Dr. Dennis Hancock
Assoc. Professor and Extension Forage Agronomist
Crop and Soil Sciences – UGA
## Forage Yield of Selected Forage Species in the South

<table>
<thead>
<tr>
<th>Forage Crop</th>
<th>Typical Yield (lbs DM/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn silage</td>
<td>20,000-32,000</td>
</tr>
<tr>
<td>Tropical corn silage</td>
<td>5,000-22,000</td>
</tr>
<tr>
<td>Ann. Ryegrass</td>
<td>8,000-14,000</td>
</tr>
<tr>
<td>Oats</td>
<td>6,000-11,000</td>
</tr>
<tr>
<td>Triticale</td>
<td>3,000-7,000</td>
</tr>
<tr>
<td>Bermudagrass, Coastal</td>
<td>12,000-15,000</td>
</tr>
<tr>
<td>Bermudagrass, Tifton 85</td>
<td>14,000-22,000</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>9,000-16,000</td>
</tr>
<tr>
<td>Forage Sorghum</td>
<td>10,000-16,000</td>
</tr>
<tr>
<td>Sorghum x Sudangrass (SxS)</td>
<td>9,000-24,000</td>
</tr>
<tr>
<td>Pearl Millet</td>
<td>8,000-13,000</td>
</tr>
</tbody>
</table>
## Differences in Forage Quality

<table>
<thead>
<tr>
<th>Forage</th>
<th>CP (%)</th>
<th>NDF (%)</th>
<th>NDFD (%)</th>
<th>NFC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn silage</td>
<td>8</td>
<td>42</td>
<td>58</td>
<td>42.5</td>
</tr>
<tr>
<td>Forage Sorghum</td>
<td>8</td>
<td>48</td>
<td>58</td>
<td>37.0</td>
</tr>
<tr>
<td>BMR Forage Sorghum</td>
<td>8</td>
<td>48</td>
<td>65</td>
<td>37.0</td>
</tr>
<tr>
<td>Sorghum-Sudan (SxS)</td>
<td>10</td>
<td>67</td>
<td>58</td>
<td>12.0</td>
</tr>
<tr>
<td>BMR SxS</td>
<td>10</td>
<td>67</td>
<td>65</td>
<td>14.0</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>20</td>
<td>40</td>
<td>48</td>
<td>27.5</td>
</tr>
<tr>
<td>Annual ryegrass</td>
<td>20</td>
<td>52</td>
<td>65</td>
<td>12.5</td>
</tr>
<tr>
<td>Rye</td>
<td>20</td>
<td>57</td>
<td>60</td>
<td>12.5</td>
</tr>
<tr>
<td>Bermudagrass, Tifton 85</td>
<td>12</td>
<td>69</td>
<td>60</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>
Bermudagrass leaf after incubation in rumen fluid for 48 hr

Tall fescue leaf after incubation in rumen fluid for 48 hr
The Relationship between Fiber (NDF) and Dry Matter Intake (DMI)

- Intake to Meet Needs
- Intake is Physically Limited

- Dry Matter Intake (DMI)
- Dig. Energy Intake

Fiber (NDF) Level

Intake

UGA extension
1) The Fiber Digestion Environment is Dynamic.
2) Not All Fiber is Created Equal.
What is the difference in Coastal and Tifton 85?

Adapted from Mandebvu et al. (1999).
### Tifton 85 Hay (BH) as a Substitute for Corn Silage (CS) in Holstein Dairy Cows (~50 DIM)\(^1\)

