2000 Seed Dealer Update Meetings

Joe Lauer
University of Wisconsin
Corn Yield (bu/A) in Wisconsin Since 1866

1866 to 1929 = 0.0 bu A\(^{-1}\) yr\(^{-1}\)

1930 to 1959 = 1.3 bu A\(^{-1}\) yr\(^{-1}\)

1960 to 1998 = 1.4 bu A\(^{-1}\) yr\(^{-1}\)

1974 to 1998 = 1.6 bu A\(^{-1}\) yr\(^{-1}\) (HT)
Years of Record Corn Yield and the Percent Increase Over the Previous Record Year

bu/A

%
Factors Contributing to Continued Yield Gain

- Resistance to root and stalk lodging
  - *Necessary for machine harvesting at higher plant densities*
- Resistance to diseases - little data to support
- Resistance to insects
- Improvement of stay-green
  - *Continuous improvement of 2nd ECB resistance (Duvick 1984)*
- Use of single-cross hybrids
- Resistance to barrenness
- Better pollen production
- Production under higher population
- Earlier planting date
  - *Better seed quality*
  - *Improved cold tolerance, better germination and emergence*
- Use of commercial fertilizers
- Pest control techniques
1999 Environment Characteristics for Corn Production in Wisconsin

- **Weather**
  - **Temperature**: Faster GDU accumulation than normal over entire growing season.
  - **Precipitation**: Adequate and timely rains through pollination. Little precipitation during grain-filling.
  - **Events**: Scattered hail

- **Silage harvest** began earlier than normal. Grain dry-down was faster than normal.

- **Pests**
  - **Weeds**: No major problems.
  - **Diseases**: Eyespot, Anthracnose and Gray Leaf Spot were observed often and early.
  - **Insects**: Low European corn borer pressure. High Corn rootworm pressure in scattered areas.

- **Planting progress** was faster than normal

- **Pollination** began earlier than normal
### 1999 Wisconsin Corn Performance Trials
#### Grain Summary

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Arlington</td>
<td>1727</td>
<td>185</td>
<td>198</td>
<td>222</td>
<td>+ 20</td>
</tr>
<tr>
<td>Janesville</td>
<td>1727</td>
<td>177</td>
<td>198</td>
<td>222</td>
<td>+ 25</td>
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<tr>
<td>Lancaster</td>
<td>1727</td>
<td>170</td>
<td>198</td>
<td>192</td>
<td>+ 13</td>
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<td>Fond du Lac</td>
<td>1525</td>
<td>159</td>
<td>159</td>
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<td>+ 30</td>
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<td>157</td>
<td>159</td>
<td>202</td>
<td>+ 29</td>
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<tr>
<td>Hancock</td>
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<td>159</td>
<td>202</td>
<td>+ 13</td>
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<tr>
<td>Chippewa Falls</td>
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<td>147</td>
<td>168</td>
<td>169</td>
<td>+ 15</td>
</tr>
<tr>
<td>Marshfield</td>
<td>990</td>
<td>137</td>
<td>168</td>
<td>179</td>
<td>+ 31</td>
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<tr>
<td>Seymour</td>
<td>922</td>
<td>144</td>
<td>69</td>
<td>171</td>
<td>+ 19</td>
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<td>Valders</td>
<td>1400</td>
<td>145</td>
<td>168</td>
<td>199</td>
<td>+ 37</td>
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<tr>
<td>Ashland</td>
<td>129</td>
<td>129</td>
<td>16</td>
<td>157</td>
<td>+ 22</td>
</tr>
<tr>
<td>Spooner</td>
<td>1901</td>
<td>123</td>
<td>189</td>
<td>168</td>
<td>+ 37</td>
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<tr>
<td>White Lake</td>
<td>582</td>
<td>85</td>
<td>63</td>
<td>147</td>
<td>+ 73</td>
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Using Wisconsin Corn Hybrid Performance
Trial Results

- Use multi-environment average data
  - Begin with trials in zone(s) nearest you
  - Compare hybrids with similar maturities
  - Use many years and locations

- Evaluate consistency of performance
  - Check performance in other zones and locations
  - Check other reliable unbiased trials
  - Be wary of inconsistent performance.

