Forage Systems for Pasture Finishing Beef

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Finishing Options

- Feeding a high-concentrate diet in dry lot
- Finishing cattle on grass with none or limited amounts of concentrates
- Growing cattle on grass then finishing them in dry lot for a relatively short period of time
- Feeding a high-roughage diet in dry lot
## Animal Performance

### Feedlot
- Nutritive value for ration is fixed
- Amount fed regulated daily
- No Travel required

### Forage
- Nutritive value constantly changes
- Availability changes
- Travel required to “harvest” forage
Forages in the South

- The Upper South: Eastern Oklahoma, Arkansas, Kentucky, Tennessee, Virginia
- The Piedmont: Virginia, North Carolina, South Carolina, Georgia, Eastern Alabama
- The Lower South: South Georgia, Florida, Louisiana, Mississippi, East Texas

Figure 3.2. Mean annual air temperatures, °F, and adaptation Zones, A, B, C, D.
Warm- and Cool-Season Forages

- **Perennial Grasses**
  - Bermudagrass, Bahiagrass, Dallisgrass, Tall Fescue

- **Annual Grasses**
  - Hybrid pearl millet, Sorghum x Sudangrass, Crabgrass, Ryegrass, Oat, Wheat, Rye

- **Annual Legumes**
  - Cowpea, Lablab, Natives, Aeschynomene, Clovers, Vetch

- **Perennial Legumes**
  - Alfalfa, Perennial Peanut, Sericea Lespedeza
Role of Warm-Season Annual Forages for Finished Beef

- Higher Nutritive Value
- Creep Grazing
- High cost of production
- High management input for grazing
- Mechanical harvest component of management
Perennial Warm-Season Forages for Pasture

- Foundation for grazing systems
- Sustainable, Reliable
- Environmentally-Friendly
- Productive
- Allows over seeding of cool-season forage
- Low nutritive value
# Role of Cool-Season Grasses for Finished Beef

## Annuals
- Higher Nutritive Value (legumes highest)
- High Cost of Production
- High management input for grazing

## Perennials
- Limited cool season species
- Easier to grow in Upper South
Forage digestibility ranges and their suitability for different classes of livestock.

Seasonality

- Major challenge
  - Providing a year round high quality forage supply
  - Spring born calves with annual ryegrass
  - Warm season forage: different calving seasons or different cattle

- Maximum and high quality production of forage
- Of forage production
- Of Forage quality
- Of forage-finished beef
Requirements for Acceptable Beef From Pastures

- Moderate to high ADG
  - Especially during final 90-100 days ±
  - > 2 lbs/day ±

- Young animal
  - Less than 18 months ±
  - Less than 12 months ±

- Final weight
  - 450 to 500 lbs minimum carcass wt. ±

- Reduced Stress
  - Handling procedures
  - Animal genotype
### Forage-Finished Beef

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal Supply</td>
<td>Lean</td>
</tr>
<tr>
<td>Harvest Facilities</td>
<td>Flavorful</td>
</tr>
<tr>
<td>USDA Quality Grade</td>
<td>Natural product</td>
</tr>
<tr>
<td>Lack of Infrastructure</td>
<td>Customer potential</td>
</tr>
<tr>
<td>Market has to be created</td>
<td>Niche Market</td>
</tr>
<tr>
<td>Niche Market</td>
<td></td>
</tr>
</tbody>
</table>
Making Comparisons

- Comparisons of forage-finished and grain-finished beef have been made.
- Problem with such comparisons is that of establishing the appropriate slaughter endpoint.

- Slaughtered on a time-constant basis
  - Differences in fatness
- Slaughtered at the same degree of fatness
  - Differences in maturity

Wanderstock and Miller, 1948; Bull et al. 1952; Craig et al., 1959; Carpenter et al., 1969; Schupp et al., 1976
Forage- vs grain-based beef production systems

- High forage-based diet
- High grain-based diet

Similar carcass wt endpoint
Similar days on feed endpoint

Live body weight, kg vs Total days on feed
### Summary of forage- vs grain-fed beef studies—Equal days on feed

