The Unique Ruminant Animal

- Ruminants have a four compartment stomach and are able to digest fiber.
- This is an important consideration when attempting to convert fiber products into a usable food-source for humans.
- Four Compartments Include:
  1. Reticulum
  2. Rumen
  3. Omasum
  4. Abomasum

The Rumen

One of the coolest places on earth

The Beef Cow’s Assignment

- Our expectation of a productive cow
  - Maintain her body weight / condition
  - Deliver a live calf without difficulty
  - Come into heat promptly
  - Conceive early in the breeding season
  - Nourish a developing fetus
  - Adequately nurse the calf through to weaning

The Basic, Complicated Nutritional Equation:

Cow Nutrient Requirements -

Nutrients Supplied by Forage =

Nutrients Needed in Supplement
Defining the Situation

• What is the overall objective of the feeding / supplementation program
  – Extend the forage base
  – Meet nutritional deficiencies
  – Alter cow production

• You have to know where you want to go before you can get there.

Water

• Water is the most critical nutrient in ALL livestock production:
  – Clean
  – Fresh
  – Consider semi-routine analysis:
    • Microorganisms
    • Chemicals

• To ensure availability and control contamination of waterways, it is best to provide cattle with water derived from a well.

Basic Required Nutrients

Water
Protein
Minerals
Vitamins
Fats
Energy

Energy

• Energy is derived from digestion of feedstuffs
  – Fiber
  – Protein
  – Starch
  – Fat

• TDN is our common measure of feedstuff energy

• Net energy assigns the proportion of that feedstuff which meets
  – Maintenance, growth, lactation, gestation

• Common sources of energy include:
  - forage (hay)
  - citrus pulp
  - molasses
  - grain byproducts
  - fat

Energy Supplementation

• Main driver of BCS

• Reasons for use:
  – Reduce forage consumption
  – Meet energy demands
  – Diet selection allows

<table>
<thead>
<tr>
<th>Feed</th>
<th>% TDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahiagrass</td>
<td>51</td>
</tr>
<tr>
<td>Hay</td>
<td>59</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>59</td>
</tr>
<tr>
<td>Pellet</td>
<td>59</td>
</tr>
<tr>
<td>Soybean</td>
<td>70</td>
</tr>
<tr>
<td>Hulls</td>
<td>72</td>
</tr>
<tr>
<td>Molasses</td>
<td>72</td>
</tr>
<tr>
<td>Soybean</td>
<td>84</td>
</tr>
<tr>
<td>Meal</td>
<td>84</td>
</tr>
<tr>
<td>Corn</td>
<td>88</td>
</tr>
</tbody>
</table>
**Energy Supplementation Considerations**

- Begin feeding before it is too late
- Response improves with long term low level supplementation
- Feeding low levels of energy (w/out adequate diet protein) decreases overall energy intake
- High starch supp. decreases fiber digestibility (Negative Associative Effects)

**Energy Supplementation Considerations**

- Usually contain < 20% CP
- Do not feed energy when high CP supplement will improve performance
- Grain is a substitute for forage
- High starch supp. work best with moderate to high quality forage

**Protein**

- Ruminant protein requirements are met by:
  - Diet
  - Rumen microbes
  - Recycling of urea
- Ruminants are able to utilize “microbial-protein”, derived from microbes, which live in the rumen.
- Common protein sources include:
  - Forage, Oilseed Meals, Grain By-products, Feather Meal

**Protein Supplementation**

- Increases forage dry matter intake and digestibility
- Critical level:
  - forage CP < 7% or
  - TDN:CP is >7 (51% TDN: 5% CP)
- Correct protein type is essential
  - Non-protein nitrogen
  - Natural protein
    - Ruminal Degradable Protein (DIP)
    - Ruminal Undegradable Protein (UIP)

**Natural Protein**

- Soybean, cottonseed, feather meal, distillers grains, other forages: ryegrass, perennial peanut
- Animal performance: natural>NPN
- Supplies DIP, UIP, energy, and other nutrients
- Proportions of DIP and UIP vary and can affect use and performance in given situation

**Natural Protein Considerations**

- Utilization: similar among classes of animals
  - Use with younger animals with increased requirements
- Fed as dry or additive in liquid feeds
- Supplies N to rumen for microbes and protein to animal
Non-Protein Nitrogen

• Synthetic (Urea, Biuret) chemical compounds that contain a nitrogen source not associated with protein.
• Improvement in performance compared with no supplementation.
• Utilization rate may be reduced because of decreased forage digestibility potential.
• Lacks energy, vitamins, and minerals.
• Urea is a common NPN source used in cattle supplements.
• Rumen microbes are able to use NPN to synthesis microbial protein.

