Intro to Meat Goat Nutrition

John Harper
Livestock & Natural Resource Advisor
Mendocino & Lake Counties
University of California Cooperative Extension

Adapted from presentation by Susan Schoenian, Sheep & Goat Specialist
University of Maryland Cooperative Extension, Western Maryland Research & Education Center
Overview

- The Ruminant Stomach
- Nutrients
- Sources of nutrients
- Nutrient requirements
- Practical feeding
The Ruminant Stomach

- **4 Compartments**
  - Reticulum
  - Rumen
  - Omasum
  - Abomasum (true stomach)

- **Microbial digestion**
  - Reticulo-rumen (the vat)
  - Absorption of some bacterial feed breakdown thru rumen wall

- **Large feed particle trap and H₂O absorption**
  - Omasum

- **Acidic digestion**
  - Abomasum

- **Enzymatic digestion/nutrient absorption**
  - Small intestine
Rumen Advantages

- Digestion of dietary fiber by bacteria
- Bacteria synthesize all B & K vitamins needed
- Also synthesize protein from nitrogen recycled in the body
- Detoxify anti-nutritional factors e.g. tannins
  - Browse utilization
- Newborns – first 3 compartments not developed
  - Allows absorption of colostrum antibodies & milk nutrients
  - Weaning dependent on development that is stimulated by fiber intake
- Unique to goats
  - Better ability to detoxify absorbed anti-nutritional factors
  - More resistant to bloat
Nutrients for Goats

• Water
• Roughage (fiber)
• Energy
• Protein
• Minerals
• Vitamins
Water

• The most essential nutrient
  • Intake (need) varies by . . .
    • Moisture in green feed
    • Lactation (2-3 gal) > Gestation > Maintenance (1/2 to 1 gal)
    • Late Gestation > Mid and early gestation
    • Triplets, twins > single
    • Milk type goats > meat type
    • Lactating goat: 1 quart for every pint
    • Summer > winter

• Keep it clean!
Roughage

• Should be primary source of feed intake
• Maintains healthy rumen function
• Less problems when goats are forage-fed
• Minimum amount of roughage is ½ lb. per 100 lbs. of body weight
Energy

• Needed in the most amount
• Usually the most limiting nutrient
• Excess is stored as fat
• Expressed as . . .
  – TDN – total digestible nutrients (%)
  – ME – metabolizable energy (mcal)
  – NE for maintenance, growth, lactation, and fiber production (mcal)
• Carbohydrates, fats, proteins
Sources of Energy

- **High**
  - Cereal grains (76-88%)
    Corn, barley, wheat, sorghum, rye, oats
  - By-product feeds (76-90%)
    Soy hulls, distiller's grains, corn gluten, wheat middlings

- **Moderate**
  - Corn silage (65-72%)
  - Haylage (50-60%)
  - Good quality pasture (60-70%)
  - Good quality hay (50-60%)

- **Low**
  - Low quality hay (40-50%)
  - Low quality pasture (< 50%)
  - Straw (40-48%)
  - By-products (<40%)
    - cottonseed hulls, peanut hulls, oat hulls
Protein

- Composed of amino acids
- Bypass or escape protein increases protein efficiency
- Quantity more important than quality
- Usually most expensive ingredient
- Excess protein is not stored in the body. It will be used inefficiently as energy
- Excess N is an environmental concern
Sources of Protein

• **Highest**
  - Protein meals (46-52%)
    - Plant - soybean meal, cottonseed meal, peanut meal
  - Fish meal (66%)
  - Urea (NPN) (288%)

• **Moderate**
  - Alfalfa and other legume hays (13-28%)

• **Low**
  - Grass hay (10-12%)
  - Cereal grains (8-14%)

• **Lowest**
  - Poor quality hay (<10%)
  - Straw (3-5%)
Minerals

- Required in small quantities (grams)
  - Macro – salt, Ca, P, Mg, K, and S
  - Micro (trace) – Se, I, Cu, Fe, Mo, Cr, F, Zn, and Mn
- Balance of minerals is important
  - Example: Ca:P
- Many interactions
  - Example: Cu-Mo-S
- Sources:
  - Hay, pasture, grain
  - Mineral mixes, blocks, tubs
Sources of Calcium

High
- Limestone (38%)
- Bonemeal (24%)
- Dicalcium phosphate (25%)

Moderate
- Alfalfa and other legume hays and pasture (1.2-1.7%)
- Soybean hulls (0.55%)
- Grass hay and pasture (0.3-0.6%)
- Protein meals (0.2-0.4%)

Poor
- Cereal grains (.02-.07%)
Vitamins

• Ruminants have a dietary requirement for Vitamin A, D, and E
• Vitamin K and B-vitamins are manufactured by the rumen
• No dietary requirement for Vitamin C or D
• Sources of vitamins
  • Natural sources
  • Vitamin packs
  • Mineral mixes, blocks, tubs
Nutrient Requirements Depend On ...

