Cows, Forage, Corn and Residues

The Great Opportunity for Nebraska Agriculture

The Situation
• 2 million beef cows
• 2.5 million cattle on feed
• 10.3 million acres corn
  • 6.3 million irrigated
  • 4 million dryland

The Change
• Ethanol Industry
  • Second state in Nation (24 plants)
  • Uses 35% of corn
  • ↑ corn price
    • $2.25 → $6.50
  • Byproducts

The Challenge
• Corn Price
• Pasture → Corn
• Supply and Price of Forage
• Abundance of Corn Residues

Corn Residue
• 10.3 million acres
  • 6.3 irrigated
  • 4.0 dryland
• 170 bu/ac yield?
  • 200 irrigated
  • 122 dryland
• 80% of grain as residue (dry)
  • 4.8 tons/ac irrigated
  • 2.93 ton/ac dryland
Effects of Supplementation on Corn Residue on Cow and Calf Performance

<table>
<thead>
<tr>
<th>Item</th>
<th>Supplemented</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>October Wt., lb</td>
<td>1263</td>
<td>1265</td>
</tr>
<tr>
<td>February Wt., lb</td>
<td>1351</td>
<td>1327</td>
</tr>
<tr>
<td>October BCS</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>February BCS</td>
<td>5.6</td>
<td>5.4</td>
</tr>
<tr>
<td>Calf Birth Wt., lb</td>
<td>86</td>
<td>85</td>
</tr>
<tr>
<td>Pregnancy Rate, %</td>
<td>94</td>
<td>91</td>
</tr>
<tr>
<td>Weaning Wt., lb</td>
<td>552</td>
<td>548</td>
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</tbody>
</table>

Treatment

- 5-Year study n=85 head per treatment per year; March calving cows
- Supp cows = 2.2 lb/d Buhler DM basis, distiller based cube
- Oct = pre-corn residue grazing
- Feb = post-residue grazing

**a** differ at P<0.05
Distribution of Plant Parts
- Husk — 6.7%
- Leaf Blade — 22.1%
- Leaf Sheath — 10.8% (39.6%)
- Cob — 11.9%
- Stem — 48.5%
10 hybrids, 4 densities, 600 plants

Grain Available
- 80s — 4.2% of corn yield
- Current — 0.5% of corn yield? — variable
- 5.6% of diet
- Increase in diet TDN 50 → 52.3%

Grazing Removal
- 200 bu/ac corn yield
- 1600 lb leaf/husk/ac consumed (2.4 AUM/ac)
- 7680 lb/ac total residue
- 21% removal
- 45% undigestible (11.6% removal)
Cattle Needs

- Cow Grazing
- Calf Grazing
- Feedlot Cattle, Stalks, Silage
- Drylot Cows

Cattle Needs

- Cow Grazing 1.8 million tons
- Calf Grazing .25 million tons
- Feedlot Cattle .46 million tons
- Drylot Cows .48 million tons
- Total 2.99 million tons

Corn Residue Balance

- Irrigated – 30.24 million tons
- Dryland – 11.7 million tons
- Total – 41.96 million tons
- Maximum use – 2.99 million tons
- Percent maximum use – 7.1%
- Irrigated only – 9.9%

Consequences

- Subsequent Crop Yields
- Soil
- Water

Crop Yields – Fall/Winter Grazing

- Linear-Move, ‘96 – ’11, corn/soybean
  Soybeans, 60.4 vs 62.4 grazed
  Corn, 205.8 vs 208.9 grazed
- Dryland ‘93 - ’95, corn/corn
  Corn, 147 vs 149.5 grazed
Light Grazing Baling

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Year</th>
<th>Control</th>
<th>1 AUM/Ac</th>
<th>2 AUM/Ac</th>
<th>Baling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009</td>
<td>124</td>
<td>128</td>
<td>133</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>141</td>
<td>144</td>
<td>145</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>165</td>
<td>159</td>
<td>170</td>
<td>166</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td>143</td>
<td>144</td>
<td>149</td>
<td>144</td>
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</tbody>
</table>

Rainfed Site

Marginal site would have qualified for CRP
No-tillage, continuous corn
Three N rates
54, 107, and 160 lbs ac\(^{-1}\)
Two residue removal treatments
Residue removed or residue retained.

