Zone</th>
<th>Soil EC (mS m$^{-1}$)</th>
<th>Nitrogen Rate (lbs/acre)</th>
<th>Seeding Rate (seeds/acre)</th>
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Example On-Farm Experiment – Implementation of Experiment

Corn was planted using a 16-row planter. Planter was equipped with a variable rate drives to control each half of the planter. This allowed the producer to plant his half of the planter with variable seeding rate and the other half to his usual whole field rate of 28,000 seeds/acre.

GPS data was collected on the variable rate side of the planter by mounting the GPS antenna in the middle of that half of the planter.
Results and Discussion – Yield Maps
Results and Discussion – Yield Maps
# Results and Discussion – Yield Summary

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<th>Fixed-rate seeding</th>
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Yield in bushels per acre
## Results and Discussion - Economics

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<td>Net benefit, $/acre-1*</td>
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* compared to whole-field fixed rate. Assumes N cost of $0.55 lb⁻¹, seed cost of $275.00 bag⁻¹, and corn grain price of $5.50 bu⁻¹

** indicates additional cost or reduced revenue
Variable-Rate Corn Seeding
Variable-Rate Corn Seeding

VR Strips - As Applied Map in plants/acre
- 21809 - 23776
- 23776 - 27851
- 27851 - 30381

Field Boundary

2001 Corn Yield - bu/acre - 26k vs VR Strips
- 72 - 100.2
- 100.2 - 116.6
- 116.6 - 130.9
- 130.9 - 145.4
- 145.4 - 162.3
- 162.3 - 194.5

Field Boundary
Variable-Rate Corn Seeding

LSD (0.05) = 4.5

Potential Yield Increase of 5.5 bu/acre
Moving to the Next Step -
Utilizing Off the Shelf Software for On-Farm Research

– The ability to create experimental plots either strips or blocks.

– How yield monitor data can be processed to obtain individual plot yield means for the purpose of statistical analysis.
Moving to the Next Step -
Utilizing Off the Shelf Software for
On-Farm Research

• Choosing software based on the following criteria:
  – Ability to process soil sample data
  – Develop fertility recommendation maps
  – Create soil sampling grids (utilized for the design of plots)
  – Process yield monitor data
Examples of Implementation

• Strip Trial Utilizing Yield Monitor As Primary Data Collection Tool

• Strip Trial Utilizing As-Applied Data and Yield Monitor For Data Analysis
Examples of Implementation

• In-field Plots Utilizing
  – Detailed Plot Map
  – Application Map
  – As-Applied Data
  – Yield Monitor Data

• Utilizing GPS as a Tool for Collecting In-Field Data Collection Efficiency
Example On-Farm Research Study

• To evaluate nitrogen rates in corn production
  – Strip trial of varying nitrogen rates
  – Traditional flagging of plots for identification
  – Yield monitor used a primary data collection
Utilizing Yield Data Collection by Load Number
Utilizing Yield Data Collection by Load Number
### Utilizing Yield Data Collection by Load Number

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<th>Dataset</th>
<th>Area (ac)</th>
<th>Average Moisture (%)</th>
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<th>Estimated Volume (Dry) (bu)</th>
<th>Average Yield (Dry) (bu/ac)</th>
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Utilizing Yield Data Collection by Load Number

![Excel spreadsheet with data]

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<tr>
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<td>8.5</td>
<td>5202.6</td>
<td>92.9</td>
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</table>
Example On-Farm Research Study

• To evaluate sensor-based nitrogen application in corn production.
  – Strip trial utilizing applicator to collect plot information for developing plot identification
  – Utilizing as-applied data as for plot map
  – Yield monitor data pass number attribute key in analyzing results
Utilizing As-Applied Data for Plot Map
Utilizing As-Applied Data for Yield Data Analysis
Sensor Benefits:

- Make sure enough N is applied
- Avoid unneeded N application
129 bu/ac
149 bu/ac

High-N reference area

115 N lbs/acre

40 extra lbs of N with the sensors

175 N lbs/acre
175 N lbs/acre
Outcomes from the demos

• 55 side-by-side comparisons

• Sensor outcomes:
  – 2 bu/acre yield increase
  – 14 lb N/acre saved
  – $13/acre at 2009 prices
  – $19/acre at 2008 prices

• Making money with sensors is easier when prices are high
Outcomes from the demos

• Different in different years

• 2004-2007
  – No effect on yield
  – Saved 24 lb N/acre

• 2008 (very wet year)
  – Used 15 lb extra N/acre
  – Made 8 extra bushels
  – Adjusted for wet weather and N loss!
Utilizing Precision Ag Data Over Time to Make Management Decisions

Combining 10-years of Data into an Overall Profit Map
Combining 10-years of Data into an Overall Profit Map
Utilizing Precision Ag Data Over Time to Make Management Decisions

<table>
<thead>
<tr>
<th>1991-2003</th>
<th>2004-present</th>
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<tbody>
<tr>
<td>Corn-Soybean Mulch-Till</td>
<td>Soybean-Wheat (N) Soybean-Corn (S) No-Till + Cover Crop</td>
</tr>
</tbody>
</table>
Big Data and Precision Ag

- Monsanto – FieldScripts℠ – Precision Planting – Climate Corporation - Integrated Farming Systems™
- Pioneer – Field 360 Select – John Deere
- Winfield – R7® Tool – Answer Plot®
- Dow AgroSciences – John Deere
- MyAgCentral – Prime Meridian
Use of Smartphones / Tablets –
Number of Apps Continue to Grow

As of December 20, 2013, I have 126 on my list. I know I’m still missing some.

http://extension.missouri.edu/boone/agapps.aspx
Continued Improvement in Hardware

- Uharvest – Unverferth
- AgLeader - AgFiniti
Use of UAV Technology – Crop Scouting – Nitrogen Stress

Nitrogen Rate Study at Graves-Chapple Farm on August 27, 2013
What Can Precision Farming Do For You?

• Provide better farm records
• Provide better information for management decisions
• It’s up to you!!!
More Information on Precision Ag

- A good site to keep updated on the latest news in precision agriculture is precisionag.com
- Visit past.infoag.org and infoag.org to view presentations from Past INFOAG Conferences
- Latest discussions go to – talk.newagtalk.com – Precision Talk
Questions ???

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