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Forage Fed</th>
<th>Grain Fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass weight</td>
<td>26% lighter</td>
<td></td>
</tr>
<tr>
<td>Fat thickness</td>
<td>66% less fat</td>
<td></td>
</tr>
<tr>
<td>Marbling</td>
<td>42% less marbling fat</td>
<td></td>
</tr>
<tr>
<td>Lean Color</td>
<td>13% darker lean color</td>
<td></td>
</tr>
<tr>
<td>Fat color</td>
<td>20% more yellow color</td>
<td></td>
</tr>
<tr>
<td>Shear force</td>
<td>27% tougher</td>
<td></td>
</tr>
<tr>
<td>TP-tenderness</td>
<td>21% less tender</td>
<td></td>
</tr>
<tr>
<td>TP-juiciness</td>
<td>6% less juiciness</td>
<td></td>
</tr>
<tr>
<td>TP-flavor</td>
<td>14% less flavor</td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Forage-fed Beef</td>
<td>Grain-fed Beef</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Carcass weight</td>
<td>2% lighter</td>
<td></td>
</tr>
<tr>
<td>Fat thickness</td>
<td>23% less fat</td>
<td></td>
</tr>
<tr>
<td>Marbling</td>
<td>10% less marbling fat</td>
<td></td>
</tr>
<tr>
<td>Lean Color</td>
<td>17% darker lean color</td>
<td></td>
</tr>
<tr>
<td>Fat color</td>
<td>20% more yellow color</td>
<td></td>
</tr>
<tr>
<td>Shear force</td>
<td>7% tougher</td>
<td></td>
</tr>
<tr>
<td>TP-tenderness</td>
<td>0% less tender</td>
<td></td>
</tr>
<tr>
<td>TP-juiciness</td>
<td>0% less juiciness</td>
<td></td>
</tr>
<tr>
<td>TP-flavor</td>
<td>3% less flavor</td>
<td></td>
</tr>
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</table>
Utilizing Pastures for Finishing Cattle

- Feeding grain on pasture depends on:
  - Quality of forage
  - Condition of cattle

- Carrying capacity of pastures will vary
  - Weather (rainfall, etc)
  - Fertilizer

- Economic constraints warrant evaluation

- Species of grasses or legumes will vary
  - Ecoregion
Two-year performance for Bonsmara crossbred steers stocked on Tifton 85 with corn gluten supplement (SUP) and pasture only (PAS)

<table>
<thead>
<tr>
<th>Item</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Weight</td>
<td>676</td>
<td>770</td>
</tr>
<tr>
<td>60-d ADG (lb/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAS Only</td>
<td>1.56</td>
<td>1.79</td>
</tr>
<tr>
<td>0.8% BW-SUP</td>
<td>2.26</td>
<td>2.03</td>
</tr>
<tr>
<td>Total ADG (lb/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAS Only</td>
<td>0.99</td>
<td>1.07</td>
</tr>
<tr>
<td>0.8% BW-SUP</td>
<td>1.74</td>
<td>1.59</td>
</tr>
<tr>
<td>Final Weight (lbs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAS Only</td>
<td>784</td>
<td>889</td>
</tr>
<tr>
<td>0.8% BW-SUP</td>
<td>848</td>
<td>944</td>
</tr>
</tbody>
</table>

Rouquette et al., 2007 Beef Cattle Research in Texas.
Performance of forage- and silage-finished beef produced year-round

<table>
<thead>
<tr>
<th>Item</th>
<th>Finishing Treatment</th>
<th>March</th>
<th>May</th>
<th>July</th>
<th>Sept</th>
<th>Nov</th>
<th>Jan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily gain</td>
<td>Silage</td>
<td>2.16</td>
<td>2.43</td>
<td>2.32</td>
<td>2.16</td>
<td>2.32</td>
<td>2.14</td>
</tr>
<tr>
<td></td>
<td>Forage</td>
<td>1.79</td>
<td>2.05</td>
<td>1.76</td>
<td>1.21</td>
<td>1.63</td>
<td>1.76</td>
</tr>
<tr>
<td>Final wt</td>
<td>Silage</td>
<td>964</td>
<td>990</td>
<td>1025</td>
<td>1052</td>
<td>1036</td>
<td>977</td>
</tr>
<tr>
<td></td>
<td>Forage</td>
<td>926</td>
<td>948</td>
<td>944</td>
<td>961</td>
<td>968</td>
<td>953</td>
</tr>
</tbody>
</table>