You are taking a tremendous gamble if basing your hybrid selection decisions on 1 or 2 local test plots.
### Multi- versus Single-Environment Trials

<table>
<thead>
<tr>
<th>Use Multi-Environment information to evaluate:</th>
<th>Use Single-Environment information to evaluate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Grain yield</td>
<td>- Consistency of performance</td>
</tr>
<tr>
<td>- Moisture and maturity</td>
<td>- Test weight</td>
</tr>
<tr>
<td>- Standability</td>
<td>- Dry-down rate</td>
</tr>
<tr>
<td></td>
<td>- Grain quality</td>
</tr>
<tr>
<td></td>
<td>- Ease of combine-shelling or picking</td>
</tr>
</tbody>
</table>
Methods for Determining Corn Hybrid Maturity

- Minnesota Relative Maturity System (1929)
- Growing Degree Days (1970)
- Company ratings
- Wisconsin Comparative Relative Maturity rating
Method for determining Wisconsin comparative relative maturity - WI CRM (n=92)
Examples of hybrid CRM ratings (based on MN RM) using WI Corn Hybrid Performance Trial data

<table>
<thead>
<tr>
<th>Year</th>
<th>Pioneer 3751</th>
<th>Nk Brand N4242</th>
<th>Jung 2496</th>
<th>Golden Harvest H2441</th>
<th>Dekalb DK493</th>
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<tbody>
<tr>
<td>1989</td>
<td>97</td>
<td></td>
<td>98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>97</td>
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<td>1994</td>
<td>99</td>
<td>99</td>
<td>99</td>
<td>105</td>
<td>99</td>
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<tr>
<td>1995</td>
<td>101</td>
<td>100</td>
<td>100</td>
<td>107</td>
<td>100</td>
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<td>1996</td>
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<td>101</td>
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<td>1997</td>
<td>99</td>
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<td>105</td>
<td>101</td>
<td></td>
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<tr>
<td>1998</td>
<td>97</td>
<td></td>
<td>98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wisconsin Corn Hybrid Silage Performance Trials

- Each hybrid is tested at 2 locations in a production zone
- Seed companies are encouraged to enter silage hybrids in at least one grain trial
## 1999 Wisconsin Corn Performance Trials
### Silage Summary

<table>
<thead>
<tr>
<th>Location</th>
<th>1989-1998</th>
<th></th>
<th>1999</th>
<th></th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Yield</td>
<td>N</td>
<td>Yield</td>
<td></td>
</tr>
<tr>
<td>Arlington</td>
<td>322</td>
<td>9.3</td>
<td>66</td>
<td>10.1</td>
<td>+ 9</td>
</tr>
<tr>
<td>Lancaster</td>
<td>245</td>
<td>7.7</td>
<td>66</td>
<td>8.9</td>
<td>+ 16</td>
</tr>
<tr>
<td>Fond du Lac</td>
<td>207</td>
<td>8.7</td>
<td>67</td>
<td>9.8</td>
<td>+ 13</td>
</tr>
<tr>
<td>Galesville</td>
<td>207</td>
<td>8.0</td>
<td>67</td>
<td>8.1</td>
<td>+ 1</td>
</tr>
<tr>
<td>Marshfield</td>
<td>346</td>
<td>6.6</td>
<td>60</td>
<td>7.5</td>
<td>+ 14</td>
</tr>
<tr>
<td>Valders</td>
<td>273</td>
<td>7.0</td>
<td>60</td>
<td>8.0</td>
<td>+ 14</td>
</tr>
<tr>
<td>Ashland</td>
<td>93</td>
<td>7.0</td>
<td>16</td>
<td>8.0</td>
<td>+ 14</td>
</tr>
</tbody>
</table>
Corn Specialty Hybrid Silage Yield and Quality During 1990-1998 in Wisconsin

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Criteria for Selecting Silage Hybrids

- Grain yield: allows flexibility (dual purpose)
- Whole plant silage yield
- Relative maturity: 5-10 days later than grain hybrids
- Standability: allows flexibility
- Pest resistance
- Silage quality

“Variation for silage yield and quality exists among commercial hybrids in Wisconsin.”
GMO Issues

- **Successes**
- **Agronomic Performance**
  - *Yield lag and drag*
  - *Pollen drift*
- **Marketing**
  - *Premiums*
  - *Emotional*
- **Pest Resistance Management**
- **Crop Rotation**
Specialty Corns

Specialty Marketing Corns
- Amylomaize (high amylose)
- Waxy corn
- High-protein (lysine) corn
- High-oil corn
- White & Yellow Food corn
- HAP corn (high available P)
- Silage corn
- Sweet corn and Popcorn

Specialty Management Corns
- “IMI” - Imidazolinone resistant or tolerant
- “SR” - Sethoxydim resistant
- “Liberty Link” - Glufosinate resistant
- “Bt”
- “Round-up Ready” - Glyphosate resistant
- “Gene stacking”
  - Bt,LL; Bt,IMI

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Yield of “IMI” Hybrids in Relation to the Average of All Hybrids in a Wisconsin Trial

Frequency (%)

- Above trial average
- Below trial average


n = 186
Yield of “BT” Hybrids in Relation to the Average of All Hybrids in a Wisconsin Trial