NPN Considerations

• Management issues
  — Mature cows consuming forage of adequate quality can use NPN as an economic substitute to natural protein.
  — Better performance in older cows than young/growing cows.
  — Young and low body condition cattle will experience improved performance with the use of natural protein.
• Potentials for toxicity
• Requires a carrier that supplies energy
• Success of utilization depends on adequate ruminal energy for microbes
• Liquid Feeds (Molasses)
  — Provide carbohydrates for bacterial energy to utilize NPN.

Vitamin-Mineral Supplementation

• Vitamin-Mineral deficiencies cause problems regardless of protein/energy
• Deficiencies in forage
  — especially low quality
  — fast-growing and/or winter annuals
• Other supplements may alter mineral availability in forage
• Efficacy of all other supplementation depends on vitamin/mineral adequacy

Mineral Supplementation

<table>
<thead>
<tr>
<th>Macro</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>Copper</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Iron</td>
</tr>
<tr>
<td>Sodium</td>
<td>Manganese</td>
</tr>
<tr>
<td>Sulfur</td>
<td>Zinc</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Cobalt</td>
</tr>
<tr>
<td>Calcium</td>
<td>Iodine</td>
</tr>
<tr>
<td>Selenium</td>
<td></td>
</tr>
</tbody>
</table>

Vitamin Supplementation

<table>
<thead>
<tr>
<th>Water</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiamine (B1)</td>
<td>Vit. A</td>
</tr>
<tr>
<td>Riboflavin (B2)</td>
<td>Vit. D</td>
</tr>
<tr>
<td>Niacin</td>
<td>Vit. E</td>
</tr>
<tr>
<td>Biotin</td>
<td>Vit. K</td>
</tr>
<tr>
<td>B6</td>
<td></td>
</tr>
<tr>
<td>B12</td>
<td></td>
</tr>
<tr>
<td>Pantothenic Acid</td>
<td></td>
</tr>
<tr>
<td>Folic Acid</td>
<td></td>
</tr>
</tbody>
</table>

What affects cow nutrient requirements

• Nutrient requirements differ:
  — Age
  — Level of production
  — Current and/or desired body condition
  — Breed
  — Physiology
    • Lactation
    • Gestation
  — Pasture activity
  — Terrain
  — Pest load
  — Feed Additives
    • Ionophore
  — Environment
    • Temperature
    • Season
Effect of Time on Requirement Cycles in Beef Cows

Comparison of Cow vs Heifer Energy Requirement

Months Needing Energy/Protein Supplementation to Meet Requirements – Grazing Bahiagrass

Assessing Effectiveness of Nutrition

Energy/Protein Requirement Cycles in Beef Cows

Nutrient Requirement Cycles and Pasture Characteristics
How to tell if cattle are getting adequate nutrition

- Body Condition Score
- Estimation of body fat
- Gauge effectiveness of feeding program
- Decision tool to determine future feeding needs
- Scale of 1 to 9
- Most Florida cows score from 3 to 7
  - BCS 3 = 7 to 9% fat.
  - BCS 5 = 15 to 18% fat.
  - BCS 7 = 25 to 27% fat.

Cow Body Condition Score

- Body condition score is the best measure of past nutritional status and a good indicator of future reproductive performance.

  *5 is the magic number!*

Supplementation

- Feeding the cow herd is the largest cost area in beef enterprises, approx 45-50% of annual maintenance cost
- Stored or supplemental feeds constitute the largest, most variable portion
- Designing supplementation program correctly is a must

Final Remarks

- Underfeeding the cow herd before or after calving really affects 2 calf crops, this year’s and next year’s.

  *THE MOST IMPORTANT NUTRIENT IS THE ONE THAT IS MISSING!*

Questions