Applied Research and Education – A New Model

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Stillwater Research Station - 1937
- Lysimeter – Determine efficiency of rainfall in crop production
- Weather Station
- Winter wheat varieties
- Crop rotation and fertility

Stillwater Research Station - 1976
- Plant population, row spacing and fertilizer response of grain sorghum
- Lime sources and rate on various crops
- Weed control/herbicide studies
- Small grains performance nurseries

What About Today?
- In some ways we haven’t changed much
- In other ways we have changed a lot
- Who’s making the coarse and fine adjustments?
- Where are the resources going?
- How does this affect you?

Where Does Ag Technology Fit?
- Data logging devices
- Rate controllers
- Guidance systems
- Yield monitors

No-Till Adoption
I think that ag technology adoption is following a similar trend.
Data Logging
- A data logger coupled with a GPS receiver lets us create application maps.
- Allows us to record (automatically) what we are doing in the field.
- Now we know where the proverbial check strip is located.

Rate Controllers
- Rate controllers allow us to easily change rates without leaving the cab.
  - No sprockets and chains
- We can even make application maps have automate the process.

Guidance Systems
- Guidance systems can help us lay out replicated, randomized plots.
- We do not need to drive paths in a sequential order.
- This is really handy if you don’t have a means to adjust rates from the cab.

Ag Machinery Research
- Small plot field research works with some machinery
- The trend has been to larger farm machinery
- Some is not available in sizes conducive to small plots
- How do we conduct valid research with current ag equipment?

Applied Research Model
- University
  - Analytical and research skills
  - Cooperative relationships where everyone has a stake.
- Industry
  - Products to test and sell in a competitive market
- Producers
  - Desire to improve efficiency by reducing production cost.

Example - 2003 Drill Study
- Soybeans were drilled into corn and milo stubble at 5 fields in NE Kansas
- Planted on May 14, 15, 22, and 28
- We used 3 drills (Deere 1590, GP 1510P, Sunflower 9412) on 7.5” spacing, the farmer’s planter (30”), and GP twin row
- Four replications at each field
**Project Responsibilities**

- University: experimental design, calibrating seeders, collecting and analyzing data, and overall study coordination.
- Growers: selecting varieties, seeding rates, adjusting and operating their planters, and collecting yield monitor data during harvest.
- Industry: transporting their seeder to fields and adjusting and operating their seeder to the desired conditions.

**Field Layout**

Five treatments, replicated four times on each field. Plots were 60 feet wide on the smaller fields and 120 feet wide on the two larger fields.

**Application and Harvest**

-Nitrogen was applied in 60 feet wide parallel swaths with OSU’s Cherokee sprayer in mid March.
-Plots were harvested with the cooperator’s John Deere combine equipped with a 30 foot grain platform and Greenstar yield mapping system.

**Example Project in Corn**

**Wheat Transect**

![Wheat Transect Graph]

**Integrating Map and Sensor 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.
Low yielding area where NDVI between the N-Rich strip and farmer practice are similar. No extra nitrogen was recommended.

High yielding zone where the NDVI is greater in the N-Rich strip and nitrogen was recommended.

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, but not as hard as some make it
  - What do you want to know?
  - Why do you want to know it?

Complications for On-Farm Trials
- Grain flow in the combine
- Data validation
- Field variation
- Plot size and layout

Limitations of Yield Monitors
- Yield maps approximate crop yield at a point
- The flow of grain in the combine does not start and stop abruptly
- Crop cut at the edges of the header takes longer to reach the sensor than crop cut at the center of the header.
- Yield monitors overestimate low yielding areas and underestimate high yielding areas

Yield Monitor Errors
- Operator Induced
  - Sudden changes in speed
- Calibration Errors
- Remember, the yield monitor measures mass flow (not yield).

What Causes Error?
- \( R^2 = 0.76 \)
- \( R^2 = 0.63 \)
- \( R^2 = 0.53 \)
Ranking Plots/Treatments

Using YM for OFR
- 50% of the error between weigh wagon and yield monitor weights was due to mass flow
- Correlation between yield monitor and weigh wagon weights was 0.97
- Regression results lead to the same conclusions regarding the treatments
- Challenging to rank treatments with YM data

Plot Size
- Takes 10-15 seconds for a combine to reach full capacity
- A combine travels about 1.5 feet every second for each mph of ground speed
- at 5 mph it travels 7.33 ft/sec (100 ft in 15 s)
- Given the understanding of combine dynamics (i.e. the limitations of your scale) plots should be sized accordingly
- Also field variation can influence yield results
- Adding these means big plots

The Future of Research & Extension
For the times they are a-changin’ -- Bob Dylan, 1963
I’ve seen a lot of change in my life and I fought most of it every step of the way.

Local Research Groups
- Find a topic of local importance
- Each producer is a replication
- Share the data for analysis
- Be the facilitator of data collection and analysis

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University

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