Pasture Nutrition for Dairy and Beef Cattle

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I am not from New York City!
Lactating Dairy Cows

- Highest nutritional requirements
- High dry matter intake
- Pasture nutrition challenges
Finishing Beef Cattle

- High nutritional requirements
- High dry matter intake
- Grass-finished nutrition challenges
The Value of Pasture and Good Nutrition

A high level of pasture management + An understanding of nutrition = Higher milk or ADG
A High Value Pasture is:

An area of land with an adequate amount, quality, type and distribution of forage.

Good pasture management complements or meets the nutritional requirements of the resident livestock, for as long a time period as possible.
Low Value Pasture
High in Forage Quality – Low in Forage Quantity
Low Value Pasture
High in Quantity - Low in Quality
High Value Pasture
High Forage Yield - High Forage Quality
Pasture Plants are Alive and Actively Growing. They Change in Yield and Quality Every Day and Even Over the Course of a Few Hours.
3 PHASES OF PASTURE GROWTH

PHASE I
LEAFY IMMATURE

PHASE II
LEAFY MATURE

PHASE III
STEMMY OVER-MATURE

NUMBER OF DAYS GROWTH
0 5 10 15 20 25
0 10 20 30 40 50

HIGH
LOW

QUALITY
QUANTITY

SPRING SUMMER
The goal of a pasture plan is to ensure the forage supply is kept in balance with the forage demand.

Once supply and demand are balanced, focus on nutritional balance of energy and protein.
The Rumen Bug’s Perspective

We feed the bugs
They feed the cow...
FORAGE QUALITY AND PLANT MATURITY

YOUNG VEGETATIVE PLANT

OLD OVER-MATURE PLANT
OLD OVER-MATURE PLANT

LEAF

PLANT CELL

CELL CONTENTS
± 80%

CELL WALL
± 20%

YOUNG VEGETATIVE PLANT

LEAF

PLANT CELL

CELL CONTENTS
± 80%

CELL WALL
± 20%
RELATIVE PROPORTION OF FIBER COMPONENTS

**YOUNG VEGETATIVE PLANT**

- **Protein Sugars**
  - 40% Cellulose
  - 50% Hemicellulose
  - 10% Lignin

**OLD OVER-MATURE PLANT**

- **Protein Sugars**
  - 20% Cellulose
  - 30% Hemicellulose
  - 50% Lignin
Typical forage quality

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>PASTURE</th>
<th>HAY</th>
<th>HAYLAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter %</td>
<td>20-25</td>
<td>88-92</td>
<td>35-40</td>
</tr>
<tr>
<td>Crude Protein %</td>
<td>20-30</td>
<td>8-14</td>
<td>14-20</td>
</tr>
<tr>
<td>Net Energy$_G$, Mcal/lb</td>
<td>.50-.60</td>
<td>.40-.50</td>
<td>.45-.55</td>
</tr>
<tr>
<td>ADF %*</td>
<td>20-30</td>
<td>30-40</td>
<td>30-40</td>
</tr>
<tr>
<td>NDF %**</td>
<td>40-50</td>
<td>55-65</td>
<td>45-55</td>
</tr>
</tbody>
</table>

* Acid Detergent Fiber – cellulose + lignin
**Neutral Detergent Fiber – hemicellulose + cellulose + lignin
Pasture Samples

• Must represent what animals eat
  - No “random samples”
    • Livestock graze selectively!

• Sample paddock being grazed
  - “But they’ll eat it before the results are back!”
  - Are the results reliable?
  - YES! If all paddocks managed same, quality will be similar
Pasture Samples

- Watch what animals eat
- Pretend you are an animal
- Sample multiple locations in paddock
- Mix samples, pack in plastic bag, freeze
How Often Should You Sample?

• First 3 Years Most Critical
  - New management
  - Fertility or forage species changes
  - Weather
  - Builds your “database”

• After Database Established
  - Based on milk production or ADG changes, weather and growth
NDF and Intake

• Lower NDF = higher intake
• NDF from forage
  – Low Quality Stored
    • 0.8-1.0% of body weight
  – High Quality Stored
    • 1.0-1.2% of body weight
NDF and Intake

• Forage NDF Intake
  - Pasture + Grain
    • Up to 1.4% of body weight
    • Total DMI up to 4% BW
  - Pasture Only
    • Total DMI up to 3.25% BW
    • Milk production limit

Pasture is the most digestible forage and has highest intake potential
Protein and Energy

- Rumen bugs
  - Protein = peptides, amino acids
  - Combine carbs with protein
  - More rumen bugs

- No carbs
  - Ammonia production
  - Converted to urea
  - High MUN
How Excess Degradable Protein Wastes Energy

Degradable Protein

Used by microbes
protein + carbohydrates
microbial protein -
used by cows

Not used
converted to ammonia
energy
ammonia into blood
ammonia in blood to liver
energy

urea excretion
liver converts to urea
NFC Digestion Rates

Fastest:
- Molasses
- Ground Oats, Barley
- Finely Ground Corn
- High Moisture Corn
- Coarse Ground Corn
- Ear Corn
- Corn Silage
- Whole Dry Corn

Processing & Moisture Make a Difference!
Post-ingestive feedback is a very rapid process, and it can change what an animal prefers to eat in a matter of minutes.

So be careful what you feed in the barn!

Feeding too much protein here = A decrease in dry matter intake here
Supplementation In The Barn

- Substitution effects
  - Too much stored forage
    - pound for pound
  - Too much TMR
    - > pound for pound
  - Too much protein
    - Post-ingestive feedback
## Typical Dairy Rations

<table>
<thead>
<tr>
<th>Feed</th>
<th>Confinement</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haylage</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Corn Silage</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Pasture</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Corn Grain</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>Soybean Meal</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Price of soybean meal is high – big savings with pasture!
# Beef requirements vs. Forage quality

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>COW/CALF</th>
<th>STEER*</th>
<th>PASTURE</th>
<th>HAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP %</td>
<td>8–12</td>
<td>10-11</td>
<td>20.0</td>
<td>12</td>
</tr>
<tr>
<td>NE₉, Mcal/lb</td>
<td></td>
<td>0.48</td>
<td>0.50</td>
<td>0.32</td>
</tr>
<tr>
<td>NE₉, Mcal/lb</td>
<td>0.55</td>
<td>0.76</td>
<td>0.70</td>
<td>0.58</td>
</tr>
<tr>
<td>TDN%</td>
<td>58</td>
<td>70</td>
<td>68</td>
<td>60</td>
</tr>
</tbody>
</table>

* 800 lb – 2.5 lb/day ADG, finish weight 1000-1200 lbs
Economics

• Growing animals will use some energy to eliminate protein
  – Costs less to grow protein
    • No need to purchase
  – May need to purchase energy

• One reason why grass-finishing takes longer than grain-finishing
Other Livestock

- Does any of this apply? Yes!
- Some energy used to eliminate protein
- Cow-calf, ewe-lamb pairs
  - Protein-energy issues not as pronounced
Take home messages

• Dairy
  – High value pasture
  – Energy supplementation
• Grass-finishing beef
  – Manage pastures like dairy
• Other kinds and classes
  – Pasture can be lower value and meet nutritional needs
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