- Size (weight)
- Age
- Stage and level of production
- Climate and environment
- Body condition
Body Condition Scoring (BCS)

- Used to evaluate the feeding program and the need for changes.
- Body condition is a better indicator of nutritional health than weight.
- The most important times to body condition score are breeding, late gestation, and weaning.
- Body condition scoring estimates fat and muscle on a scale of 1 to 5. Half scores are commonly used.
- 1 BCS equals 13% of the live weight of a female in moderate condition (3-3.5).
- Exact score is not important as the relative scores and the differences between scores.
Body Condition Scoring

BCS1

BCS2

BCS3

BCS4

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Making a Difference for California
Body Condition Scoring

BCS1

BCS2

BCS3

BCS4

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Making a Difference for California
Stage & Body Condition Score
General Feeding

• Pasture and browse should provide majority of nutrients to goats
• Supplement pasture as needed
  • Free choice minerals
  • Late pregnancy
  • Early lactation
  • To increase growth rates
  • Flush does in poor body condition
  • Poor quality pasture
  • Drought
• Adequate feeder space
## Trough Space

<table>
<thead>
<tr>
<th>Type</th>
<th>Concentrate</th>
<th>Restricted Roughage</th>
<th>Ad Libitum Roughage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult goat &gt; 132 lbs.</td>
<td>20 inches</td>
<td>10 inches</td>
<td>6 inches</td>
</tr>
<tr>
<td>Growing kid &lt; 77 lbs.</td>
<td>16</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Weaned kid &lt; 44 lbs.</td>
<td>12</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
Practical Feeding

• Feed manufactured feeds
• Balance a ration
  • By hand (math)
    • Simultaneous equations (Algebra)
  • Use computer program
    http://www.sheepandgoat.com/software.html#ration
  • Use spreadsheet
  • Web-based ration balancing
    http://www.luresext.edu/goats/research/nutr_calc.htm
• Feed by “rules of thumb”
Manufactured Feeds

- Blends of ingredients that are formulated to supply all (complete) or defined portions (supplement) of the requirements of targeted animal).
  - Complete feeds
  - Protein supplements or balancers
  - Mineral mixes, blocks, tubs
  - Use properly!

More expensive, but convenient and properly balanced.
Steps To Balancing A Ration

- Know nutrient requirements of animals (NRC tables)
- Know nutrient composition of feeds (test feed or use “book” values)
- Determine how much forage or hay you need to feed to meet the energy requirements
- Make sure the animal can consume the amount of forage or hay that you calculate she needs by looking up dry matter intake in NRC table
- Calculate how much protein, Ca, and P the hay is providing.
- Add supplement(s) to hay or pasture ration to provide the protein, Ca, and P that the hay lacks
“Rules Of Thumb”

Forage

– Feed 3 to 4 lbs. of grass hay (or pasture) during early and mid gestation.
– Feed 4 to 5 lbs. of average quality hay (or pasture) during late gestation.
– During late gestation, you may need to supplement Ca if feeding a grass hay (don’t depend on free choice minerals).
– Save alfalfa hay for lactation when the female’s nutritional needs are the highest.
– Feed poor quality hay prior to and after weaning.

Bigger amounts for big females and smaller amounts for smaller females.
Thumb Rules

Concentrate/grain

- No grain during early and mid pregnancy.
- Feed ½ to 1 lb. of grain per day to females during late gestation.
- Start with a ¼ lb. of grain and gradually increase amount of grain in diet.
- May need to feed more if you expect a birthing percentage greater than 200%.
- Grain can substitute for some of the hay in the ration, but be CAREFUL.
Thumb Rules

After parturition

• Plenty of water. Warm water in winter.
• Forage for the first few days.
• Take about a week to get the ewe/ doe on full feed.
Thumb Rules

Lactation

• Feed 4 to 5 lbs. of your best quality hay + 1 lb. of grain for each offspring the female is nursing.
• Separate females into production groups: singles, twins, and triplets.
• If feeding alfalfa hay or another legume, the grain can be whole corn or barley.
• If feeding grass hay, you will need to supplement protein and calcium in the grain ration.
Additional Tips for Feeding

• Weigh feed
• Don’t rely on free choice minerals.
• Include Rumensin® or Deccox® in ration to prevent coccidiosis. **They are toxic to equines**
• Feed whole grains
• Split feedings if you’re feeding a lot of grain
• Separate animals into groups according to their nutritional needs
• Feed and manage doelings separate from mature females.
• Aim for moderate body condition scores.