- 120-d on corn silage or forage
- Minimum final target weight of 900 lbs
- Forage finished
  - Ryegrass-clover mixtures from Nov-May
  - Bermudagrass, warm season annuals, grass-clover mixtures, and grain-on-grass from June-Oct

Coombs et al., 1990
Finishing with Grain

- Feeding steers concentrates increases the yield grade
  - Tatum et al. (1980), Schroeder et al. (1980), and Hedrick et al. (1983)

- Increasing time on a concentrate diet will increase marbling scores and quality grade.
  - Harrison et al. (1978), Schroeder et al. (1980), and Skelley et al. (1978)

- Wise et al. (1967) reported that a concentrate supplement was necessary to produce good and choice grading carcasses.
  - Indicated grain on grass will increase the profitability of a cattle finishing system
    - Chapman et al. (1967), Suman and Woods (1966) and Carpenter et al. (1968)
Winter annual pastures have been used extensively to grow stocker cattle and to a limited extent as a finishing diet.

Roberts et al., 2009
- Finished steers on annual ryegrass with varied levels of corn

Forage DM increased with each increase in grain

Increasing the amount of grain of finishing cattle
- Decreased days on feed
- Increased ADG
Grain on Grass

<table>
<thead>
<tr>
<th>Item</th>
<th>No Corn</th>
<th>Corn</th>
<th>Corn + Corn Oil</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steers #</td>
<td>9</td>
<td>14</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Initial BW</td>
<td>414.2</td>
<td>387.6</td>
<td>387.8</td>
<td>&lt;0.04</td>
</tr>
<tr>
<td>112-d ADG, kg</td>
<td>1.07</td>
<td>1.65</td>
<td>1.62</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HCW, kg</td>
<td>288.1</td>
<td>321.4</td>
<td>326.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>QG</td>
<td>9.78</td>
<td>10.57</td>
<td>10.29</td>
<td>&lt;0.28</td>
</tr>
<tr>
<td>YG</td>
<td>1.89</td>
<td>2.29</td>
<td>2.43</td>
<td>&lt;0.10</td>
</tr>
</tbody>
</table>

QG: 9=US Select -; 10=US Select; 11=US Select +
Corriher et al., 2009
Finishing with Harvested Forages

- Could fill in gaps of lower quality forage
- Environmental Constraints
- Costs
- Storing and handling
Harvested Forages

- A 3-yr study evaluating finishing steer performance on corn silage and small grain pasture resulted in no difference in ADG (Utley et al., 1973)

- Steers that were fed a corn silage and cottonseed meal diet had lower HCW than steers grazing oat and rye pastures.
Costs & Value

- Feed costs are a major proportion of total variable costs in beef systems:
  - Efficiently managed grazed grass can be a cheaper feedstuff (O’Riordan & O’Kiely, 1996)

- Value of beef from grass-finished cattle is often discounted:
  - Perceived differences in tenderness (Chrystall, 1994)
  - Color (Baardseth et al., 1988)
  - Juiciness (Hutchings et al., 1988)
  - Flavor (Melton, 1990)
The Goal

- To fit into niche market:
  - Growth potential of the animals should be achieved with max inclusion of forage
  - Without impairment of sensory quality
Forage Finishing Beef

- Forage-grain feeding regimens allows growth and development on forages.
  - Completion of the finishing phase with grain increases product acceptability and consistency.

- The selection of the best system will vary geographically as well as yearly.

- No one set strategy that will fulfill the needs of all.

- Matching of the production system within a given environment while maintaining a marketable product and fulfilling the needs of the consumer.
Problems with Forage Finishing

- Decreased ADG
- Longer finishing period to reach target endpoint
- Reduced dressing percentage
- Less acceptable lean and fat scores
- Less quality grade
- Palatability issues as a beef product
Forage Finished Beef Data Needs

- Harvest logistics
- End point, Age-Weight
- Product Merchandising
- Quality assurance
  - Tenderness
  - Flavorful
- Variation in breeds
- Grain on grass?
- Stored forages feasibility?
- Match forages to animals