<table>
<thead>
<tr>
<th>Year</th>
<th>Above trial average</th>
<th>Below trial average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>100 (n = 585)</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>1998</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1999</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Lauer University of Wisconsin - Madison
Yield of “Round-up Ready” Hybrids in Relation to the Average of All Hybrids in a Wisconsin Trial

Frequency (%)

- Above trial average
- Below trial average

1998

1999

n = 77

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Yield of “Liberty Link” Hybrids in Relation to the Average of All Hybrids in a Wisconsin Trial

Frequency (%)

<table>
<thead>
<tr>
<th></th>
<th>Above trial average</th>
<th>Below trial average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>1998</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>1999</td>
<td>50</td>
<td>50</td>
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n = 35
Yield of “Gene Stacked” Hybrids in Relation to the Average of All Hybrids in a Wisconsin Trial

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Above trial average</th>
<th>Below trial average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>Bt,LL</td>
<td>n = 11</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Bt,IMI</td>
<td>n = 9</td>
<td></td>
</tr>
</tbody>
</table>

Lauer University of Wisconsin - Madison
Yield of Specialty Hybrids in Relation to the Average of All Hybrids in the 1999 Wisconsin Hybrid Trials

Frequency (%)

- Above trial average
- Below trial average

<table>
<thead>
<tr>
<th>Variety</th>
<th>Above 50%</th>
<th>Below 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal dent</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Bt</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>IMI</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>LL</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>RR</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td>Bt,IMI</td>
<td>11</td>
<td>89</td>
</tr>
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</table>

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Comparison of 2-row and 4-row Plots

Materials and Methods

- RCB in split-plot arrangement
- Main: Plot size
  - 2-row (5’ x 25’)
  - 4-row (10’ x 25’)
- Split: Randomly selected hybrids
  - 1998: Maturity
  - 1999: Height
- In 1999, chose same hybrids as in HT
  - Planted adjacent to HT
Correlation Between 2-row and 4-row Plots


- 2-row ($r = 0.97^{**}$)
- HT ($r = 0.96^{**}$)

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Hybrid Challenge I
Materials and Methods

- Farmers feel that results from small plots do not relate to field scale production.
- Paul Carter challenged Farmer
  - *Hybrid selected using UW results*
  - *Hybrid selected by seed company, consultant, or farmer*
- Random odds = ~50%
- Trials replicated and randomized (1991: n = 60)
- Large plots: 0.1 to 0.5 A

- Farm-scale machinery used to plant, manage and harvest plots

Conclusions

- UW hybrids were starred (beat or tied farmer hybrid) in 47 of 60 trials or 78% of time
- UW Trial results were a useful predictor of future hybrid performance
Hybrid Challenge II
Materials and Methods

- Data set = WAPAC Hybrid Performance Trials
  - 2 “standard” hybrids: Selected using UW trial results. Used to “set the bar”
  - 6 to 10 other hybrids. “Best of the best” Selected by seed companies, consultants, and farmers
- Random odds = ~25%

- Trials replicated and randomized
- Multi-environments: same set of hybrids grown at numerous locations
- Large plots: 0.1 to 0.5 A
- Farm-scale machinery used to plant, manage and harvest plots
Hybrid Challenge II - Grain yield
Frequency of trials with starred standard hybrids.

- Standard starred in trial
- Standard not starred in trial

Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Frequency (%)</th>
<th>n = 141</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>75</td>
<td></td>
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<tr>
<td>1998</td>
<td>70</td>
<td></td>
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<tr>
<td>1999</td>
<td>50</td>
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</tr>
<tr>
<td>Average</td>
<td>65</td>
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</tr>
</tbody>
</table>

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Hybrid Challenge II - Grower return

Frequency of trials with starred standard hybrids.

- Standard starred in trial
- Standard not starred in trial


Average

n = 141
Quintile frequency of two hybrids in a trial where there is no significant difference.
Quintile frequency of two hybrids in a trial where there is a significant difference

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Correlation Between 2-row and 4-row Plots


- 2-row plots: $r = 0.93**$
- HT plots: $r = 0.71**$

Grain yield rank in 2-row or HT plots vs. Grain yield rank in 4-row plots
Correlation Between 2-row and 4-row Plots

Data includes Arlington, Janesville, and Lancaster (2- and 4-row: 1998, 1999)

- 4-row plots (r = -0.03 ns)
- 2-row plots (r = 0.03 ns)
Correlation Between 2-row and 4-row Plots

Data includes Arlington, Janesville, and Lancaster (2- and 4-row: 1998, 1999)

- 4-row plots: $r = -0.86^{**}$
- 2-row plots: $r = -0.82^{**}$
- HT plots: $r = -0.72^{**}$