Nutritional Needs and Challenges of Animals Raised on Pasture

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Pasture and woody browse important

Cow-calf and ewe-lamb pairs usually on pasture

Grass-finished growing in popularity

Challenges

• What are they eating?
• How much are they eating?
• What is the quality of what they are eating?
• Does it meet their needs?
• What else should I feed?
• How do I know???

Some of these are or will be answered by other presenters
## 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>TEEN (Mcal/kg)</td>
<td>65-75</td>
<td>55-65</td>
<td>60-70</td>
</tr>
<tr>
<td>Net Energy (Mcal/kg)</td>
<td>50-60</td>
<td>40-50</td>
<td>40-50</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>

Also need to know mineral content – Ca, P, Mg, K, trace minerals – will vary with soil type, fertility, and soil health

* Acid Detergent Fiber
** Neutral Detergent Fiber

## Protein

- Protein from pasture > animal req’ts
  - 20 – 30% crude protein from pasture
  - Most livestock need 16-17% or less
- Protein from pasture > rumen bacteria req’ts
  - 70 – 80% degradability
- Ruminants will use energy to eliminate excess protein
- Results in high milk urea nitrogen (MUN) in dairy animals

## How Excess Degradable Protein Wastes Energy

- **Degradable Protein**
  - Used by microbes
  - Not used
  - protein + carbohydrates
  - microbial protein - used by animals
  - converted to ammonia
  - energy
  - ammonia into blood
  - liver converts to urea

## Non-Fiber Carbohydrates (NFC)

- Source of energy
- Sugars and starches from grain
  - Corn, barley, oats, etc.
- Rumen bugs match with protein
  - More microbial protein – feeds the animal
Non-Fiber Carbohydrates (NFC)

• Dairy
  • Critical for high milk production
  • Caution – no grain not easy
• Beef
  • Only if gains are low
  • Sheep, goats
    – Breeding, lactating w/multiples, weaned lambs or kids

There may be some adaptation in the rumen of 100% grass-fed animals to utilize more N without added NFC’s

Non-Fiber Carbohydrates (NFC)

• Swine
  • Grain higher proportion of diet
• Poultry
  • 70-90% of diet with insects, grass, etc balance

Neither of these species needs NFC’s for rumen or excess pasture protein issues
They are non-ruminants, so pasture is supplemental protein

High Quality Forage

• How much forage can they eat?
  • Cattle – 2.5-3.5% of body weight
  • Sheep – 2.5-3.5% of BW
  • Goats – 3.5-5.5% of BW
  • Swine – 1.0-2.0% of BW
  • Poultry - ?? 5-20% of total intake

Depends on stage of production – growing vs lactating vs “dry”

Nutritional Requirements and Rations

• National Research Council publications
  • https://www.nap.edu/collection/63/nutrient-requirements-of-animals
• Ration balancing programs
  • Some free, some cost $5
  • Many universities have easy to use programs
  • Google “beef cattle/sheep/goat/poultry/swine ration formulation software”
  • Goats
    – Langston University: http://www.langston.edu/pl/rating
  • Service provided by feed companies, consultants, veterinarians, Cooperative Extension, etc.
**Beef Requirements vs. Pasture Quality**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Cow/Calf</th>
<th>Steer*</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP%</td>
<td>8 - 12</td>
<td>11.7</td>
<td>20.0</td>
</tr>
<tr>
<td>NE_G, Mcal/lb</td>
<td>0.46</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>NE_M, Mcal/lb</td>
<td>0.55</td>
<td>0.74</td>
<td>0.70</td>
</tr>
<tr>
<td>TDN%</td>
<td>58</td>
<td>70</td>
<td>68</td>
</tr>
</tbody>
</table>

* 600 LB – 8 months age, 2.5 lb/day ADG

**Sheep Requirements vs. Pasture Quality**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Ewe/Lambs*</th>
<th>Lamb#</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP%</td>
<td>15.0</td>
<td>11.7</td>
<td>20.0</td>
</tr>
<tr>
<td>NE_G, Mcal/lb</td>
<td>0.31</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>NE_M, Mcal/lb</td>
<td>0.25</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>TDN%</td>
<td>65</td>
<td>77</td>
<td>68</td>
</tr>
</tbody>
</table>

* 164 lb w/twins – early lactation
# Ram lamb – 88 lb finishing, 0.5 lb ADG

**Goat Requirements vs. Pasture Quality**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dairy*</th>
<th>Meat#</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP%</td>
<td>12-17</td>
<td>15-17</td>
<td>20.0</td>
</tr>
<tr>
<td>TDN%</td>
<td>65</td>
<td>67</td>
<td>68</td>
</tr>
</tbody>
</table>

* Doe in lactation
# 55 lb Boer, 0.25 lb ADG

**Parasites!**

* Sheep and goats are very susceptible to parasites on pasture
  * Barber pole worm (H. contortus), stomach worms (many types), meningeal/deer worm (P. tenuis), etc.
  * Management can minimize
    * Taller grazing height – parasites on plants up to 4" above ground
    * Longer pasture rotations
    * Multi-species grazing
    * Selection for resistance
  * Resistance to dewormers
  * [www.ansci.cornell.edu/sheep](http://www.ansci.cornell.edu/sheep) for more info
Parasite Issues

