Crop Quality 2009 and 2010 and Grain Storage Management

The Extension Grain Management Team
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Agricultural Engineering
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Farm Management
Mark Licht: Agronomy
Alison Robertson: Plant Pathology
OUTLINE

• Crop quality
  – 2009 Corn Issues
  – Blending and Carryover
  – 2010 Weather and Quality

• Basic storage practice

• Future needs for grain storage
2009 Growing Degree Days (base=50) (Mar 01 - Sep 01)

- Sutherland: 2012, (-524)
- Kanawha: 2094, (-306)
- Nas hua: 2076, (-355)
- Castana: 2317, (-304)
- Gilbert: 2296, (-292)
- Ames: 2242, (-237)
- Cedar Rapids: 2238, (-402)
- Lewis: 2413, (-222)
- Chariton: 2409, (-275)
- Mus catine: 2399, (-418)
- Calmar: 2134, (-210)

Iowa Environmental Mesonet
Iowa State Ag Climate Network

Iowa State University
University Extension
Wet Corn!
Hail damage, Sac County, 8-09-2009

Photos courtesy: Mark Licht, ISU Extension
Ear rot assessments – percent severity; rot present

- Fusarium
- Penicillium
- Cladosporium
- Gibberella
- Fusarium
- Trichoderma
Corn, NE Iowa, January 2010
## Ear Rot Summary

<table>
<thead>
<tr>
<th>Total Damage</th>
<th>Mean ear rot severity (%)</th>
<th>Ear rots present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Range)</td>
<td></td>
</tr>
<tr>
<td><strong>Hail damage samples</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>($N=56$)</td>
<td>11.8 (0 – 53.4)</td>
<td>Fusarium*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gibberella*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cladosporium, Penecillium</td>
</tr>
<tr>
<td><strong>Background samples</strong></td>
<td>3.3 (0 – 16.4)</td>
<td>Cladosporium*</td>
</tr>
<tr>
<td>($N=27$)</td>
<td></td>
<td>Fusarium, Gibberella</td>
</tr>
<tr>
<td><strong>Standing corn samples</strong></td>
<td>24.0 (0.2 - 83.8)</td>
<td>Cladosporium*</td>
</tr>
<tr>
<td>($N=72$) (No increased toxin)</td>
<td></td>
<td>Fusarium, Gibberella</td>
</tr>
</tbody>
</table>

* Predominant ear rot present
DON and ZEN in 2009 Corn from Iowa

Vomitoxin (DON) and Zearalenone (ZEN), 2009 Corn

- FDA Guidance
- Hail
- Standing
- Control

-- For Ethanol to DDGS
Ethanol Yield Wet vs Dry

Sample ID

Wet
Dry

Ethanol Yield, gal/bu
Ethanol Yield vs Density, 2009 Corn

Ethanol Yield vs Density, 2009 Corn

Density, g/cc@15% M
# Reduce to half for 2009 crop

### Maximum storage time (months) for corn and soybeans*

<table>
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<tr>
<th>Corn temperature °F</th>
<th>Corn, soybeans moisture content</th>
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<tr>
<td>40</td>
<td>150</td>
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<td>50</td>
<td>84</td>
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*Based on 0.5% maximum dry matter loss—calculated on the basis of USDA research at Iowa State University. Corresponds to one grade number loss; 2-3% pts in damaged seeds Soybeans approximated at 2% lower moisture than corn.
Blue-eye; Penicillium or A. Glaucus
No Dry Air in July and August!
Any time you have EMC balanced with 65% RH, Blue Eye is possible
Flooded Corn

• A health hazard – flood waters not clean.
• Cob soaks up; gets moldy and soft.
• Spreads mold to ear; likely A. Flavus.
• Threat of toxins; a mess after shelling
• Destroy (FDA, IDALS October 1, 2010).
• Not in elevators or handling systems!
Flooded Corn
Inbound Grading - Corn Damage

Inbound Corn Damage

Official Damage (%) vs. House - Official

Copyright © 2007
Net Error of Corn Damage Grading

\[ y = -0.4494x + 0.0249 \]

\[ R^2 = 0.4569 \]

Average = -1.2%

Generally graders underpicked more as damage increased
Blending Ratios for Percentage Factors

Percent in Off Grade Fraction

Target = 4.5% Damage
In September and October, 2010 we had extremely dry air.
Summary – Crop Quality

• 2009 crop continued to deteriorate.
• It will take a long time to clear out all the off grade inventories.

