2007 Corn Production Considerations

Jim Fawcett
ISU Extension Crop Field Specialist
The Rotation Decision?

- Traditional Corn-Soybean
- Corn-Corn-Soybean
- Continuous Corn

- Problems and Considerations
Why Corn-Bean Rotation

- Higher yields (?)
  - Rotation Effect...
- Less pest problems (?)
  - Weeds, insects, disease
- Lower fertilizer costs
- Less crop residue
Challenges for Corn on Corn

• Lower Yields (especially with stress)

Increased Pest Problems
  – Especially insects & diseases
  – Hybrid selection more critical

• Higher N Rates & Costs

• More crop residue to manage
  – Field selection important
  – More tillage?
  – Planting operations more critical
Yield Difference: C-SB and C-C

32 Site-Years in Iowa, at 240 lb N/acre

<table>
<thead>
<tr>
<th>Year</th>
<th>C-S</th>
<th>C-C</th>
<th>Difference</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>160</td>
<td>156</td>
<td>4</td>
<td>2.2</td>
</tr>
<tr>
<td>2001</td>
<td>146</td>
<td>115</td>
<td>31</td>
<td>21.0</td>
</tr>
<tr>
<td>2002</td>
<td>152</td>
<td>122</td>
<td>30</td>
<td>19.7</td>
</tr>
<tr>
<td>2003</td>
<td>163</td>
<td>117</td>
<td>46</td>
<td>28.1</td>
</tr>
<tr>
<td>2004</td>
<td>204</td>
<td>200</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>2005</td>
<td>193</td>
<td>163</td>
<td>30</td>
<td>16.1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>170</strong></td>
<td><strong>144</strong></td>
<td><strong>26</strong></td>
<td><strong>16.2</strong></td>
</tr>
</tbody>
</table>

J.E. Sawyer, Iowa State University

Iowa State University
University Extension
Corn Yield - % of Corn-Soybean Rotation
IA Studies

Corn Grain Yield % of Corn-Soybean Rotation

-10% -7%

Corn-Soybean
Corn (1st Yr)
Corn (2nd Yr)
Continuos Corn

23-Yr Data Set
Last 4-YR Data Set
Corn - Corn vs. Corn - Soybean
Monmouth, IL (2005)

Yield of corn following corn

Yield change with corn on soybean

- Non-RW
- RW

$R^2 = 0.8271$
$R^2 = 0.3742$
Insect issues...

• Primary insect to consider in short-term corn after corn is corn rootworm.
  – Consider a soil insecticide, seed treatment, or transgenic Bt hybrid.

• Corn borer likely not worse in 2\textsuperscript{nd}-yr corn, but pressure could elevate in lengthier continuous corn systems.
CRW control options...

- Most consistent control:
  - Bt-RW hybrids (transgenics)
  - Soil applied granular insecticides

- Less consistent control:
  - Liquid insecticides.
  - High rate seed applied insecticide.

These differences are most pronounced where rootworm pressure is severe (high populations).
Seed-Applied Insecticides

- Newer insecticide class: Neonicotinoids
  - Poncho™, Cruiser ™, Gaucho™
  - Systemic to roots & new leaves

- Targeted towards...
  - Secondary soil insects (low rate formulations)
  - Corn rootworm (high rate formulations)

- Pre-applied to seed by seed company.
  - Sometimes must be requested w/ seed order.
  - ~ $4 – $6 per acre (low rate formulations)
  - ~ $18 – 20 per acre (high rate formulations)
Corn Pests
–western bean cutworm

• Relatively new corn pest for Iowa
• No difference between corn ground and soybean ground
• Populations may increase with increased corn acreage
Corn Pests – western bean cutworm

• Injury:
  - Different from other cutworms; ear feeders
  - Economic damage may occur when multiple cutworms feed on an ear
  - Injury allows pathogens into the ear
Soybean Yield - % of Soybean-Corn Rotation
IA Studies

<table>
<thead>
<tr>
<th>% of Soybean-Corn Rotation</th>
<th>Soybean Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>110%</td>
<td></td>
</tr>
<tr>
<td>120%</td>
<td></td>
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</tbody>
</table>

23-YR
- Soy-Corn: 100%
- Soy-Corn-Corn: 110%
- Continuous Soy: 80%

Last 4-YR
- Soy-Corn: 100%
- Soy-Corn-Corn: 110%
- Continuous Soy: 80%
Field Selection for Corn on Corn

- Consider fields with past soybean disease problems
  - Sudden death syndrome
  - Soybean cyst nematode
Plant Disease Management

Some seedling blight diseases thrive in cool, wet soils early in the season.