- Cattle – minor issue
  - Roundworm, flukes, tapeworms
  - Same lifecycle as sheep parasites, but species specific
  - Dewormers typically used twice in spring – resistance issue
  - Young animals most susceptible – cattle become more resistant with age
  - Pasture management
    - Young animals on “clean” pasture
    - Don’t overgraze

Poultry and swine

- Neither of these species are true “grazers”
  - Grain, insects, food waste, etc.
  - Do benefit from being on pasture
    - Poultry – eat small amounts of grass & clover
    - Swine – root in soil for grubs and insects, some grass, weeds – “pigness”

Supplementation

- Dilute the pasture protein
  - Feed a little dry hay
    - Lower protein than pasture
    - Substitutes for pasture intake

- Use the pasture protein
  - Feed a little ground corn
    - Provides non-fiber carbs (NFC)
    - Rumen bugs use to make more bugs

Minerals
Plant Minerals
- Most available form for animals
  - Fresh forage vs. fermented
  - Depends on soil fertility
  - Depends on soil health
  - Depends on plant and root structure

Supplemental Minerals
- Conventional nutrition
  - Major minerals
  - Supplement w/pre-mix or complex mixtures
  - Forages not tested for all trace minerals, vitamins
- Organics
  - Reliance on plants
  - Look to soil mineralization, pH, and OM
  - Long-term

Force-Feed or Free-Choice?
Free-choice
- Mix minerals with salt to limit intake
- May either encourage or limit intake of other minerals
- Minerals all taste like salt
  - Animals can’t associate feedback with flavor
Supplementation

- **Salt**
  - Supply free-choice
  - Loose vs. blocks
  - Self-liming
  - Mix in with grain
  - Limits intake

- **Minerals**
  - Can be in trace mineral salt block
  - Specially formulated based on forage tests
  - Mix in with grain or free choice

Immune System & Minerals

- **Major minerals**
  - Ca, P, Mg, K, Na, Cl, S
  - Acid-base balance, osmotic pressure, membrane electrical potential and nervous transmission

- **Trace minerals**
  - Co, Cu, I, Fe, Mn, Mo, Se, Zn
  - Components of enzymes and enzyme co-factors, hormones

*These systems are inter-related in support of the immune system – need to consider holistic viewpoint*

Grass tetany

- Also known as “grass staggers”
- Caused by low Mg in spring pasture
  - Cool, wet weather
- Animals have difficulty standing, walking
  - Mg needed for muscles to contract
- Preventable by increasing Mg in diet
  - Magnesium oxide or sulfate

White muscle disease

- Caused by low Se in diet
- Northeast soils deficient in Se = forages low
- Need to supplement at correct level
- Can be toxic
  - FDA sets limit of 0.3 mg/kg (ppm) in feed
- Calves, lambs, and kids can be born with disease
  - Lesions in skeletal and/or heart muscle
  - Can cause death if not diagnosed and treated
  - Make sure Mama is getting enough
    - Can inject a Se/Vitamin E product in late pregnancy to boost
Vitamins

- A, D, E
- Function in metabolic pathways, immune cell function, gene regulation
- Grazing Season
  - Vitamin A – precursor is ß-carotene
  - Vitamin D – sunlight & grass
  - May decrease slightly in diet

Sodium Bicarbonate

- Helps to buffer the rumen
- Fermented forages
  - Wet
  - Finely chopped
  - Intake limited
  - High grain
  - Pasture?

Sodium Bicarbonate on Pasture

- Pasture is a neutral pH feed
- Pasture has a long particle length
- Rapid rate of digestion
  - Low fiber
  - Wet

Kelp

- Approved for organics
- Source of minerals, vitamins, anti-oxidants
- High iodine content
  - Not problematic
- Limited research
  - Boosts immune system
  - Reduces pinkeye
Kelp

From www.thorvin.com
Not intended as a product endorsement

Multi-species Grazing

- Benefits
  - More uniform grazing
  - Different preferences for plants
  - Avoid own manure, but not of other species
  - Better animal performance
  - Manage parasites
  - Predator protection

- Options
  - Different species grazing together
  - Leader-follower system
  - Which is better?
    - Depends on your goals and livestock types

Species Together

- Beef and sheep or goats
  - Challenge with minerals – copper
  - Tend to have species “cliques”
  - Bovine malignant catarrhal fever
    - Uncommon, but vets may have concerns
    - Spread from sheep to cattle during lambing in fluids
    - Important to separate

- Beef/sheep/goats and poultry
  - Poultry can free-range days, confined at night
  - Break up manure – eat fly larvae, slugs
  - Reduced poultry grain consumption
Species Together

- Sheep and goats
- Same mineral
- Goats can work on woody plants, sheep on grasses and forbs
- “Personality conflicts” may occur

Leader-follower species

- Which comes first?
  - Beef then sheep/goats
  - Sheep/goats then beef?
- Anything can be followed by poultry
- Pigs can follow where you want disturbance

Who’s First?

- Advantages to leader grazing
  - Better quality forage and availability – can select preferred species
  - May have better animal performance
  - Sheep eat tallest forage – reduce parasite intake in bottom 4”
  - Beef “vacuum” parasites, reducing larva concentration
- Disadvantages to follower grazing
  - Lower quality forage, availability, selection

“Strategic Rotational” Stocking Method

Regardless of any system you choose, pastures will be utilized better.

45-60 day rest period for sheep
20-30 day rest period for cattle