Meat Goat Female Nutrition

Terry K Hutchens
Extension Goat Specialist
University of Kentucky
Small Ruminant Digestive System

• Sheep and goats are members of a class of animals called ruminants. These animals ruminate, a process where they regurgitate their feed, rechew the cud bolus, and then reswallow the feed.

• The four compartments of the stomach of ruminants include: 1) the rumen, 2) the honey-combed shaped reticulum, 3) the omasum, and 4) the abomasum or true stomach (ab- means away from the omasum).
Small Ruminant Digestive System

• Reticulum
  – The reticulum has a distinctive “honeycomb” appearance.
  – It aids in bringing boluses of feed back up into the mouth for rechewing.
  – Can serve as a repository for heavy foreign objects, such as wire or nails.
Small Ruminant Digestive System

• Rumen
  – The rumen is by far, the largest compartment.
  – The main purpose of the rumen is to provide a suitable environment for bacteria and protozoa.
Small Ruminant Digestive System

- **Omasum**
  - Once the feed has been reduced in size by chewing, rumination, and digestion it can pass into the omasum.
  - The primary purpose of the omasum is to squeeze and absorb water from the feed.
Small Ruminant Digestive System

- Abomasum
  - This fourth and last compartment is the abomasum or “true” stomach.
  - The abomasum is proportionally larger in small ruminants than is the abomasum of the cow.
  - The chief digestive function of the abomasum is the partial breakdown of proteins.
Small Ruminant Digestive System

• Small Intestine
  – The digesta moves forward through the digestive process into the small intestine.
  – In order for feedstuffs to be absorbed across the intestine wall, they must be broken down into smaller molecules.
  – Much of this occurs in the small intestine using enzymes and hormones.
Small Ruminant Digestive System

• Large Intestine
  – The cecum, colon, and rectum make up the rest of the digestive tract.
  – They are collectively referred to as the large intestine.
  – The primary purpose of the large intestine is to absorb water from the digesta.
Understanding Terms Relating to Nutritional Science

• **Moisture**-
  – Moisture is expressed as a %, and represents the percentage of water present in the forage or feed being analyzed.

• **Dry matter**-
  – Dry Matter (DM) is the portion (weight) of forage other than water. Dry matter equals 100% minus the percentage of moisture.
• **Crude Protein**-
  – Crude protein (CP) is the sum of true protein and non-protein nitrogen. It is calculated by measuring the nitrogen concentration in a feed and multiplying by 6.25.

• **Soluble Protein**-
  – Soluble protein (SP) represents true proteins and non-protein nitrogen rapidly broken down in the rumen.
Understanding Terms Relating to Nutritional Science

• Degradable Protein and Rumen Undegradable Protein-
  – Rumen degradable protein (RDP) or degradable intake protein (DIP)– consists of the soluble protein and proteins of intermediate rumen degradability. They are used to synthesize microbial protein in the rumen. Rumen undegradable protein (RUP) or undegradable intake protein (UIP) are proteins that have a slow rate of degradability and escape digestion in the rumen.
Understanding Terms Relating to Nutritional Science

• Acid Detergent Fiber
  – *Acid detergent fiber* (ADF) and neutral detergent fiber are frequently used as standard forage testing techniques for fiber analysis. Low ADF values are desirable.

• Neutral Detergent Fiber
  – *Neutral detergent fiber* (NDF) approximates the total cell wall components including hemicellulose, cellulose and lignin.
Understanding Terms Relating to Nutritional Science

• Total digestible nutrients (TDN)
  – Total digestible nutrients (TDN) reflects the percentage of digestible material in a forage or grain. Total digestible nutrients are calculated from ADF and express the difference in digestible materials between forages.
Understanding Terms Relating to Nutritional Science

• Relative Feed Value
  – *Relative feed value* (RFV) is a comparative term that allows the comparison of forage “A” to forage “B” based on digestibility and potential intake.

