What is Forage Quality?

Ashley Pierce, Rensselaer County CCE
Take time to think about...

- What is forage quality to you?
- What are your goals?
Goals
Produce a healthy and nutritious animal feed
Produce a quality feed product that will sell for a premium price
How are you determining quality?
Not a real “analysis”
Can give a general idea of quality
What do you look for?
Visual Hay Characteristics

- Stage of maturity
- Color
- Leafiness
- Foreign matter
- Smell
Who tests forages and why?
Forages from the same field can vary greatly in quality
  - Impacted by maturity at harvest, weather, and storage
Low quality forages have less available nutrients and need supplementation
Low quality forages will sell for a lower price
Why Bother to Test?

- Let the customer know what they are getting
- Set pricing
- Pursue the proper market based on its quality
- Balance a ration, especially K in dry cows
  - > 3% potassium is high
- Gauge soil fertility
- Are you getting dirt from harvest?
Sample each hay lot separately
  - A lot is forage from the same field, same cutting, same environmental conditions, and uniform composition

Use a forage probe, no grab samples!

15-20 bales

Take a representative sample

Remember poor sampling will result in misleading values
Representative Samples
Push VERY hard before trying to core

Take sample through:
  - short end of small and large square bales
  - Round side of round bales

Mix samples together
Place in bag and label
Send immediately
Collecting a Haylage Sample

- Collect only freshly unloaded material
- Grab handfuls of silage
- Use 12-20 locations
The Test

Wet Chemical

- The “Gold Standard”
- High accuracy measuring feed mineral content
- More expensive
- Slower

NIR

- High accuracy measuring crude protein and fiber
- Cheaper
- Faster
- NIR=Near Infrared Reflectance Spectroscopy
Class Question:

- What are the 5 basic nutrients?
Basic Nutrients

- Energy
  - Fat and carbohydrates
- Protein
- Vitamins
- Minerals
- Water
## Annual Ryegrass May 1st

**Washington Cty Young Frmrs Project**

**Aaron Gabriel**

415 Lower Main Street

Hudson Falls, NY 12839-2629

### Energy Table - NRC 2001

<table>
<thead>
<tr>
<th>DE, 1X</th>
<th>Mcal/Lb</th>
<th>Mcal/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.36</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>1.17</td>
<td>2.58</td>
<td></td>
</tr>
<tr>
<td>0.68</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td>0.71</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td>0.44</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>TDN1X, %</td>
<td>69</td>
<td></td>
</tr>
</tbody>
</table>

### Comments:

1. **Effective 4/01/12, Prepaid**
   - Postage Mailer Fees Will
   - Increase to $4 for Individual
   - Mailers and $10 for Large Mailers. Visit Our Website for Info on Our New Ups Service. www.dairyone.com/forage/service

2. **KD is a Complex Calculation That May Yield Values Exceeding Theoretical Limits. A Default Maximum KD is Reported for This Sample.**
   - IVTD 24hr, % of DM
   - NDFD 24hr, % of NDF
   - kd, %/hr

3. **This Sample Was Tested Twice for Acid Detergent Fiber, Neutral Detergent Fiber and...**