Residue Removal in an Irrigated Corn System

Corn yield

-50% of residue removed.
Grain yield is ~2 bu ac\(^{-1}\) less in residue removed treatment.

Varvel et al., 2008
Irrigated Site

Continuous corn, 180 lbs N ac\(^{-1}\)
Two tillage treatments
  Disk tillage or No tillage
Three residue removal treatments
  0, 50, or 100% removal

Grain and stover yields in an irrigated study at Mead, NE (2009-2010)

<table>
<thead>
<tr>
<th>Tillage removal</th>
<th>Grain yield (%)</th>
<th>Total lbs/a</th>
<th>Removed lbs/a</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>201.7</td>
<td>10677</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>207.5</td>
<td>10684</td>
<td>3816</td>
<td>36</td>
</tr>
<tr>
<td>100</td>
<td>212.4</td>
<td>11241</td>
<td>8549</td>
<td>76</td>
</tr>
<tr>
<td>Mean</td>
<td>207.2</td>
<td>10867</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No tillage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>180.9</td>
<td>9659</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>205.9</td>
<td>11018</td>
<td>4323</td>
<td>39</td>
</tr>
<tr>
<td>100</td>
<td>202.0</td>
<td>10145</td>
<td>8230</td>
<td>81</td>
</tr>
<tr>
<td>Mean</td>
<td>196.2</td>
<td>10274</td>
<td></td>
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</tr>
</tbody>
</table>

1. Corn residue offers an opportunity to maintain and grow the beef cattle industry in Nebraska and compensate for the increase in corn cost and reduction in pasture acres.

2. Even with increased numbers and use of corn residue, the beef industry would use less than 15% of the state’s corn residue.

3. Removal of residue by cattle grazing is less than 15% in most cases. Maybe but I have the impression that it is more in some cases and especially in rainfed situations. The residues appear to be more palatable with lower yields and, in variable fields, the most heavily grazed is often where more cover is needed.

4. Grazing of irrigated corn residue or harvest of 20 to 30% of the residue likely increases subsequent crop yields if no-till. Probably even 40 to 50%.
5. Tillage is more detrimental to erosion and probably subsequent yields than residue removal up to 20%. Even up to 40-50% for irrigated situations.

6. No residue should be removed from highly erodible fields. That is fields with highly erodible soil but with inappropriate management for erosion control. Unfortunately, some of the heaviest removal occurs on fields of highly erodible soil with management inappropriate for erosion control. This is a major concern and where stewardship appears to be moving backward. It is my impression that land stewardship is currently worse than it has been during the past 3-4 decades in some parts of the state!

7. Light to moderate grazing of non-irrigated fields of low erodability is likely without consequence.

8. Residue harvest should be done primarily on irrigated fields. Yes, but even rainfed fields in higher rainfall eastern Nebraska where conditions and management prevent much erosion.

9. Residue harvest should be limited to 20% to 30%. Management of this level of removal is problematic and needs further research. The acceptable removal demands on the amount produced. We do not have good guidelines in regards to effect on yield. There may now be sufficient data available from numerous corn belt and Great Plains studies for a good analysis of residue remaining and effects on yield in consideration of annual or early season water availability; better guidelines could be developed. RUSLE2, as we applied it for NebGuide G1846, is valuable for accessing effects on water erosion as is NRCS WEPS for wind erosion.

10. Husk and cob removal is of little consequence, especially on irrigated acres.
11. Silage harvest should be accompanied with heavy manure application and(or) cover crops. Sowing of cover crops immediately after harvest needs to be strongly promoted for the ground cover and soil protection but also for grazing or hay, at least for irrigated land.

12. NebGuide G1864 covers residue material well but might be interpreted that any removal will reduce crop yield. Hopefully that can be changed so not to be misinterpreted. This is under revision in consideration of more recent research findings.

Hypothetical

- 2 – 3 bu yield loss
- @ $6/bu = $12 to 18/ac
- Equal to grazing lease
- Hypothetical “DOESN’T CUT IT”