• Minerals
  – Minerals are compounds that regulate many of the metabolic functions in the body. They may be classified as either macro-minerals or trace minerals.
Understanding Nutrient Requirements

• Sheep and goats require nutrients to support maintenance, growth, reproduction, and lactation. Nutritional requirements for maintenance reflect the amount of energy and other nutrients required to sustain an animal’s basic body functions.
• **Nutrient Requirements**
  
  – Nutrient requirements change with body weight and even greater changes occur with reproduction and lactation.
  
  – The *first step* in the process of determining nutrient needs of a specific set of animals should begin by obtaining nutrient information from a set of tables.

• **Nutrient Value of Feeds**
  
  – Balancing a ration requires the best estimate possible for the nutrient value of feeds to be fed.
Forage Quality & Goat Requirements

TDN

<table>
<thead>
<tr>
<th>TDN %</th>
<th>Pasture Veget.</th>
<th>Pasture Mature</th>
<th>Pasture Dead</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Weanling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Does in Early Lactation</td>
<td>Yearling</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Dry &amp; Early Pregnant Does</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Kidding on Tall Fescue Pasture Good
But Not Perfect
SIPAC Study
(Supplementations Study 2007)
(2005-2007)
Spring Pasture Kidding Programs
Supplemented and Non-Supplemented

• Objective was to find the lowest input level for a commercial goat herd kidding on KY-31 tall fescue E.

• Supplementation:
  – Significant to highly significant differences in 60 and 90 day weaning weights.
  – Increase in doe efficiency for number of kids weaned
  – Improved kid weaning weights as a percent of doe body weight.
  – Increased doe efficiency for weaning multiple births.
  – Increase in herd efficiency for numbers of kids weaned/doe exposed.
Feed Used in Study

- Hand-fed 1 time daily 14% Concentrate

<table>
<thead>
<tr>
<th>AS Fed %</th>
<th>Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>DDGS</td>
</tr>
<tr>
<td>16</td>
<td>Cracked Corn</td>
</tr>
<tr>
<td>65</td>
<td>SBH</td>
</tr>
<tr>
<td>4</td>
<td>Liq. Molasses</td>
</tr>
<tr>
<td>5</td>
<td>Mineral</td>
</tr>
<tr>
<td>.05</td>
<td>Ammonium Chloride</td>
</tr>
</tbody>
</table>
Energy Needs for Doe

Graph 1. Pounds of TDN Required/Day

Week of production cycle

1st Trimester Preg. Day (0–50)
2nd Trimester Preg. Day (50-100)
3rd Trimester Preg. Day (100-150)
Lactation Day (150-225)
Non-lactating Period Day (225-365)

Graph modified from Langston Univ. online certification short course.

University of Kentucky
Why Are We Seeing These Differences?

• Endophyte effect
• Dry Matter Intake may peak at 4% of body weight (DMI Summer and Fall 4%)
• Lack of nutrient density during the rapid spring growth period due to high moisture content
• Grazing a monoculture pasture, reduced pasture diversity
• Need for improved milk production
### Seasonal Nutrient Values of KY, 31-Tall Fescue

#### Seasonal Chemical Composition and Digestibility of Tall Fescue

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugars, %</td>
<td>(9.5)</td>
<td>8.5</td>
<td>19</td>
</tr>
<tr>
<td>Crude Protein, %</td>
<td>22</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>D.D.M, %</td>
<td>69</td>
<td>66</td>
<td>74</td>
</tr>
</tbody>
</table>

Digestible Dry Matter
University of Kentucky Ext. Pub. (AGR-59)
Lower Cost Supplements Common to Kentucky

- Protein Sources
  - Cottonseed* CP%, 24, TDN%, 95
  - Corn Gluten Feeds* CP%, 21-22, TDN%, 78
  - Distillers Dried Grains** CP%, 29-31, TDN%, 92
- * May be self fed
- **17% Bypass protein
- High in digestible fiber,
- 20-25% salt limits to 1.5-2 lbs
- Limit to 25-30% of concentrate ration
Lower Cost Supplements Common to Kentucky

