2009 Wisconsin Corn Conference Sponsors

Dairyland Seed Company
AMVAC Chemical
First Capital Ag
Monsanto Company
Mycogen Seeds
Syngenta NK Brand Seeds
Pioneer Hi-Bred, International
Legacy Seeds
Syngenta Crop Protection
Trelay Seed Company
Rural Mutual Insurance Company

Wisconsin Corn Promotion Board
Wisconsin Corn Growers Association
University of Wisconsin Agronomy Department
University of Wisconsin Cooperative Extension
UWEX Cooperating Counties – La Crosse, Waupaca, and Manitowoc
Key Management Practices for Profitable Corn Production in the Northern Corn Belt

Joe Lauer
University of Wisconsin-Madison

2009 Wisconsin Corn Conferences
West Salem, Waupaca, and Kiel
January 20, 21 and 22
Overview

• Keys to high yields and profitability - Ten principles for successful corn production in the northern Corn Belt

• The impact of $300 per bag seed corn - What management adjustments are needed?

• What do we do with all these yield maps?
Corn yield in Wisconsin since 1866

- Top Hybrid = 2.6 bu/A yr
- Arlington = 2.7 bu/A yr
- **Marshfield = 2.6 bu/A yr**
  
  *source: UW Hybrid Trials*

- 1866 to 1930 = 0.0 bu/A yr
- 1931 to 1995 = 1.4 bu/A yr
- **1996 to 2006 = 1.9 bu/A yr**
  
  *source: USDA Statistics*

The yield march continues …

- **Open Pollinated Era**
- **Hybrid Era**
- **Transgenic Era**
Corn Yield Progress in Wisconsin
(Top Producer in Category)

All = 3.6 bu/A yr

- PEPS Cash Corn = 4.8 bu/A yr
- PEPS Livestock Corn = 4.4 bu/A yr
- NCGA Non Irrigated = 4.8 bu/A yr
- NCGA No Till/Strip Till Non Irrigated = 4.5 bu/A yr
- NCGA No Till/Strip Till Irrigated = 3.0 bu/A yr
- NCGA Irrigated = 3.2 bu/A yr
- NCGA Ridge Till Irrigated = 3.3 bu/A yr
- NCGA Ridge Till Non Irrigated = 3.5 bu/A yr

Source: Data derived from grower yield contests (PEPS = 1987 to 2006; NCGA = 1983 to 2006)
Profits through Efficient Production Systems

- Objectives
  - Cost analysis of grain enterprises
  - Emphasize soil and water conservation, efficiency, profitability, and competitiveness vs. productivity alone
  - Recognize the way efficient growers integrate practices into a system

- Divisions
  - Corn, Cash Crop
  - Corn, Livestock
  - Corn, Silage
  - Soybean
Calculating Grower Return

Partial Budget Analysis

- **Corn Price per bushel**
  - Price matrix: $2.00, $4.00, $6.00
  - grPEPS: Weighted Price per bushel =
    50% November Average Cash price
    + 25% March CBOT Futures ($0.15 basis)
    + 25% July CBOT Futures ($0.10 basis)
  - November Average Cash price derived from WI Ag Statistics; CBOT Futures prices derived from closing price on first business day in December.

- **Grower return = (Yield x Price) - Input costs**
  - Handling ($0.02 per bushel)
  - Hauling ($0.04 per bushel)
  - Trucking (system rate)
  - Drying (system rate per bushel-point > 15.5%)
  - Storage (system rate per 30 day)
  - Marketing plan: 50% sold at harvest, 25% at 4 months, and 25% at 8 months.

- **Corn Production Systems**
  - Livestock: drying=$0.00, trucking=$0.00, storage=$0.01
  - On-farm: drying=$0.02, trucking=$0.11, storage=$0.02
  - Commercial: drying=$0.04, trucking=$0.11, storage=$0.03
How much does it cost to produce corn in WI?