<table>
<thead>
<tr>
<th>Item</th>
<th>Control 45CS/ 0BH</th>
<th>T85 Hay 30CS/ 15BH</th>
<th>15CS/ 30BH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, lbs/cow/d</td>
<td>50.4 a</td>
<td>48.6 b</td>
<td>48.4 b</td>
</tr>
<tr>
<td>DMI, % of BW/d</td>
<td>4.29 a</td>
<td>4.16 b</td>
<td>4.19 b</td>
</tr>
<tr>
<td>Milk Yield, lbs/cow/d</td>
<td>75.0 a</td>
<td>72.6 ab</td>
<td>70.0 b</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.33 b</td>
<td>3.73 a</td>
<td>3.72 a</td>
</tr>
<tr>
<td>3.5% FCM, lbs/cow/d</td>
<td>73.9 ab</td>
<td>74.6 a</td>
<td>73.7 b</td>
</tr>
<tr>
<td>3.5% FCM:DMI(^3)</td>
<td>1.47</td>
<td>1.53</td>
<td>1.52</td>
</tr>
</tbody>
</table>

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2. The 15% and 30% BH diets contained 14% and 28% more ground corn and 70 and 84% less soybean meal, respectively than the CS diet.
3. Calculated from reported values.
What is the difference in Coastal and Tifton 85?

Adapted from Mandebyu et al. (1999).
What is the difference in Coastal and Tifton 85?

NDFD48h, %

- Coastal: 42.6 (3 wk), 41.0 (6 wk)
- Tifton 85: 60.6 (3 wk), 55.6 (6 wk)

Adapted from Mandebvu et al. (1999).
The Relationship between Fiber (NDF) and Dry Matter Intake (DMI)

Intake to Meet Needs

Intake is Physically Limited

Dry Matter Intake (DMI)

Dig. Energy Intake

Intake

Fiber (NDF) Level
# Feeding 10, 17.5, & 25% T85 Baleage to Holsteins (221 DIM) When Balancing for NDF

<table>
<thead>
<tr>
<th>Item</th>
<th>Proportion T85 in diet</th>
<th>10</th>
<th>17.5</th>
<th>25</th>
<th>SE</th>
<th>TRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, lbs/cow/d</td>
<td></td>
<td>45.3</td>
<td>46.2</td>
<td>48.0</td>
<td>1.98</td>
<td>0.4377</td>
</tr>
<tr>
<td>BW change, lbs</td>
<td></td>
<td>40.0</td>
<td>21.1</td>
<td>30.4</td>
<td>11.0</td>
<td>0.2314</td>
</tr>
<tr>
<td>BCS change</td>
<td></td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.08</td>
<td>0.04</td>
<td>0.4856</td>
</tr>
<tr>
<td>Milk Yield, lbs/cow/d</td>
<td></td>
<td>73.9</td>
<td>73.9</td>
<td>73.9</td>
<td>1.98</td>
<td>0.9981</td>
</tr>
<tr>
<td>Fat, %</td>
<td></td>
<td>3.60</td>
<td>3.64</td>
<td>3.75</td>
<td>0.09</td>
<td>0.5929</td>
</tr>
<tr>
<td>ECM, lbs/cow/d</td>
<td></td>
<td>74.8</td>
<td>75.0</td>
<td>75.7</td>
<td>0.20</td>
<td>0.6297</td>
</tr>
<tr>
<td>ECM:DMI</td>
<td></td>
<td>1.65</td>
<td>1.63</td>
<td>1.58</td>
<td>0.05</td>
<td>0.7255</td>
</tr>
<tr>
<td>MUN, mg/dl</td>
<td></td>
<td>11.0</td>
<td>11.9</td>
<td>11.4</td>
<td>0.30</td>
<td>0.0060</td>
</tr>
</tbody>
</table>

TAKE HOME NOTES

• **T85 hay/ baleage fed at 10-15% of the diet improves components and does NOT significantly lower milk yield, as long as total energy & protein is balanced to need.**

