Forage Sorghum 101
Important decisions

• Single cut (silage) or multi cut (generally hay)
• Hybrid selection
• Harvest management
• Planting date
• Soil fertility
• Water supply
• Weed management
• Seeding rate
Forage hybrid decisions

- **Silage**
  - Headed
    - BMR
      - Early: SP3905 BD
      - Full: SP3904 BD
      - Headless
        - BMR
          - Early: HIKANE II
          - Full: SS405
  - Conventional
    - SP1615

- **Hay/Grazing**
  - Headless
    - BMR
      - Early: SP4555 BMR
      - Full: SS304
    - Conventional
      - BMR
        - Early: Sordan 79
        - Full: SP4105 BMR
  - Headed
    - BMR
      - Early: Sordan
      - Full: SP4105 BMR
    - Conventional
      - Trudan 8
      - Headless
        - Trudan
      - Headed
        - Sordan Headless

- **Sorghum x Sudan**
  - Headed
    - BMR
      - Early: SP4555 BMR
      - Full: SS304
    - Conventional
      - Sordan 79

- **Sudangrass**
  - Headless
    - BMR
      - Early: SP4105 BMR
      - Full: SP4105 BMR
    - Conventional
      - Trudan 8
      - Headless
        - Trudan
      - Headed
        - Sordan Headless
  - Conventional
    - Trudan 8
    - Headless
      - Trudan
    - Headed
      - Sordan Headless

- **Millet**
  - Conventional
    - Millex 32
Silage

- Headed
  - BMR
    - Early: SP3905 BD
    - Full: SP3904 BD
  - Conventional
    - Early: NK300
    - Full: SS304
- Headless
  - SP1615
  - SS304
  - SS405
# Role of Silage in U.S. Cattle Rations

<table>
<thead>
<tr>
<th>System</th>
<th>Feedlot</th>
<th>Dairy</th>
<th>Beef Cow/Steer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDF in Diet (% DM)</td>
<td>5-9</td>
<td>30-35</td>
<td>50-100%</td>
</tr>
<tr>
<td>Concentrated Feed (Starch)</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Fiber</td>
<td>Functional</td>
<td>Functional and Nutritional</td>
<td>Functional and Nutritional</td>
</tr>
<tr>
<td>Silage Source(s)</td>
<td>Corn Forage Sorghum Alfalfa</td>
<td>Corn Forage Sorghum Alfalfa</td>
<td>Forage Sorghum</td>
</tr>
<tr>
<td>Importance of Grain in Silage</td>
<td>Low</td>
<td>Mod – High†</td>
<td>Very Low</td>
</tr>
</tbody>
</table>
Hay/Grazing

Sorghum x Sudan
- Headed
  - BMR: SP4555 BMR
  - Conventional: Sordan 79
- Headless
  - BMR: SP4105 BMR
Sudangrass
- Headed
  - BMR: Trudan 8
  - Conventional: SP7106 BMR
- Headless
  - Headless: Trudan Headless
Millet
  - Conventional: Millex 32
What is BMR

• A mutation that causes the mid rib of the leaves to turn brown. It also reduces lignification and increases digestibility.
Silage harvest management

- Headed hybrids need to be harvested at milk to soft dough stage
  - Allows for the best forage quality
  - Highest utilization of grain
  - Generally lodging will be reduced

- Headless hybrids can be harvested at any time
  - Generally will have higher moisture content therefore will require swathing before chopping
  - Quality does not change
  - Lodging may increase as hybrids get taller
Hay harvest management

• Headed hybrids will begin to lose quality as they mature
  • Cell walls thicken and lignin increases
  • Highest protein is generally at boot stage and will decrease as it matures
  • If harvest is delayed beyond soft dough, starch availability to the animal will decline, despite what appears in lab results.
What happens to quality

Mean of four sorghum cultivars harvested at different maturity stages

<table>
<thead>
<tr>
<th>Grow Stage</th>
<th>Crude Protein %</th>
<th>Lignin %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading</td>
<td>8.34</td>
<td>4.14</td>
</tr>
<tr>
<td>Milk</td>
<td>7.85</td>
<td>4.60</td>
</tr>
<tr>
<td>Dough</td>
<td>7.69</td>
<td>4.70</td>
</tr>
<tr>
<td>Physiological maturity</td>
<td>6.35</td>
<td>5.16</td>
</tr>
</tbody>
</table>

How to tell what stage.

Figure 2: Six sorghum heads of different maturity are pictured in chronological order. (1) Green color indicates milk stage, too early to harvest; (2 and 3) Transition from milk to soft dough stage; (4) Tan color indicates soft dough stage, the optimal time for harvest; (5) Transition from soft dough to hard dough stage; (6) Hard dough stage, seeds are mature and almost indigestible at this time.