Data derived from PEPS cash corn division

- **Cost per Acre ($/A)**
- **Cost per bushel ($/bu)**

### Linear Regression Models

1. **Yield Model**
   - Formula: $y = 2.73x - 5157$
   - $R^2 = 0.51$

2. **Income Model**
   - Formula: $y = -0.02x + 36$
   - $R^2 = 0.31$

### Costs Overview

- **1986:**
  - Cost per Acre: $300 - $450
  - Cost per Bushel: $1.00 - $2.50

- **2000:**
  - Cost per Acre: $450
  - Cost per Bushel: $1.50 - $2.50

### Source
- Lauer

---

Lauer © 1994-2009
University of Wisconsin - Agronomy
http://corn.agronomy.wisc.edu
Average corn production costs for major inputs

Data derived from PEPS cash corn division

Source: Lauer

http://corn.agronomy.wisc.edu

Lauer © 1994-2009
University of Wisconsin – Agronomy
Number of Participants in PEPS
(n= 2173)

Cash Corn
Livestock Corn
Soybean
Corn Silage
How can you get involved in PEPS?

• Contest versus Verification options

• Does it pay to grow corn on my farm?
  ✓ Do I know my production costs?
  ✓ If I do, how do I compare?
  ✓ How efficient is my operation?
  ✓ Am I a good steward?
  ✓ If I make changes, how does that affect my bottom-line?

• What role can agents/dealers/consultants play in PEPS?
  ✓ Promote among producers who would benefit (helping with forms, soil loss and yield checks)
  ✓ Encourage National Corn Growers Association yield contestants to enter
  ✓ Provide input to PEPS committee from “real world”
  ✓ Financial sponsorship
Agronomic and economic consequences of corn management decisions in WI

1. Weather / Environment
   ✓ Top to bottom ranking = 0 to 30% change
   ✓ Presence or absence of genetic traits = 0 to 100% change

2. Hybrid
   ✓ May 1 to June 1 = 0 to 30% change
   ✓ Presence or absence of genetic traits = 0 to 100% change

3. Date of Planting
   ✓ May 1 to June 1 = 0 to 30% change
   ✓ Also need to add moisture penalty

4. Pest Control
   ✓ Timeliness
   ✓ Weeds > Insects > Diseases
   ✓ Good v. Bad = 0 to 100% change

5. Plant Density
   ✓ 32,000 to 15,000 plants/A = 0 to 22% change

6. Rotation
   ✓ Continuous v. Rotation = 0 to 30% change
   ✓ Greater consequence in ‘stress’ environments

7. Soil Fertility
   ✓ 160 v. 0 lb N/A = 20 to 50% change

8. Harvest Timing
   ✓ Oct. 15 to Dec. 1 = 0 to 20% change

9. Tillage
   ✓ Chisel v. No-till = -5 to 10% change
   ✓ No-till = energy savings
   ✓ Cultivation: Yes v. No = 0 to 10% change

10. Row Spacing
    ✓ 30-inches to 15-inches = 0 to 5% change
Is Plant Density at Maximum Yield Changing?
Annual grain yield increase at optimum plant density = 2.8 bu/ A

Source: Lauer
Arlington, 1987-2003 02PD, n= 867 plots
Yield Components of Corn

- Number of rows
- Kernels per row

Grain Yield

Kernel number

Kernel weight

Ears per area

Lauer © 1994-2009
University of Wisconsin - Agronomy
http://corn.agronomy.wisc.edu
Potential Grain Yield Using Calculated Components

Assume 90,000 kernels/bu and 56 lb/bu; kernel mass = 282 mg

<table>
<thead>
<tr>
<th>Plant density (number/A)</th>
<th>Row spacing Plant spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 000</td>
<td>28 14</td>
</tr>
<tr>
<td>25 000</td>
<td>17 8</td>
</tr>
<tr>
<td>30 000</td>
<td>14 7</td>
</tr>
<tr>
<td>35 000</td>
<td>12 6</td>
</tr>
<tr>
<td>45 000</td>
<td>9 5</td>
</tr>
</tbody>
</table>

Grain yield (bu/A)

Kernels/ear

Grain(lb)/ear

0 0.12 0.25 0.37 0.50 0.62

0 100 200 300 400 500

0 200 400 600 800 1000

Row spacing

15 in 30 in

Plant spacing

Lauer © 1994-2009

University of Wisconsin - Agronomy

http://corn.agronomy.wisc.edu
Corn response to plant density in Wisconsin

Varies by location and hybrid (GxE)

Concerns: Lodging and Drought

Plant density (number/A)
What Does the Relationship Between Grain Yield
And Plant Density Look Like?

