Grazing Corn Residue:
Part 2

Aaron Stalker
Outline

• NE corn residue is abundant
• Stocking rate is critical
• Plant parts differ in nutrient content
• Grazing is compatible with modern farming
• Corn residue is a good resource
  – Animal performance
  – Cost
USDA ERS Data

Source: 2010 Ag Resource Management Survey
Cows plus stockers (Q6a1 + Q6a2), Rancher specific AU values or average if specific not available
Average grazing rate: 0.9 AUM/ac

- Best information on weight (specific if available, average if not)
- Adds cows and stockers in Q6

Percent of area grazed: 39% of corn

- Percent of survey area reported as grazed

If 1 AUM = 702 lbs dry matter (UNL grazing calculator)

- 9.1 million ac corn planted in Nebraska in 2010
- 3.5 million ac of corn stalks grazed in winter 2010
- 2.9 million tons of corn stalks eaten by cattle in winter of 2010

- Total stover supply (INL) 11.2 million tons

Cattle eat about 25% of available stover in NE
## Composition of corn residue

<table>
<thead>
<tr>
<th></th>
<th>% DM</th>
<th>% CP</th>
<th>% TDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>86</td>
<td>10.2</td>
<td>90</td>
</tr>
<tr>
<td>Husk</td>
<td>55</td>
<td>4.4</td>
<td>58</td>
</tr>
<tr>
<td>Leaf</td>
<td>76</td>
<td>6.9</td>
<td>52</td>
</tr>
<tr>
<td>Cob</td>
<td>58</td>
<td>2.9</td>
<td>48</td>
</tr>
<tr>
<td>Stem</td>
<td>31</td>
<td>3.9</td>
<td>49</td>
</tr>
</tbody>
</table>

Gigax et al., 2011
Dry matter content of corn residue

<table>
<thead>
<tr>
<th>Corn Residue</th>
<th>% Moisture</th>
<th>% of Residue (D.M. Basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husk</td>
<td>45-50</td>
<td>12</td>
</tr>
<tr>
<td>Leaf</td>
<td>20-25</td>
<td>27</td>
</tr>
<tr>
<td>Cob</td>
<td>50-55</td>
<td>12</td>
</tr>
<tr>
<td>Stem</td>
<td>70-75</td>
<td>49</td>
</tr>
</tbody>
</table>

Wilson et al., 2003
Cows are “selective” grazers on stalk fields

- Select the corn first – Diet quality = high
- Select husk second – Diet quality = high
- Select leaves next – Diet quality = medium
- Select cob and stem last – Diet quality selected = low
Figure 1. *In vitro* dry matter disappearance of the roughage fraction of diets selected by esophageally fistulated calves grazing cornstalks.
Corn stalk grazing, baling
Corn stalk grazing, baling

- Light Grazing
- Heavy Grazing
- No Removal
- Baling

- 17
- 34

Diagram showing the distribution of grazing and baling activities.
# Cattle Performance

<table>
<thead>
<tr>
<th></th>
<th>2 AUM/Acre</th>
<th>1 AUM/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Weight, lbs</td>
<td>896</td>
<td>907</td>
</tr>
<tr>
<td>End Weight, lbs</td>
<td>1181</td>
<td>975</td>
</tr>
<tr>
<td>Weight Change, lbs</td>
<td>285</td>
<td>69</td>
</tr>
<tr>
<td>Start BCS</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>End BCS</td>
<td>5.1</td>
<td>5.5</td>
</tr>
<tr>
<td>BCS Change</td>
<td>-0.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Start date 11/9/10   End date 1/7/11

van Donk et al., 2011
# Corn Yields

<table>
<thead>
<tr>
<th>Year</th>
<th>Control</th>
<th>1 AUM/Ac</th>
<th>2 AUM/Ac</th>
<th>Baling</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>129</td>
<td>130</td>
<td>140</td>
<td>127</td>
</tr>
<tr>
<td>2010</td>
<td>157</td>
<td>164</td>
<td>165</td>
<td>164</td>
</tr>
<tr>
<td>2011</td>
<td>167</td>
<td>159</td>
<td>171</td>
<td>167</td>
</tr>
<tr>
<td>2012</td>
<td>158</td>
<td>164</td>
<td>158</td>
<td>149</td>
</tr>
<tr>
<td>Average</td>
<td>153</td>
<td>155</td>
<td>159</td>
<td>152</td>
</tr>
</tbody>
</table>
Consequences of grazing

