Forage Options for Drought Stressed Corn
Options

• Silage
  – Reduced nitrates (30-70%)
  – Improved feeding
  – Increased harvested material
  – Moisture level and cost

• Bale Dry Stover
  – Drying time (2-3 wks)
  – Equipment issues
  – No reduction in nitrate level
  – Less water to haul

• Grazing
  – Low dry matter recovery (less than 50%)
  – Low cost
  – Possible nitrate issues
    • Do not force cattle to eat the bottom 10-12 inches of the stalk
Estimating the yield

• Based on grain yield
  – < 100 bu/acre
    • 1 ton 30% dm silage/5 bu of grain
      – 20 bu corn yield = 4 ton of silage
  – >100 bu/acre
    • 1 ton 30% dm silage/6-7 bu of grain
      – 150 bu corn yield = 21.4 to 25 ton of silage

• Based on Plant Height – No grain
  – 1 ton of 30% dm silage/ft of plant height excluding tassel
    • 5 ft of plant height = 5 ton/acre of silage
Actual Yield Estimate

• 8.7ft of row (30 inch row spacing) = 1/2000 acre

• Cut 8.7ft of row in 15-20 spots in the field
  – Start measurement between two plants

• Cut at cutter height

• Weight total weight and multiply by 2000

• Divide by 2000lb/ton = tons/acre
  – Whole plants from 8.7ft of row weighs 10 lbs
    • 10 x 2000 = 20,000lb/acre / 2000lb/ton = 10 ton/acre
Conversion of Silage to Hay Yield

• 10 ton/acre @ 30%DM
  – 10 ton x 0.30 = 3 ton/acre of DM

• 3 ton/acre DM
  – 3 ton / 0.85 (85% dm hay) = 3.53 ton @ 85% DM
Actual Yields

• Hybrid
• Weather conditions
• Harvest height
• Harvest loss
• Forage moisture
## Nutrient Content

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal Corn Silage*</th>
<th>Stressed Corn Plants**</th>
<th>Stalkage*</th>
<th>Brome Hay**</th>
<th>Wheat Straw**</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM, %</td>
<td>33.7</td>
<td>32.0</td>
<td>68.0</td>
<td>89.1</td>
<td>89.7</td>
</tr>
<tr>
<td>CP, %</td>
<td>8.3</td>
<td>11.82</td>
<td>6.1</td>
<td>10.17</td>
<td>5.32</td>
</tr>
<tr>
<td>ADF, %</td>
<td>25.9</td>
<td>29.89</td>
<td>47.1</td>
<td>35.95</td>
<td>49.49</td>
</tr>
<tr>
<td>NDF, %</td>
<td>43.8</td>
<td>50.71</td>
<td>70.7</td>
<td>57.87</td>
<td>71.43</td>
</tr>
<tr>
<td>NE_L, Mcal/lb</td>
<td>0.73</td>
<td>0.70</td>
<td>0.34</td>
<td>0.55</td>
<td>0.41</td>
</tr>
<tr>
<td>NE_M, Mcal/lb</td>
<td>0.73</td>
<td>0.73</td>
<td>0.39</td>
<td>0.52</td>
<td>0.28</td>
</tr>
<tr>
<td>NE_G, Mcal/lb</td>
<td>0.46</td>
<td>0.43</td>
<td>0.14</td>
<td>0.26</td>
<td>0.13</td>
</tr>
<tr>
<td>TDN, %</td>
<td>70.7</td>
<td>67.9</td>
<td>49.9</td>
<td>54.4</td>
<td>41.8</td>
</tr>
</tbody>
</table>

* Data from Dairy One Forage Lab  **Data from SDK Labs, Hutchinson
Value of Normal Corn Silage

- 8 – 10 x bu price of corn (price of whole plant material)
  - 8 for a standing crop
  - 10 for ready to feed silage
  - Corn at $7.50/bu
    - $60/ton @35% DM standing in the field
    - $75/ton @35% DM harvested and packed in silo

- What the market will allow
Feeding Value Stressed Corn

<table>
<thead>
<tr>
<th>Estimate Grain Yield</th>
<th>% of Normal Corn Silage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 40 bu/acre</td>
<td>90 – 100%</td>
</tr>
<tr>
<td>0 – 20 bu/acre</td>
<td>80 – 90%</td>
</tr>
<tr>
<td>Short barren stalks</td>
<td>70 – 80%</td>
</tr>
</tbody>
</table>

$60/ton = $42.00 - $54.00/ton standing in the field
$75/ton = $52.5 - $67.5/ton packed in the silo
## Value Based on TDN or Energy

<table>
<thead>
<tr>
<th></th>
<th>Utility Alfalfa</th>
<th>Straw</th>
<th>Brome</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/ton</td>
<td>180</td>
<td>65</td>
<td>120</td>
<td>270</td>
</tr>
<tr>
<td>DM, %</td>
<td>87</td>
<td>90</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>TDN, %</td>
<td>52</td>
<td>41.8</td>
<td>54.4</td>
<td>88.1</td>
</tr>
<tr>
<td>NE_M, Mcal/lb</td>
<td>0.58</td>
<td>0.28</td>
<td>0.52</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$/pt of TDN</td>
<td>0.199</td>
<td>0.086</td>
<td>0.125</td>
<td>0.174</td>
</tr>
<tr>
<td>$/Mcal of NE_M</td>
<td>0.178</td>
<td>0.129</td>
<td>0.131</td>
<td>0.153</td>
</tr>
</tbody>
</table>

