Collecting and Analyzing Data

Terry Griffin, Ph.D.
Assistant Professor – Extension Economist
University of Arkansas
Cooperative Extension Service

Familiar Questions

• “I have all this data, now what?”
• “Before I collect any more data, can somebody tell me what I’m going to do with it?”
• “Exactly how will I make better farm management decisions with a yield monitor?”
• “Is there any science to back up what I’m about to do with my precision technology?”

What is On-Farm Research

• Farmer managed field-scale trials
  – In conjunction with others, e.g. researchers
  – On your own
• Categorical or rate trials
  – Planned comparisons
• Split-planter strips, split-field, other design

Criteria for On-Farm Trials

• Minimize time requirements at key times
  – Planting
  – Harvesting
    • Yield monitors have reduced harvest time commitment
• Minimize interference with farming operation
  – Relative to expected benefits from research
• Farmer must be interested in research question

Feedback from Farmers

• Filling planters with small amount of seed and cleaning boxes takes too long
• Hard to fill planter with small amount of bulk seed
• Split planter trials are convenient if the harvester is exactly half the planter width
• Harvesting soybeans at diagonals to rows makes it impossible to detect narrow strips with yield data
• “Small-plot trials are not realistic to my farm”

On-farm Trials

• Planning the experiment
• Data collection
• Data analysis
• Farm management decision making
• Available training
Know Costs and Benefits

- Diverting equipment away from other farming operations to conduct experiments may impact whole-farm profitability.
- What are your realistic benefits from conducting the research?

Whole-Farm Returns Impacts

<table>
<thead>
<tr>
<th>Reductions in days: April 27 to May 2</th>
<th>Reduction in days October 11-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 days</td>
<td>$0</td>
</tr>
<tr>
<td>0.5 days</td>
<td>$2,684</td>
</tr>
<tr>
<td>1.0 days</td>
<td>$5,448</td>
</tr>
</tbody>
</table>

Source: Griffin, Dobbins, and Lowenberg-DeBoer, 2006

Planning the Experiment

- Ask the right research questions
- What can we test?
- “With & without” categorical treatments
  - Systems, timing, products, hybrids
- Rate trials
  - Seeding rates, fertilizer rates
- Farmer must be interested in research question

Choosing an experimental design

- Most farmers use split-planter strip-trials
  - Mostly categorical: hybrids, seed treatments
- Some use limited replication split-field designs
  - Tillage, drainage, foliar fungicides, even hybrids

What makes a good design “good”

- Every treatment represented on each zone
  - May necessitate repeating treatment in field
- Ample yield data from each treatment:zone
- Non-intrusive to farming operation
- Easily conveyed
- Provides more reliable results
- Output is a recommendation
  - Not a map

Implementing the Experiment

- Electronically record as much as possible
  - Anything that affects crop growth
  - “northeast corner was wet relative to field”
  - Especially important with strip-trial designs
- Record the true experiment
  - Experiments rarely go as planned
  - Analyst must know true experiment
Data Collection

- Electronically collect as much as possible
- Supporting data important to explain “noise”
  - Elevation, soils, cropping history, old feedlots
- Yield monitor calibration crucial
  - “garbage in = garbage out”
  - Avoid playing with hydrostat
- Record anomalies and yield affecting factors

Data Handling – Yield Data

- Begin with “best” data possible
- Remove erroneously measured yield data
  - Yield monitor not always able to measure properly
- Adjust observation location
  - Flow delays, start & end pass delays
- USDA-ARS Yield Editor (Drummond)
  - Free download
  - Some farm software has integrated Yield Editor

Evolution of Yield Data Analysis

- Eyeballing of printed maps
  - Subjective and misleading
- Numerical analysis
Decision Making with Numerical Analysis

- Farmers using numerical analysis results were more confident:
  - on-farm trials, data, and decisions than before
- Farmers made decisions more quickly
  - Some farmers made more decisions

Third-party Analysts

- If you are interested in performing analysis for yourself or for others, what questions to consider?
- If you are looking for an analyst, what questions to pose?

Issues for analyzing on-farm trials

- What software to assemble the data?
- What type of analysis conducted?
- What software to analyze the data?
- Where received spatial analysis training?
- How confident are you in the results?
- Focus not on providing maps, but recommendations

GPS-guidance and On-Farm Trials

- Implementing the experiment
  - Returning to same plots each year
  - “Guess row” reduction for strip-trials
  - Consistent overlap for spray applied treatments
- Collecting yield data
  - Full or consistent combine header swaths
  - Leads to consistent operation of machine
- Evidence adoption along with yield monitors
More information

• Site Specific Management Center
  – www.purdue.edu/ssmc

Contact Information:
Terry Griffin
Assistant Professor – Extension Economist
University of Arkansas
Cooperative Extension Service
501.671.2182 (O)
501.249.6360 (C)
tgriffin@uaex.edu

Free Software

• Yield Editor – USDA-ARS (Drummond, 2005)
  – http://www.fse.missouri.edu/ars/YE/YE_Reg.ASP