Total forms = 8; GxE n= 5571 cases (123 locations; 631 hybrids; 80,822 plots)
Trials with min PD< 28,000 and max PD> 34,000

Optimum

95% of optimum

15%

+ Linear and - Quadratic

5%

+ Quadratic

26%

+ Linear

- L = 1%

- Q = 2%

- L + Q = 1%

50%

None

Lauer © 1994-2009

University of Wisconsin - Agronomy

http://corn.agronomy.wisc.edu
Increasing plant density increases grain yield ... but there is a risk

\[ y = -0.07x^2 + 5.69x + 77.67 \]

\[ R^2 = 0.24 \]

Source: Lauer
Arlington, 1987-2005, n= 867 plots
Should We Be Concerned About Seed Costs?

• Seed costs have dramatically increased over the last few years.
  ✓ Transgenic hybrids and technology fees have driven the cost of seed
    ❑ In the early 1990s, premium seed would run about $80 - $100 per bag.
    ❑ Premium hybrids cost $150 - $250 per bag.

• The plant density that maximizes corn yield is increasing over time.

• When grower returns are low, farmers are concerned about the cost of all inputs for corn production.

• Ultimately, optimum plant density is affected by both seed cost and corn price.
## The Maximum Return to Seed (MRTS) Strategy

Price ratio of seed:corn (i.e. $/1000 seeds ÷ $/bu corn).

<table>
<thead>
<tr>
<th>Price of seed</th>
<th>Price of seed ($/1000 seeds)</th>
<th>Price of corn ($/bu)</th>
<th>$1.00</th>
<th>$1.75</th>
<th>$2.50</th>
<th>$3.25</th>
<th>$4.00</th>
<th>$4.75</th>
<th>$5.50</th>
<th>$6.25</th>
<th>$7.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
<td>$0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>$40</td>
<td>$0.50</td>
<td>0.50</td>
<td>0.29</td>
<td>0.20</td>
<td>0.15</td>
<td>0.13</td>
<td>0.11</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>$80</td>
<td>$1.00</td>
<td>1.00</td>
<td>0.57</td>
<td>0.40</td>
<td>0.31</td>
<td>0.25</td>
<td>0.21</td>
<td>0.18</td>
<td>0.16</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>$120</td>
<td>$1.50</td>
<td>1.50</td>
<td>0.86</td>
<td>0.60</td>
<td>0.46</td>
<td>0.38</td>
<td>0.32</td>
<td>0.27</td>
<td>0.24</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>$160</td>
<td>$2.00</td>
<td>2.00</td>
<td>1.14</td>
<td>0.80</td>
<td>0.62</td>
<td>0.50</td>
<td>0.42</td>
<td>0.36</td>
<td>0.32</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>$200</td>
<td>$2.50</td>
<td>2.50</td>
<td>1.43</td>
<td>1.00</td>
<td>0.77</td>
<td>0.63</td>
<td>0.53</td>
<td>0.45</td>
<td>0.40</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>$240</td>
<td>$3.00</td>
<td>3.00</td>
<td>1.71</td>
<td>1.20</td>
<td>0.92</td>
<td>0.75</td>
<td>0.63</td>
<td>0.55</td>
<td>0.48</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>$280</td>
<td>$3.50</td>
<td>3.50</td>
<td>2.00</td>
<td>1.40</td>
<td>1.08</td>
<td>0.88</td>
<td>0.74</td>
<td>0.64</td>
<td>0.56</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>$320</td>
<td>$4.00</td>
<td>4.00</td>
<td>2.29</td>
<td>1.60</td>
<td>1.23</td>
<td>1.00</td>
<td>0.84</td>
<td>0.73</td>
<td>0.64</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>$360</td>
<td>$4.50</td>
<td>4.50</td>
<td>2.57</td>
<td>1.80</td>
<td>1.38</td>
<td>1.13</td>
<td>0.95</td>
<td>0.82</td>
<td>0.72</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>$400</td>
<td>$5.00</td>
<td>5.00</td>
<td>2.86</td>
<td>2.00</td>
<td>1.54</td>
<td>1.25</td>
<td>1.05</td>
<td>0.91</td>
<td>0.80</td>
<td>0.71</td>
<td></td>
</tr>
</tbody>
</table>
Maximum return to seed at Arlington, WI