• **Rates up to 25% are possible, if the diet is balanced for NDF as well as total energy and CP.**
<table>
<thead>
<tr>
<th>Crop</th>
<th>Water Used</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb H₂O/lb DM</td>
<td>Acre-inches H₂O/ton DM</td>
</tr>
<tr>
<td>Alfalfa (C₃)</td>
<td>844</td>
<td>7.5</td>
</tr>
<tr>
<td>Sudangrass (C₄)</td>
<td>380</td>
<td>3.4</td>
</tr>
<tr>
<td>Corn (C₄)</td>
<td>372</td>
<td>3.3</td>
</tr>
<tr>
<td>Sorghum (C₄)</td>
<td>271</td>
<td>2.4</td>
</tr>
<tr>
<td>Coastal Bermuda (C₄)</td>
<td>265</td>
<td>2.3</td>
</tr>
</tbody>
</table>
What About Forage Sorghum and Other Members of the Sorghum Family?
WHAT ABOUT BROWN MID-RIB (BMR) VARIETIES?

BMR Trait: Less lignin, more digestibility
Impact of BMR Gene

Summer Annual Variety Trials-2009 to 11

In Vitro True Digestibility (%)

- Non-BMR
- BMR-6
- BMR-12
- BMR-18

Teutsch et al., 2014
Using BMR Sorghum x Sudan (bmrSSxS) as a Substitute for Corn Silage (CS) in a Diet for Holstein Milk Cows (120 DIM)\(^1\)

<table>
<thead>
<tr>
<th>Item</th>
<th>bmrSS(^2)</th>
<th></th>
<th>CS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35%</td>
<td>45%</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>DMI, % of BW/d</td>
<td>3.06 b</td>
<td>2.71 c</td>
<td>3.62 a</td>
<td>3.58 a</td>
</tr>
<tr>
<td>BW change, lbs/21 d</td>
<td>39.2 a</td>
<td>26.2 a</td>
<td>2.9 b</td>
<td>18.3 ab</td>
</tr>
<tr>
<td>BCS change, unit/21 d</td>
<td>0.04</td>
<td>0.02</td>
<td>0.13</td>
<td>0.1</td>
</tr>
<tr>
<td>Milk Yield, lbs/cow/d</td>
<td>69.0 ab</td>
<td>63.7 b</td>
<td>72.1 a</td>
<td>68.1 ab</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.43</td>
<td>3.43</td>
<td>3.15</td>
<td>3.15</td>
</tr>
<tr>
<td>3.5% FCM, lbs/cow/d</td>
<td>67.0</td>
<td>62.6</td>
<td>67.0</td>
<td>64.1</td>
</tr>
<tr>
<td>3.5% FCM:DMI</td>
<td>1.52 a</td>
<td>1.62 a</td>
<td>1.32 b</td>
<td>1.26 b</td>
</tr>
</tbody>
</table>

\(^1\) Dann et al., 2008. J. Dairy Sci. 91:663–672

\(^2\) The 35% and 45% bmrSS diets contained 64% and 143% more ground corn than the corresponding CS diets, respectively.
## Dairy Cow Performance

<table>
<thead>
<tr>
<th>Study</th>
<th>Normal</th>
<th>BMR-6</th>
<th>BMR-12</th>
<th>BMR-18</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>lbs fat corrected milk/day</td>
</tr>
<tr>
<td>Browning and Lusk, 1966</td>
<td>35.7a</td>
<td></td>
<td>35.5a</td>
<td></td>
<td>35.5a</td>
</tr>
<tr>
<td>Lusk et al., 1984</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>47.8b 52.2a</td>
</tr>
<tr>
<td>Experiment I</td>
<td>49.2a</td>
<td></td>
<td>54.5a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment II</td>
<td>47.8b</td>
<td>52.2a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grant et al., 1995</td>
<td>39.5b</td>
<td>57.8a</td>
<td></td>
<td></td>
<td>58.6a</td>
</tr>
<tr>
<td>Oliver et al., 2004</td>
<td>64.2b</td>
<td>74.3a</td>
<td>68.8ab</td>
<td>73.4a</td>
<td></td>
</tr>
<tr>
<td>Aydin et al., 1999</td>
<td>45.6c</td>
<td>52.2b</td>
<td>63.9a</td>
<td>71.4ab</td>
<td></td>
</tr>
<tr>
<td>Experiment I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment II</td>
<td>69.2b</td>
<td>74.5a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• bmrSxS (especially the bmr-6 variants) can sustain milk yields and improve components (and weight gains) compared to CS, as long as energy and protein are balanced to need.