### Components

<table>
<thead>
<tr>
<th>% Moisture</th>
<th>6.0</th>
</tr>
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<tbody>
<tr>
<td>% Dry Matter</td>
<td>94.0</td>
</tr>
<tr>
<td>% Crude Protein</td>
<td>9.5</td>
</tr>
<tr>
<td>% Available Protein</td>
<td>8.6</td>
</tr>
<tr>
<td>% ADICP</td>
<td>.8</td>
</tr>
<tr>
<td>% Adjusted Crude Protein</td>
<td>9.5</td>
</tr>
<tr>
<td>% Soluble Protein % CP</td>
<td>34</td>
</tr>
<tr>
<td>% Degradable Protein %CP</td>
<td>54</td>
</tr>
<tr>
<td>% NDICP</td>
<td>2.8</td>
</tr>
<tr>
<td>% Acid Detergent Fiber</td>
<td>16.7</td>
</tr>
<tr>
<td>% Neutral Detergent Fiber</td>
<td>33.6</td>
</tr>
<tr>
<td>% Lignin</td>
<td>3.8</td>
</tr>
<tr>
<td>% NFC</td>
<td>43.4</td>
</tr>
<tr>
<td>% Starch</td>
<td>3.4</td>
</tr>
<tr>
<td>% WSC (Water Sol. Carbs.)</td>
<td>33.0</td>
</tr>
<tr>
<td>% ESC (Simple Sugars)</td>
<td>13.9</td>
</tr>
<tr>
<td>% Crude Fat</td>
<td>3.0</td>
</tr>
<tr>
<td>% Ash</td>
<td>7.31</td>
</tr>
<tr>
<td>% TDN</td>
<td>69</td>
</tr>
<tr>
<td>NEL, Mcal/Lb</td>
<td>.74</td>
</tr>
<tr>
<td>NEM, Mcal/Lb</td>
<td>.74</td>
</tr>
<tr>
<td>NEG, Mcal/Lb</td>
<td>.47</td>
</tr>
<tr>
<td>% Calcium</td>
<td>.45</td>
</tr>
<tr>
<td>% Phosphorus</td>
<td>.24</td>
</tr>
<tr>
<td>% Magnesium</td>
<td>.08</td>
</tr>
<tr>
<td>% Potassium</td>
<td>1.95</td>
</tr>
<tr>
<td>% Sulfur</td>
<td>.13</td>
</tr>
<tr>
<td>% Chloride Ion</td>
<td>.19</td>
</tr>
</tbody>
</table>

| % Lysine | .22 | .24 |
| % Methionine | .11 | .12 |
Terms

- Dry Matter
- NDF
- ADF
- Crude Protein
- Energy
- Relative Feed Value
- Relative Forage Quality
Class Question:

- How are “Dry Matter” and “As Fed” different?
### Dry Matter
- The non-moisture portion of the feed
- Expressed as a percent
- Makes it easy to compare feeds on an equal basis

### As Fed
- Includes moisture
- Nutrient content will be “lower” because of the increased moisture content
Types of fiber are cellulose, hemi-cellulose, and lignin.

- Structure of the cell walls
- Varies in digestibility
NDF
- Measure of hemicellulose, cellulose, and lignin
- Structural carbohydrates
- NDF is negatively correlated with intake
- Commonly used as a quality parameter

ADF
- Measure of cellulose and lignin
- As lignin content increases, digestibility of the cellulose decreases.
Crude Protein includes both the true protein and the non-protein Nitrogen

What is “non-protein Nitrogen?”
Although not true protein, it supplies Nitrogen which can be used to form microbial protein.

They have a value that is equivalent to protein for ruminants.
Class Question:

- After water, which nutrient is needed in the largest quantity?
Used in all biological processes and is essential for life
Divided into many categories
Energy

- Gross Energy (GE)
- Digestive Energy (DE)
- Metabolizable Energy (ME)
- Net Energy for Lactation (NEI)
- Net Energy for Maintenance (Nem)
- Net Energy for Gain (NEg)
Relative Feed Value

- Used to compare legume and legume/grass hay and silage quality
- Estimates the digestibility (from % ADF) and potential intake (from % NDF)
- Compares alfalfa and alfalfa/grass mixes
- Easy comparison for nutrient content and pricing
DDM (Digestible Dry Matter) is the % of the DM that is digestible
DMI and DDM are used
DDM is assumed constant for all forages
Crude protein is not used; the only values that are used are ADF and NDF
Relative Forage Quality

- Evaluates how much the animal will eat and the total digestible nutrients
- Gives the producer a better idea of the performance they can expect from their animals
- Easily compares grasses and legumes against each other
  - When analyzing grasses, they tend to have more fiber when compared to alfalfa, but this fiber tends to be more easily digestible for the animal
  - You could have similar RFV’s and have different animal performance because the fibers are not able to be digested in the same way.
Neither RFV nor RFQ are used in ration formulation.

Provides a great way to:

- Gauge the price you should pay
- Which animals you should be feeding it to
- Type of performance you can expect from animals
What values are we looking for?