Cornell Agronomy Fact Sheet 92: Guidance for growing BMR Brachytic Dwarf Forage Sorghum.
Harvest Stage affect on Yield and Quality of Silage Sorghum

Sorghum Estimated Milk Production

Balancing act

• As crop matures yields increase

Mean of four sorghum cultivars harvested at different maturity stages

<table>
<thead>
<tr>
<th>Grow Stage</th>
<th>Yield tons/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading</td>
<td>4.5</td>
</tr>
<tr>
<td>Milk</td>
<td>7.3</td>
</tr>
<tr>
<td>Dough</td>
<td>9.4</td>
</tr>
<tr>
<td>Physiological maturity</td>
<td>13.4</td>
</tr>
</tbody>
</table>

Have choppers ready
Highest quality for Hay
Highest yield + good quality?
# Hay management

<table>
<thead>
<tr>
<th>Forage</th>
<th>Cutting management</th>
<th>Days from planting to first harvest</th>
<th>Estimated DM yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>hay, haylage, green-chop, silage</td>
<td></td>
</tr>
<tr>
<td>Sudangrass and hybrid sudangrass</td>
<td>cut 2-3 times</td>
<td>2.5 feet tall</td>
<td>3-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>~ 45 days from planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>~ 25 days regrowth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cut at dough stage</td>
<td>80-90 days</td>
</tr>
<tr>
<td>Sorghum-sudan</td>
<td>cut 2-3 times</td>
<td>3 feet tall</td>
<td>4-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>~ 30 days regrowth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cut at dough stage</td>
<td>80-100 days</td>
</tr>
</tbody>
</table>

- Tons/A -
# Grazing management

<table>
<thead>
<tr>
<th>Forage</th>
<th>Days from planting to first grazing</th>
<th>Stocking rate and rotation</th>
<th>Days rest to allow regrowth</th>
<th>Rotational grazing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudangrass and hybrid sudangrass</td>
<td>18 inch height about 35 days</td>
<td>4-5 AU/A graze to 6-8 inches grazed in 7-10 days</td>
<td>18 inch height about 21 days</td>
<td>130-150</td>
</tr>
<tr>
<td>Sorghum-sudan hybrid</td>
<td>24-30 inch height about 40 days</td>
<td>5-6 AU/A graze to 6-8 inches grazed in 7-10 days</td>
<td>24-30 inch height about 25 days</td>
<td>160-180</td>
</tr>
</tbody>
</table>
Planting Date

- Wide window depending upon use and need
- Minimum of 60°F but 65°F or higher is preferred
  - If planting at 60°F make sure forecast for next week is for warm temperatures
Fertilizer recommendations

• Nitrogen
  • 6 – 8 lbs. per ton of wet yield
    • Example: 20 wet tons harvested X 6 = 120 lbs. N

• Phosphorous
  • Low soil test: 50 lbs. P$_2$O$_5$
  • Medium soil test: 30 lbs. P$_2$O$_5$
  • High soil test: sufficient

• Potassium
  • Soil test medium or lower 80 to 100 lbs. K$_2$O
Nitrate management

• Generally occurs during times of drought stress
  • Plant continues to uptake N and not able to metabolize due to water stress
  • Do not graze or bale when under drought stress
  • After rainfall or irrigation allow time for nitrates to metabolize before grazing or haying
  • Research has shown that ensiling will reduce nitrates by 40 – 50%
Prussic Acid/HCN

- Sudangrass and sorghum plants contain the cyanogenetic glucoside *dhurrin* (or *durrin*).
- An enzyme called *emulsin*, breaks down *dhurrin* to release prussic acid or hydrocyanic acid (HCN).
- If plants are damaged, as by freezing, chewing, or trampling, then emulsin can more easily free larger quantities of the poison; thus the hazard.
- HCN is lost if the stem is broken (crimping/ensiling)
Prussic Acid/HCN

- Species: Millet < Sudangrass < Sorg-Sudan < forage sorghum.
- Plant part: Leaves are higher than stems, upper leaves are higher than lower leaves.
- Tillers: Higher than main plants.
- Maturity: Higher yields result in lower HCN.
- Fertilizer: Do not over apply N and amend P and K deficiencies.
- Frost: Frost concentrates HCN, delay harvest or grazing few days for HCN to dissipate.
- Drought: Lower yields increase HCN concentration.
Water supply

• Biggest key is to harvest (silage/hay) after rainfall/irrigation to reduce nitrates

• Forage sorghum silage yields have been similar to those of corn while using 30 percent less irrigation water

• Sorghums will yield 1.75 to 2.5 tons of biomass per one inch of irrigation water

• Sorghum silage yield increased approximately 0.75 ton/acre (at 65 percent moisture) for every inch of watered used by the crop
Weed management

• Use of Concep treated seed in Silage Sorghum and sorghum x sudan allows for the use of chloracetamide (metolachlor) + atrazine
  • Dimethenamid and Acetochlor labels do not contain forage sorghum

• Broadleaf control
  • Atrazine for (forage sorghum, SXS, sudangrass)
  • Sharpen (forage sorghum, SXS, sudangrass, and pearl millet)
Double crop weed control

- **Burn down options**
  - Glyphosate (22 to 32 oz) + Sharpen (2 oz)
  - Glyphosate (22 to 32 oz) + Atrazine (1 to 1.5 lbs.)
  - 2,4-D or Banvel
    - wait 1 – 3 days/oz to plant
Seeding rate

<table>
<thead>
<tr>
<th></th>
<th>Adequate Moisture</th>
<th>Limited Moisture</th>
<th>Planting Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage Sorghum</td>
<td>100,000 seed/acre</td>
<td>60,000 seed/acre</td>
<td>Row Crop Planter</td>
</tr>
<tr>
<td>Sorghum X Sudangrass</td>
<td>20-25 lbs/acre</td>
<td>15 lbs/acre</td>
<td>Drilled</td>
</tr>
<tr>
<td>Sudangrass X Sudangrass</td>
<td>15 lbs/acre</td>
<td>10 lbs/acre</td>
<td>Drilled</td>
</tr>
</tbody>
</table>

- Lower rates for dryland
- Seeding depth of 1 to 1.5 inches