- Soil water balance
  - Varies by location
- Planting considerations
- Weeds
  - Volunteer corn
- Nutrient removal
  - Completely different than baling
Nutrients returned when grazing.
Consequences of grazing

- Plant disease
- Soil quality
  - Particle aggregation
  - Compaction
Grazing Cornstalks

A Decision Support Tool to Evaluate the Economics

Aaron Stalker, Beef Range Systems Specialist
Robert N. Klein, Western Nebraska Crops Specialist
Bo Liu, Cropping Systems Disease Management Specialist
Tim M. Shaver, Nutrient Management Specialist
Matthew C. Stockton, Agricultural Economist
Simon J. van Donk, Irrigation/Water Resources Specialist
Steve L. Young, Weed Ecologist

Grazing cornstalks is widely practiced in Nebraska and is a good use of a valuable resource. For the majority of corn fields in Nebraska, grazing is a sustainable, recommended practice and has the potential to increase net returns. In fact, on highly productive no-till fields, where too much residue accumulates, grazing increases subsequent yield in addition to generating income from the cattle.

This tool was designed to be helpful to producers across the state. Because conditions vary widely, not all features of the tool will be applicable in every instance. If a particular feature does not apply to your situation, just leave that segment blank.

This tool is similar to one designed to evaluate the economics of baling cornstalks called Baling Corn

EC290
Determining Stocking Rate of Cornstalk Residue

- Residue yield related to grain yield
  - 16 lb of dry leaf and husk per bushel of corn
  - Pounds of husk and leaf per acre (DM)
    - \([\text{bu/acre corn yield} \times 38.2] + 429 \times 0.39\)
    - 175 bu/acre corn = 16 lb of l&h \times 175 = 2800 lb DM/acre
  - Assume 50% available to graze (trampling etc losses)
Residue yield related to grain yield
- 2800 lb DM/acre/2 = 1400 lb of residue per acre available
- 1 AUM = 780 lb of DM
- 1200 lb cow is 1.2 AU
  - 1.2 AU x 780 lb = 936 lb forage DM per month for 1200 lb cow
  - 1400 lb of l&h per acre / 936 lb for 1200 lb cow = 1.5 Months
- 1 ac would supply enough forage for 45 days.
UNL Beef

Learning Modules

Body Condition Scoring Beef Cows
- Body Condition Scoring Your Beef Cow Herd
- A Guide to Condition Scoring Beef Cows
- Using Body Condition Score to Manage the Nutritional Program

Teat and Udder Scoring
- Udder and Teat Scoring Beef Cows
- A guide to Udder and Teat Scoring

Micronutrient Formulation
- Minerals and Vitamins For Beef Cows (PDF 178KB, 7 pgs)
- Calculating Trace Mineral Needs of Beef Cow

Corn Stalk Grazing Calculator
- Corn Stalk Grazing Calculator

Understanding a Nutrient Analysis
- Understanding Feed Analysis

Beef Cattle Breeding and Genetics
- Ultrasound Basics: Equipment, Scanning Techniques, Carcass, Anatomy, and Breed Association
# Feed Cost Calculator with Examples

## Corn Stalks

### Calculated Values

- **Corn yield**: 230 bu/acre
- **Total available DM per acre**: 1,617 lbs
- **Percent dry matter**: 90.0%
- **Percent crude protein (on a DM basis)**: 8.0%
- **Percent TDN (on a DM basis)**: 56.0%
- **Stalk harvest efficiency (90% Recommended)**: 50.0%
- **Average animal weight**: 1,000 lbs
- **Total number of animals**: 100 head
- **Days on corn stalks**: 90 days
- **Acres rented**: 130 acres
- **Cost per acre**: $12

### Nutritional Costs

- **Cost per pound of Crude Protein**: $0.0464
- **Cost per pound of TDN**: $0.0066
- **Cost per pound of DM**: $0.0037

### Transportation Costs

- **Cattle transportation distance (ranch to co)**: 20 miles
- **Animals per load**: 35
- **Transportation cost per mile to co**: $5.00
- **Transportation cost per mile to check cattle**: $0.45
- **Other charges (labor) per visit**: $30
- **How far to check cattle (one way)**: 15 miles
- **Cost per trip**: $100
- **Cost per visit**: $44

### Data for 'Whole Herd' Calculations

- **Lbs/Hd/Day (As Fed)**: 25.96
- **Number of Days Fe**: 90
- **Number of Cows Per**: 160