- Avoid excessively early planting in poorly drained soils.
- Avoid fields for corn on corn that tend to be cold & wet in spring.
More corn residue can increase the severity of some foliar diseases such as gray leaf spot.

- Hybrid selection and occasionally foliar fungicide applications can manage diseases.
Plant Disease Management

• More corn residue can increase problems with stalk and ear rots
  - Scout fields and harvest in a timely fashion if problems occur
# Nutrient Requirements

## Nutrient Balance Summary

<table>
<thead>
<tr>
<th>Rotation</th>
<th>N (lb/yr)</th>
<th>P$_2$O$_5$ (lb/yr)</th>
<th>K$_2$O (lb/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn/Soybean</td>
<td>63</td>
<td>53</td>
<td>66</td>
</tr>
<tr>
<td>Corn/Corn/Soybean</td>
<td>91</td>
<td>58</td>
<td>59</td>
</tr>
<tr>
<td>Corn/Corn/Corn/Soybean</td>
<td>119</td>
<td>56</td>
<td>58</td>
</tr>
<tr>
<td>Continuous Corn</td>
<td>169</td>
<td>58</td>
<td>46</td>
</tr>
</tbody>
</table>

## Nutrient Balance Summary

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<tr>
<th>Rotation</th>
<th>N</th>
<th>P$_2$O$_5$</th>
<th>K$_2$O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn/Soybean</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Corn/Corn/Soybean</td>
<td>145%</td>
<td>108%</td>
<td>89%</td>
</tr>
<tr>
<td>Corn/Corn/Corn/Soybean</td>
<td>190%</td>
<td>106%</td>
<td>87%</td>
</tr>
<tr>
<td>Continuous Corn</td>
<td>270%</td>
<td>108%</td>
<td>70%</td>
</tr>
</tbody>
</table>
Comparison of Responses to N in CC and SC Rotation

Six Nitrogen Rate by Crop Rotation Sites
2000-2004 C-S and C-C Rotations

C-S Economic Yield: 161 bu/acre
C-S Economic N Rate: 108 lb N/acre

C-C Economic Yield: 137 bu/acre
C-C Economic N Rate: 167 lb N/acre

C-C 15% Lower Yield
C-C 59 lb N/acre Higher N Need

J.E. Sawyer, Iowa State Univ., 2004
Tillage Considerations

• More Residue to Manage With Corn on Corn
• More Difficult to Make No-till Work on Corn Ground
• More Residue than in the Past – Higher Populations & Yields and Bt Corn
Stand establishment issues

- Greater residues of corn/corn often delay soil warm-up & drying in spring; can also provide greater challenges with the planting operation if no-till.
  - Target better-drained fields for corn/corn.
  - Tillage, if practical, to manage residue.
  - Row cleaners and proper operation of planter equipment more critical in no-till
  - Avoid planting excessively early.
  - Response to starter more likely.
Average Yield of Continuous Corn 1995-2005
SE Iowa Research Farm

Kalona Soil
Flat, Poorly Drained

Nira Soil
Rolling, Fairly Well Drained

- No Till
- Alternative
- Chisel-Disk
Average Yield of Rotated Corn
1995-2005
SE Iowa Research Farm

Kalona Soil
Flat, Poorly Drained

Nira Soil
Rolling, Fairly Well Drained

Bu/A

No Till
Alternative
Chisel-Disk

IOWA STATE UNIVERSITY
University Extension
Average Yield of Soybeans
1995-2005
SE Iowa Research Farm

Kalona Soil
Flat, Poorly Drained

Nira Soil
Rolling, Fairly Well Drained

No Till
Alternative
Chisel-Disk
Summary

• Managing corn on corn ground takes a higher level of skill and provides more challenges.
  – Use hybrid selection and/or appropriate use of pesticides to manage pests.
  – Remember greater N needs of corn.
  – Avoid fields that tend to take longer to warm up in spring and don’t be in a hurry to plant.
  – Pay more attention to detail in operating planter.
QUESTIONS???