Seed: Corn Price Ratio

- 0.0 = Yield (bu/A)
- 0.25
- 0.50
- 0.75
- 1.00
- 1.25

Grower return to seed ($/A) for each $1/bu grain price

Harvest plant density (x 1000/A)
Spreadsheet for Calculating Seed Costs

<table>
<thead>
<tr>
<th>Hybrid / Variety</th>
<th>Hybrid A</th>
<th>Hybrid B</th>
<th>difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed Price ($/bag)</td>
<td>$150.00</td>
<td>$150.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Kernels/Seeds per bag (no./bag)</td>
<td>80,000</td>
<td>80,000</td>
<td>$0.00</td>
</tr>
<tr>
<td>Seed Population (number/acre)</td>
<td>32,000</td>
<td>32,000</td>
<td>0</td>
</tr>
<tr>
<td>Potential plant death (%)</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Acres per bag (acres/bag)</td>
<td>2.27</td>
<td>2.27</td>
<td>0.00</td>
</tr>
<tr>
<td>Herbicide Cost ($/acre)</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Insecticide Cost ($/acre)</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Fungicide Cost ($/acre)</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Insurance Cost ($/acre)</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Harvest Moisture (%)</td>
<td>20.0</td>
<td>20.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Drying ($/point*bu)</td>
<td>$0.06</td>
<td>$0.06</td>
<td>$0.00</td>
</tr>
<tr>
<td>Handling Cost ($/bu)</td>
<td>$0.02</td>
<td>$0.02</td>
<td>$0.00</td>
</tr>
<tr>
<td>Hauling Cost ($/bu)</td>
<td>$0.04</td>
<td>$0.04</td>
<td>$0.00</td>
</tr>
<tr>
<td>Trucking Cost ($/bu)</td>
<td>$0.11</td>
<td>$0.11</td>
<td>$0.00</td>
</tr>
<tr>
<td>Storage Cost ($/bu)</td>
<td>$0.12</td>
<td>$0.12</td>
<td>$0.00</td>
</tr>
<tr>
<td>Yield adjustment ($/bu)</td>
<td>$0.56</td>
<td>$0.56</td>
<td>$0.00</td>
</tr>
<tr>
<td>Total Input Cost ($/acre)</td>
<td>$150.00</td>
<td>$150.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

Economic advantage ($/acre) of Hybrid A or Hybrid B. Seed price difference = $0 per bag: A = $150, Hybrid B = $160.

<table>
<thead>
<tr>
<th>Yield advantage bushel/acre</th>
<th>Crop Price ($/bu)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1.00</td>
</tr>
<tr>
<td>Hybrid A yields less than</td>
<td>$14.00</td>
</tr>
<tr>
<td>Hybrid B</td>
<td>$12.00</td>
</tr>
<tr>
<td>Hybrid A yields more than</td>
<td>$10.00</td>
</tr>
<tr>
<td>Hybrid B</td>
<td>$8.00</td>
</tr>
</tbody>
</table>

Hybrid A = (Hybrid B)

