Factors Affecting Relative Forage Quality in Hay and Haylage

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Forage Quality Needs of Animals

- **Heifer, 18-24 mo**
  - Dry cow

- **Heifer, 12-18 mo**
  - Beef cow & calf

- **Dairy, 1st trimester**
  - Dairy Calf

- **Dairy, last 200 days**
  - Heifer, 3-12 month Stocker cattle

<table>
<thead>
<tr>
<th>Relative Forage Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

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Forage Quality Needs of Animals

- Stocker cattle
- Growing lambs & kids

- Nursing mare
- Hard working horse

- Beef cow & calf
- Ewe with lamb
- Doe with kid

- Ewe/ doe, not lactating
- Idle horse

Relative Forage Quality

100 110 120 130 140 150 160
Relative Forage Quality (RFQ)

RFV = \frac{\text{Intake potential} \times \text{DDM}}{1.29} = \frac{120/NDF \times [88.9 - (0.779 \times \text{ADF})]}{1.29}

RFQ = \frac{d\text{Intake potential} \times d\text{TDN}}{1.23} = \frac{[\text{NDF} + (d\text{NDF} - \text{avg dNDF}) \times 0.374] \times [d\text{NFC} + d\text{CP} + d\text{FA} \times 2.25 + d\text{NDF} - 7]}{1.23}
Relative Forage Quality Change

RFQ changes as following change:

- NDF
- digestible fiber (dNDF)
- Crude protein
- Nonfibrous carbohydrate
Crude Protein Change over Time

\[ y = -0.3232x + 12701 \]
\[ R^2 = 0.7101 \]
NDF Change over Time
Change in NDFD over time
Change in RFV and RFQ over time

RFV: $y = -4.4532x + 178171$
$R^2 = 0.5264$

RFQ: $y = -3.2486x + 130025$
$R^2 = 0.2497$
Timely harvest

The largest single effect on forage quality is the date of harvest.

**Daily Rate of Forage Quality Change in Spring**

<table>
<thead>
<tr>
<th>Component</th>
<th>2006 - 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>-0.25</td>
</tr>
<tr>
<td>Acid Detergent Fiber</td>
<td>0.36</td>
</tr>
<tr>
<td>Neutral Detergent Fiber</td>
<td>0.43</td>
</tr>
<tr>
<td>NDFD</td>
<td>-0.43</td>
</tr>
<tr>
<td>RFV</td>
<td>-2.9</td>
</tr>
<tr>
<td>RFQ</td>
<td>-3.6</td>
</tr>
</tbody>
</table>
Relationship of NDF Content to NDF Digestibility

\[
y = -0.0791x + 53.876
\]

\[R^2 = 0.0018\]
Range of digestibility of Common Forages

- Legume Silage/Hay: 30% - 40%
- Grass Silage/Hay: 20% - 30%
- Corn Silage: 10% - 20%

NDF digestibility (% of NDF)
Minimize Ash Content

<table>
<thead>
<tr>
<th>Ash Content of 2010 Superbowl Forage Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>
Minimize Ash Content

- Cutting height $\geq$ 3 inches
- Disc mower blade angle
- Swath on top of stubble, not on ground
- Rake so tines do not touch ground
Select a High Quality Variety

- High forage quality variety
- Disease resistance
- Fertilize to meet nutrient needs
Factors affecting Fiber Digestibility

- Maturity
- Genetics
- Cool Weather
  - First cutting vs later cuttings
  - Cool weather over summer
Harvesting/storage moisture

- Heat damage to hay haylage

Source: Coblentz, 2008, USDA -ARS
Hay Preservation – Results of Malliard Reaction

- TDN = dNFC + dCP + 2.25*FA + dNDF - 7

Source: Coblentz, 2008, USDA -ARS
High Nonfibrous Carbohydrate

- Good Growing Conditions
  - Adequate soil fertility
  - Adequate moisture
- Sunny day before
- AM/PM harvest
Change in RFV and RFQ over time

\[
y = -4.4532x + 178171 \\
R^2 = 0.5264
\]

\[
y = -3.2486x + 130025 \\
R^2 = 0.2497
\]
Factors affecting RFQ

- Maturity at harvest
- Ash content
- Select high quality variety
  - Genetics
  - Disease Resistance
- Cool Weather
- Harvest to avoid heating
- Harvest for high NFC
  - Sunny day
  - AM/PM