35% DM Stressed corn with 67.9% TDN = $41 - $95/ton less harvest cost

35% DM Stressed corn with 0.73 Mcal, NEM = $66 – $91/ton less harvest cost
Other Factors in Pricing

• Silage
  – Buyer suffers the storage loss
    • 15-50% of the dry matter
    • Losses of comparison crops is 2-5%
    • For value comparisons, need to adjust for storage loss

• Alfalfa may be overpriced compared to other forages
Helping Producers Price Forage

• Win, win for both parties
• Crop producers need to work with crop insurance companies first!!!
• Silage pricing spreadsheet can be helpful if grain is present
• Alternate pricing methods if dealing with barren stalks
• Local markets will result in significant price variation
Harvest Moisture

• Critical factor for good silage
  – 30-35% DM is the target
  – 40% DM is getting pretty dry
    • Increased storage and feeding losses

• Handful of finely cut material squeezed tightly for 90 seconds and then grip is released
  – Juice between fingers or running – 15-25% DM
  – Ball holds shape when pressure is released and the hand is moist – 25-30% DM
  – Ball expands slowly and no dampness on hand – 30-40% DM
  – Ball springs out when hand is open - >40% DM

• Actual testing with microwave or Koster tester is the best
Nitrate Toxicity

• Nitrite (NO₂) not Nitrate (NO₃) Toxicity
  – Rumen bacteria reduce NO₃ to NO₂
  – Normally NO₂ converted to ammonia
  – Excessive NO₂ overloads the system
  – Nitrite absorbed into blood
  – Nitrite converts hemoglobin to methemoglobin
  – Loss of oxygen carrying ability of hemoglobin
  – Animal dies of asphyxiation
  – Sick, hungry, lactating or pregnant most susceptible
Symptoms of Toxicity

• Factors of toxicity
  – Amount consumed
  – Length of time for consumption

• Symptoms
  – Bluish color of mucus membranes
  – Labored breathing
  – Muscular tremors
  – Collapse and death within 2-3 hours
Qualitative Nitrate Test

• **Reagent A**
  – 500 mg of diphenylamine dissolved in 20 ml of water and brought to a final volume of 100 ml with concentrated sulfuric acid (amber storage bottle and storage in dark place)

• **Reagent B**
  – 20 ml of water to which 80 ml of concentrated sulfuric acid is carefully added.

• **Field Test**
  – Mix equal parts of reagents A and B and apply mixture to cut portion of plant, if it turns blue, nitrates are present
  – If nitrates are detected, a quantitative analysis is needed
What to sample

• Most stressed plants in the field
  – Field edges next to trees
  – Slopes of the field

• Bottom 1/3 of the stalk
  – Higher levels of nitrate in the lower portion of the stalk
Nitrate Levels in Corn Stalks

<table>
<thead>
<tr>
<th>NO₃-N ppm</th>
<th>Stalk, lower 1/3</th>
<th>Stalk, middle 1/3</th>
<th>Stalk, upper 1/3</th>
<th>Leaves</th>
<th>Ears</th>
<th>Whole Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5524</td>
<td>803</td>
<td>153</td>
<td>64</td>
<td>17</td>
<td>978</td>
</tr>
</tbody>
</table>

Graph showing NO₃-N ppm levels in different parts of the corn plant.
## Nitrate Levels

<table>
<thead>
<tr>
<th>ppm Nitrate (NO$_3$)</th>
<th>Effect on animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 3,000</td>
<td>Virtually safe</td>
</tr>
<tr>
<td>3,000 – 6,000</td>
<td>Moderately safe in most situations; limit use for stressed animals to 50% of the total ration</td>
</tr>
<tr>
<td>6,000 – 9,000</td>
<td>Potentially toxic to cattle depending on the situation; do not use as the only source of feed</td>
</tr>
<tr>
<td>9,000 and above</td>
<td>Dangerous to cattle and will often cause death</td>
</tr>
</tbody>
</table>

**Nitrate Toxicity – MF3029**
Conversion Factors for Nitrate Reports

Potassium Nitrate $\times 0.61 = \text{Nitrate (ppm NO}_3\text{)}$

Nitrate-Nitrogen $\times 4.42 = \text{Nitrate (ppm NO}_3\text{)}$

$\% \text{ Nitrate} \times 10,000 = \text{Nitrate (ppm NO}_3\text{)}$
Special Nitrate Considerations

• If nitrates are present
  – Cut plants at 10-12 inches from the ground

• Rain can cause nitrates to accumulate quickly
  – Wait 7-14 days before chopping to allow nitrates levels to be reduced

• Certain plants accumulate nitrates
  – Lambsquarters, pigweed, Johnsongrass
Summary

• Drought stressed corn can be a useful feed source
• Silage offers advantages of
  – Increased quality
  – Opportunity to reduce nitrates
  – TMR feeding
  – Increased yields
• Watch for nitrates – commercial lab recommended
• Pricing needs to be a win, win for both parties
• Adapt to high nitrate forages slowly