### Total Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Per Head</th>
<th>Cost Per Head Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Cost</strong></td>
<td>$23.34</td>
<td>$0.26</td>
</tr>
<tr>
<td><strong>Total Cost Per Head</strong></td>
<td>$15.60</td>
<td>$0.17</td>
</tr>
<tr>
<td><strong>Total Cost Per Head Per Day</strong></td>
<td>$6.00</td>
<td>$0.07</td>
</tr>
<tr>
<td><strong>C &amp; S</strong></td>
<td>$174</td>
<td>$0.02</td>
</tr>
</tbody>
</table>
Other considerations

- Supplementation
- Weather
- Genetically modified corn
  - Ear drop
  - Residue nutrient content
Supplementation on corn residue

<table>
<thead>
<tr>
<th></th>
<th>Supplement</th>
<th>No Supplement</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct BCS</td>
<td>5.5</td>
<td>5.5</td>
<td>0.59</td>
</tr>
<tr>
<td>Feb BCS</td>
<td>5.8</td>
<td>5.5</td>
<td>0.01</td>
</tr>
<tr>
<td>Oct wt</td>
<td>1279</td>
<td>1282</td>
<td>0.81</td>
</tr>
<tr>
<td>Feb wt</td>
<td>1342</td>
<td>1333</td>
<td>0.41</td>
</tr>
<tr>
<td>Calf wean wt</td>
<td>547</td>
<td>548</td>
<td>0.86</td>
</tr>
<tr>
<td>Pregnancy, %</td>
<td>92</td>
<td>95</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Hall et al., 2008
Number of days (Dec. – Feb.) with > 3 inches snow cover (1915 – 1990).

<table>
<thead>
<tr>
<th>Location</th>
<th>Average</th>
<th>Fewest</th>
<th>Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healy, KS</td>
<td>12</td>
<td>0</td>
<td>52</td>
</tr>
<tr>
<td>Fairbury, NE</td>
<td>21</td>
<td>0</td>
<td>68</td>
</tr>
<tr>
<td>Oshkosh, NE</td>
<td>15</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Gann Valley, SD</td>
<td>34</td>
<td>0</td>
<td>90</td>
</tr>
</tbody>
</table>

From: Robinson and Hughes, 1991
Number of days with > 3 inches of snowcover (Dec. through Feb.) at Fairbury, NE, 1915-1989.

(From: Robinson and Hughes, 1991)
Snow risk is over-estimated.
Ice risk isn’t.
Health Concerns for Cows Grazing Corn Stalk Residue

Founder/Acidosis

- If ear drop is greater than 8 bu/acre
- If combine “spills” or over-shoots transport wagon
  - Could add sodium bi-carbonate to water – 2.5#/100 gal

- Nitrates usually not a problem
  - Total nitrate intake = forage(s) + water (additive)
    - Provide fresh water at all times
Grazing Genetic Modified Corn

- Bt-corn (corn root worm protected) and RR hybrids:
## Corn residue vs winter range

<table>
<thead>
<tr>
<th></th>
<th>WR 0</th>
<th>WR 1</th>
<th>WR 2</th>
<th>Cornstalks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec BCS</td>
<td>5.0</td>
<td>5.0</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Pre-calving BCS</td>
<td>4.6(^a)</td>
<td>4.9(^b)</td>
<td>5.2(^c)</td>
<td>5.5(^d)</td>
</tr>
<tr>
<td>Pre-breeding BCS</td>
<td>4.9(^a)</td>
<td>5.0(^b)</td>
<td>5.1(^b)</td>
<td>5.3(^b)</td>
</tr>
<tr>
<td>Dec wt</td>
<td>1018</td>
<td>1014</td>
<td>1039</td>
<td>1039</td>
</tr>
<tr>
<td>Pre-calving wt</td>
<td>1038(^a)</td>
<td>1064(^b)</td>
<td>1114(^c)</td>
<td>1189(^d)</td>
</tr>
<tr>
<td>Pre-breeding wt</td>
<td>967(^a)</td>
<td>986(^b)</td>
<td>1001(^b)</td>
<td>1052(^c)</td>
</tr>
<tr>
<td>Calf weaning wt</td>
<td>430(^a)</td>
<td>463(^b)</td>
<td>476(^c)</td>
<td>480(^c)</td>
</tr>
<tr>
<td>Pregnancy %</td>
<td>97</td>
<td>99</td>
<td>99</td>
<td>97</td>
</tr>
</tbody>
</table>

Rolf et al., 2011
Summary

• NE corn residue is abundant
• Stocking rate is critical
• Plant parts differ in nutrient content
• Grazing is compatible with modern farming
• Corn residue is a good resource
  – Animal performance
  – Cost