GRADE YOUR CORN!
Toxins don’t go away!
Mixed feed will be an issue!

• 2010 corn crop quality is better, but not great. 54-56 lb/bu; dry but small kernels.
# Allowable Storage Time

## Maximum storage time (months) for corn and soybeans*

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Storage Choices

Choose which grain for less flexible storage.

- Clean
- **Uniform moisture**; means has been aerated
- Higher test weight; as possible (56+ for corn)
- From one crop year
- No history of problems; under your control for as long as possible.

- Sort on Test Weight.
- Remove the center core.
Shrink – Handling and Storage

• Lost kernels, dust, mold, increased FM
• Some Estimates:
  – 0.5% (0.005) weight loss per in and out. Out to Pile counts double. More if multiple turns.
  – 0.2% FM Increase per rotation (15% corn); 0.4% if 13%, etc. More with dryer stress cracks or low TW (2x)
  – 0.5% weight loss per 3% pt damage increase.
  • Example: 3% to 12% is 9% pts = 1.5% shrink
Aeration Phases

• **Phase 1: Fall Cool Down**
  - Lower grain temperatures stepwise
    - September 50-55 F!!! 2010 warm grain.
    - October 40-45 F
    - November 35-40 F
    - December 28-35 F

• **Phase 2: Winter Maintenance**
  - Maintain temperatures with intermittent aeration
    - January, February 28-35 F

• **Phase 3: Spring Holding**
  - Keep cold grain cold
    - Seal fans
    - Ventilate headspace intermittently

Source: Purdue Univ.
Corn and Soybean Ending Stocks, 1991 - 2011
# Iowa Ethanol Production and Corn Usage

<table>
<thead>
<tr>
<th>Summary Statistics May-2010</th>
<th>n</th>
<th>Ethanol Produced mil gal/yr</th>
<th>Corn Used mil bu/yr</th>
<th>DGS 000 tons/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Dry-grind Plants</strong></td>
<td>34</td>
<td>3,280</td>
<td>1170</td>
<td>10,237</td>
</tr>
<tr>
<td><strong>Expansions and new construction</strong></td>
<td>1</td>
<td>277</td>
<td>98</td>
<td>857</td>
</tr>
<tr>
<td><strong>Wet Mills</strong></td>
<td>4</td>
<td>500</td>
<td>178</td>
<td>1,557</td>
</tr>
<tr>
<td><strong>Nearby Iowa</strong></td>
<td>11</td>
<td>636</td>
<td>227</td>
<td>1,986</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>50</td>
<td>4,693</td>
<td>1,673 (69% of 2009)</td>
<td>14,637</td>
</tr>
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</table>
Corn Yield Potential

Overall = 2.1 bu/a/yr; Last 10 = 3.5 bu/a/yr;
Seed industry = 4-6 bu/a/yr; +400-500 million bu/year
Nitrogen use: 1.0-1.1 lb/bu down to 0.7-0.8 lb/bu

Source: Monsanto, June 2010
Potential Corn and Ethanol Production
Feed, Food Export @ +1%/yr, 80MM Acres of Corn

- Ethanol
- Corn
- Present Production

Year
2005 2010 2015 2020 2025 2030 2035 2040
Billion gal. billion bu

- Gal of EtOH, 4 bu/a/yr
- Total Corn, 4 bu/a/yr
- Gal of EtOH, 6 bu/a/yr
- Total Corn, 6 bu/a/yr

IOWA STATE UNIVERSITY
University Extension
New Corn Storage as "105s"

"105" = 650,000 bu; 4 bu/acre/yr increase

Number

Year

2010 2015 2020 2025 2030 2035

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000
Infrastructure Investments

- 4-8 new 100mgy plants per year ($200MM/plant+$50MM fractionation)
- Storage and Handling ($3-$4/ bu cap’y)
- Drying ($250K/dryer)
- Related support
  - Railcars, trucks
  - Roads, other...

$100 Bln+ is conservative
Summary - Storage

• Attention to longstanding storage principles will be more necessary as volumes increase.

• Ethanol use is holding grain locally.

• Use has to increase to avoid surpluses.

• Significant infrastructure investment will follow corn production.
Where To Find Us...

Iowa Grain Quality Initiative

Grain Quality Laboratory

www.iowagrain.org

www.grainlab.org

Supporting Services and Technologies for BioProcess Industries

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