• Blending, rather than complete replacement may be best in TMR.
White Sugarcane Aphid Damage on Sorghums

- Attacks everything in Sorghum family
  - (inc. FS, SxS, Sudangrass, and Johnsongrass)
- Yield losses 50-80%+
- Treatment threshold: 25% of leaves w/ 50+ aphids/leaf in pre-boot stage and beyond
White Sugarcane Aphid Damage on Sorghums

Insecticide Options:

• Sivanto (*flupyradifurone*) labeled in some states
  • Rate of 4.0-7.0 oz./acre

• Section 18 label (GA) for Transform WG (*sulfoxaflor*)
  • Rate of 1.0-1.5 oz/acre is about 90% effective

• Pyrethroids are not recommended. Can kill beneficials and cause SCA pop to flare.
SO WHY NOT ALFALFA?
### Alfalfa Hay (AH) as a Substitute for Corn Silage (CS) in Holstein Dairy Cows (~50 DIM)\(^1\)

<table>
<thead>
<tr>
<th>Item</th>
<th>Control 45CS/0AH</th>
<th>Alfalfa Hay 30CS/15AH</th>
<th>Alfalfa Hay 15CS/30AH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, lbs/cow/d</td>
<td>50.4</td>
<td>49.5</td>
<td>49.5</td>
</tr>
<tr>
<td>DMI, % of BW/d</td>
<td>4.29</td>
<td>4.38</td>
<td>4.27</td>
</tr>
<tr>
<td>Milk Yield, lbs/cow/d</td>
<td>75.0 a</td>
<td>75.0 a</td>
<td>71.7 b</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.33 c</td>
<td>3.54 b</td>
<td>3.99 a</td>
</tr>
<tr>
<td>3.5% FCM, lbs/cow/d</td>
<td>73.9 b</td>
<td>75.5 a</td>
<td>74.8 ab</td>
</tr>
<tr>
<td>3.5% FCM:DMI(^3)</td>
<td>1.47</td>
<td>1.52</td>
<td>1.51</td>
</tr>
</tbody>
</table>

1 Adapted from West et al., 1997. J. Dairy Sci. 80:1656–1665.
2 The 15% and 30% AH diets contained 14% and 28% more ground corn and 70 and 84% less soybean meal, respectively than the CS diet.
3 Calculated from reported values.
Alfalfa can be used effectively as an alt. to CS and we do have an opportunity to grow alfalfa with bermudagrass.
Focus on Winter Annuals
Potential to Reduce Costs with High Quality Grasses?
Effect of Replacing Corn Silage with Annual Ryegrass Silage for Holstein Cows (~310 DIM)¹

\[ y = 4.796x + 42.24 \]

<table>
<thead>
<tr>
<th>Proportion of Total Dietary Forage (CS:RS)</th>
<th>DMI or Milk Yld (lbs/cow/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100:0</td>
<td>35</td>
</tr>
<tr>
<td>65:35</td>
<td>40</td>
</tr>
<tr>
<td>35:65</td>
<td>45</td>
</tr>
<tr>
<td>0:100</td>
<td>50</td>
</tr>
</tbody>
</table>

Annual ryegrass can improve milk yield and components as an alternative to CS. Its high quality fiber likely stimulates/improves ruminal starch digestion.
Summary:

- There are many forage options for dairying in warmer climates
  - Forages there are far better than their reputation
- Long growing season, high rainfall, and irrigation potential are a great advantage
  - Water use efficiency is a major concern.
- Alternatives to corn silage have a fit
- Focus should be on winter annuals and alfalfa
MS and PhD Assistantship available. Please contact Dr. Dennis Hancock at dhancock@uga.edu or 706-542-1529 for details.