<table>
<thead>
<tr>
<th>Hybrid A = (Hybrid B)</th>
<th>$2.00</th>
<th>$4.00</th>
<th>$6.00</th>
<th>$8.00</th>
<th>$10.00</th>
<th>$12.00</th>
<th>$14.00</th>
</tr>
</thead>
</table>

http://corn.agronomy.wisc.edu

Lauer © 1994-2009
University of Wisconsin - Agronomy
Conclusions

• Optimum plant populations for grain yield are higher than currently recommended levels.
  ✓ At Arlington, optimum plant density has been annually increasing 420 plants/A

• About half of the environments (50%) do not respond to plant population. But,
  ✓ High plant populations rarely reduce grain yield (<4%)
  ✓ Need to manage for the opportunities in a responsive environment.
Guidelines for Choosing an Appropriate Plant Density for Corn

• May have the most potential to move a farmer from current yield levels.
  ✓ Might be the place to start for moving off the “yield plateau.”
  ✓ Optimum plant densities seem to be increasing as newer hybrids are commercialized.
    ☐ Grain yield increases to plant densities of 38,100 plants/A.

• The EOPD for seed:corn price ratios between 0.5 and 1.5 is 29,800 to 36,200 plants/A.
  ✓ The plant density of 32,700 plants/A is within $1.00 of the EOPD for ratios between 0.5 and 1.5.

• In general, silage yield increases as plant density increases.
  ✓ But, a trade-off exists where quality decreases with increasing population.
  ✓ Thus, the EOPD is the same for corn grown for silage or grain.
Guidelines: How do you know if an environment is responsive? Let the plants tell you how your field is doing ...

- Tillered v. Runt plants
- Prolific v. Barren shoots
- Big v. Small ears
- Full ear tips v. Nose-back
- Lodging
Guidelines: One place to begin is evaluate your plant density for each field …

- Reference Strips for On-Farm Testing Plant Density
- Field specific
- At least one strip per field. Total of 3-4 strips per farm.
- Increase plant population 10% in one-strip.
  - Plant majority of field to normal plant density
  - Ideally 2-3 strips per field
What do we do with all these yield maps?

• Precision farming and yield maps are ~15 years old.

✓ Crop yields typically vary over space and time. This in-field variability is the focus of precision agriculture – how to manage it, diminish it, or overcome it (Lamb, 1997).

✓ Tremendous costs
  - Infrastructure / Equipment / Data
  - People / Time

✓ Generated lots of data

• To successfully implement variable rate technology, we need predictable patterns of grain yield variability.

• Bottom line: Time is required before yield maps are useful.

✓ “Farming for your sons and daughters.”
So far little economic benefit seen with yield maps ...

**Equipment**
- Sensitive
  - Requires frequent calibration ("GIGO")
- Sophisticated
  ✓ Requires time to learn electronic skills in order to operate equipment and software.
- Requires both yield monitor AND GPS data.

**Data**
- Computer resources
- Management
- Software for Analysis
  ✓ Sophisticated and complicated

**People**
- Lack of local technical assistance
- Decision making
  ✓ Uncertainty for recommendations
- Most benefit is to people in the field rather than absentee owner operators who do little or no field work.
  ✓ Data requires interpretation (notes)

http://corn.agronomy.wisc.edu
Assessing Variable Rate Technology Implemented on Management Zones determined by Multiyear Yield Data

- **Objectives:**

  ✓ Determine if geo-referenced cells within a field vary with respect to grain yield cohort from year to year.
    - How much?
    - Biologically significant?
    - Economically significant?

  ✓ Determine if multi-year grain yield data can be used to predict a management zone classification.

  ✓ If grain yield prediction is achievable, can variable rate starter fertilizer prescriptions, based on management zone grain yield cohorts, be beneficial (agronomic and/or economic).

**Source:** Hopf, 2008
Materials and Methods - from the Grower

• Yield maps were collected over a 13 year period on five fields in Walworth County, WI.
  ✓ The crop rotation for all fields was an alternating corn-soybean rotation.
  ✓ These fields represent a unique dataset due to the high-quality spatially referenced grain yield and grain moisture data.