- Depends on many factors:
  - Our investment in that crop
  - What our animals require
  - What our customers are looking to purchase
  - What type of performance we want from our animals
  - The price we are hoping to sell the product for
  - Any others?
### General Forage Standards for Livestock (RFV)

<table>
<thead>
<tr>
<th>Quality</th>
<th>Crude Protein</th>
<th>ADF</th>
<th>NDF</th>
<th>DDM</th>
<th>DMI</th>
<th>RFV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
<td>&gt;19%</td>
<td>&lt;31%</td>
<td>&lt;40%</td>
<td>&gt;65%</td>
<td>&gt;3.0</td>
<td>Above 151</td>
</tr>
<tr>
<td>1</td>
<td>17-19%</td>
<td>31-35%</td>
<td>40-46%</td>
<td>62-65%</td>
<td>2.6-3.0%</td>
<td>125-151</td>
</tr>
<tr>
<td>2</td>
<td>14-16%</td>
<td>36-40%</td>
<td>47-53%</td>
<td>58-61%</td>
<td>2.3-2.5%</td>
<td>103-124</td>
</tr>
<tr>
<td>3</td>
<td>11-13%</td>
<td>41-42%</td>
<td>54-60%</td>
<td>56-57%</td>
<td>2.0-2.2%</td>
<td>87-102</td>
</tr>
<tr>
<td>4</td>
<td>8-10%</td>
<td>43-45%</td>
<td>61-65%</td>
<td>53-55%</td>
<td>1.8-1.9%</td>
<td>75-86</td>
</tr>
<tr>
<td>5</td>
<td>&lt;8%</td>
<td>&gt;45%</td>
<td>&gt;65%</td>
<td>&lt;53%</td>
<td>&lt;1.8%</td>
<td>Below 75</td>
</tr>
<tr>
<td>Crop</td>
<td>Crude Protein</td>
<td>ADF</td>
<td>NDF</td>
<td>Total Digestible Nutrients</td>
<td>Relative Feed Value</td>
<td></td>
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<tr>
<td>-----------------------</td>
<td>---------------</td>
<td>-------</td>
<td>-------</td>
<td>----------------------------</td>
<td>---------------------</td>
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<tr>
<td>Alfalfa</td>
<td>18-22</td>
<td>28-32</td>
<td>38-47</td>
<td>64-71</td>
<td>90-127</td>
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<tr>
<td>Grass</td>
<td>10-18</td>
<td>35-48</td>
<td>45-65</td>
<td>49-62</td>
<td>60-111</td>
<td></td>
</tr>
<tr>
<td>Grass/Legume Mix</td>
<td>9-17</td>
<td>32-47</td>
<td>42-58</td>
<td>56-62</td>
<td>80-105</td>
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<tr>
<td>Small Grains</td>
<td>8-16</td>
<td>35-46</td>
<td>48-67</td>
<td>55-64</td>
<td>95-120</td>
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<tr>
<td>Rye Grass</td>
<td>12-16</td>
<td>27-33</td>
<td>47-53</td>
<td>63-68</td>
<td>111-134</td>
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<tr>
<td>Tall Fescue/Orchard Grass</td>
<td>12-16</td>
<td>30-36</td>
<td>50-56</td>
<td>61-66</td>
<td>101-122</td>
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<tr>
<td>Red Clover</td>
<td>14-16</td>
<td>28-32</td>
<td>38-42</td>
<td>64-67</td>
<td>142-164</td>
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<tr>
<td>White Clover</td>
<td>18-25</td>
<td>24-38</td>
<td>30-44</td>
<td>55-70</td>
<td>115-150</td>
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<tr>
<td>Warm Season Annual Grass</td>
<td>8-12</td>
<td>35-40</td>
<td>55-70</td>
<td>50-58</td>
<td>77-104</td>
<td></td>
</tr>
</tbody>
</table>
ADF and NDF are both low, which means less lignin.

Over 10% ash in analysis means we are likely getting soil in our hay from field operations. Ex: rakes digging up soil.

Relative feed value puts this feed in the “prime” category.
Crude Protein is average

ADF is good, but NDF is higher (which means intake will be lower).

RFV of 114 is a “2” on the Prime-5 scale
Lower protein

Both values are very low, which means they are highly digestible

“Prime” category feed
In Conclusion

- Test forages consistently and as “lots”
- Always take a representative sample
- Use the analysis to accurately price your product
- Use the analysis to make the best use of your feed to maximize animal performance
- Use the analysis to improve your future production
Questions or Comments?