• Fields were divided into spatially-referenced cells, which remained consistent within a field across years.
  ✓ The size of a cell depended on field size (~100 cells per field).

• During the last growing season in which corn was grown, either 2005 or 2006, the producer implemented variable rate starter fertilizer applications.
  ✓ The N-P-K fertilizer analysis was either 10-34-0, or 16-22.5-0.
  ✓ Starter fertilizer application for these fields was split between three rates of low, medium, and high.

• “Post-mortem” analysis
Materials and Methods - Layout of Fields (~400 A)

**Definitions**

✓ **Cells** are annually affected by environment (weather and management)
  ✓ Size and number is critical
✓ **Cohorts/ Classes** are arbitrary (i.e. SD)
✓ **Management Zones** account for yield AND variance.

### Source: Hopf, 2008

**Field E**
- 0.62 A
- 2500 m²

**Field D**
- 0.25 A
- 1000 m²

**Field C**
- 0.49 A
- 2000 m²

**Field B**
- 0.25 A
- 1000 m²

**Field A**
- 0.62 A
- 2500 m²

---

Lauer © 1994-2009

University of Wisconsin - Agronomy

http://corn.agronomy.wisc.edu
Materials and Methods - Data Cleaning

• Combines equipped with commercially available yield sensing systems were used to collect data from 1994-2007.

• Individual points were determined unreliable based on several criterions.

  ✓ All negative values for grain yield and grain moisture were deleted.
  ✓ Points with GPS positional errors were deleted.
  ✓ Outside headlands were deleted, to avoid significant changes in grain flow while entering and exiting the field.
  ✓ Grain moisture points that were abnormally high, and were not associated with normal grain harvest practices were deleted.
  ✓ Grain yield points that were deemed higher than the agronomical potential for a field under a set of management practices (>300 bu/A) were deleted.
Calculating corn yield cohorts to predict next year’s yield

Source: Hopf, 2008
Methods of Analysis - Field Management Zones

<table>
<thead>
<tr>
<th>Yield cohort</th>
<th>Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>17%</td>
</tr>
<tr>
<td>Medium</td>
<td>66%</td>
</tr>
<tr>
<td>Low</td>
<td>17%</td>
</tr>
</tbody>
</table>
What is the yield range between yield cohorts?

Source: Hopf, 2008
Following cell classification and variable rate application of starter fertilizer, what was the range between yield cohorts?

Source: Hopf, 2008
Did variable rate fertilizer application have any effect on yield?

Source: Hopf, 2008
Did variable rate fertilizer application have any effect on yield?

Source: Hopf, 2008
Did variable rate fertilizer application have any effect on yield within a management zone?

![Graph showing grain yield variation across different management zones and yield variances.](corn.agronomy.wisc.edu)

**Source:** Hopf, 2008
Conclusions

- Annual weather conditions affected classification of cells into cohorts.
- The range between the highest and lowest yielding MZ within a field averaged 26 bu/A across all fields.
- Predicting grain yield of MZs across all fields during the year of variable rate fertilizer application was successful.

- Corn grain yield of MZs based on corn grain yield produced 174, 166, and 150 bu/A in the high, medium and low yield classes.
- Averaged across all fields, variable starter fertilizer treatment did not impact corn grain yield
What crop management decisions can be managed in responsive environments?

**Maybe**

- Hybrid
- Plant density
- Fertilizer: N, P, K, micro, starter, lime
- Pesticide
  - Fungicide
  - Herbicide
Summary

• Grain yield increases are occurring faster in Corn Belt counties outside of Wisconsin.

• The most expensive corn crop ever planted occurred in 2008. The most risky corn crop ever planted will be in 2009.

• Optimum plant populations for grain yield are higher than currently recommended levels.

• Predicting grain yield of MZs across all fields during the year of variable rate fertilizer application was successful.

✓ Averaged across all fields, variable fertilizer treatment did not impact corn grain yield
Thanks for your attention!
Questions?

January 29-30, 2009
Kalahari Resort
Wisconsin Dells, WI