• Energy sources
  – Corn* CP%, 10, TDN%, 90
  – Soybean Hulls CP%, 9-12, TDN%, 77
• *Limit corn to 20-25% of total ratio, 40% of the concentrate
• Blended feeds** CP%, 14-16, TDN%, 77 + mineral mix
• **Hand fed due to separation
Forage Are Most Important Component of the Diet

• Forages are the bases of ruminant nutrition
• Concentrates are used to make-up forage deficiencies
• **Concentrate feeding guide:**
  - Early gestation feed 0% LBW **(Doelings)**
  - Mid-gestation feed 1% LBW** (15% CP)
  - Late-gestation feed 1.5-2.0% LBW
  - Growing kids feed 2.0-2.5% LBW** (18% CP)
• All ways remember the 50:50 rule
• Test hay for nutrient value supplement accordingly
Supplementation Guidelines

• Define breeding season

• Match forage system with nutrient needs of animals

• Improve forage, (renovation increases diversity) and allow adequate alliance of forage

• Supplement during critical periods when forage is not adequate, 2nd Tri, 3rd Tri, Early Lact.

• Supplement at 1-2.0% of BW
**Feedstuffs Classification**

**Forages / Roughages**
- **Dry**
  - Low Protein (< 10% CP)
    - Crop residues
    - Poor quality hay
    - Mature grass
  - Higher Protein (> 10% CP)
    - Legume hay
    - Grass-legume hay
    - Immature grasses
  - Pasture
  - Silage
  - Haylage

**Concentrate**
- **Energy**
  - Corn
  - Oats
  - Molasses
  - Citrus pulp
  - Soybean hulls
- **Protein**
  - Soybean meal
  - Cottonseed meal
  - Whole cotton seed
  - Brewer’s dried grains
  - Distiller’s dried grains with solubles
  - Corn gluten feed
  - Fish meal
  - Feather meal
  - Blood meal
Effect of level of supplementation in late gestation on performance of meat goat does and kids Purdue Univ., UK, KSU

- Objective: to evaluate if productivity of Boer x Kiko does can be influenced by supplementation strategy in last 56 days of gestation
– Second trimester – grass hay
– 24 Boer x Kiko does (3-4 years of age)
– Ultrasound verification 2 feti
– Does were randomly allocated into 6 does per treatment group
– Does were fed fescue & alfalfa mix hay, 15% CP, 56.9% NDF – DM bases
– Hay was chopped and fed free choice in individual feeders (disappearance and refusals were recorded weekly)
– Supplement was 1 of 4 soybean hull treatments fed at 1 and 2 percent of initial average BW (105.6 lbs)
– Supplement level was (1.0 lb and 2.0 lbs)
Energy Needs for Doe

Graph 1. Pounds of TDN Required/Day

Graph modified from Langston Univ. online certification short course.
Treatments were soybean hulls fed at:

- **1=1% SBH for 28d + 2% SBH 28d**  (M,H)
- **2=0% SBH for 28d +2% SBH 28d**  (L,H)
- **3=2% SBH for 28d +2% SBH 28d**  (H,H)
- **4= 1% SBH for 28d +1% SBH 28d**  (M,M)

- Supplementation period was 56 days
- **Doe** body weights and body condition scores were taken at
  - 14 day intervals for the 56 day gestational period,
  - 24 hours after kidding,
  - 30, 60, 90 days during lactation
- **Kid** body weights were recorded at
  - birth, and 30,60,90 days
  - average daily gain was calculated
Results

Effect of level of supplementation in late gestation on performance of meat goat does and kids Purdue Univ., UK, KSU

• Trt: Supplement 1 of 4 soybean hulls/percent BW
  • 1=1% SBH for 28d + 2% SBH 28d
  • 2=0% SBH for 28d +2% SBH 28d
  • 3=2% SBH for 28d +2% SBH 28d
  • 4= 1% SBH for 28d +1% SBH 28d

• Results= Late gestation supplement level used in this trial did not affect growth and performance of meat goat does or kids. No effect on hay disappearance (3.0 lbs hay/day)
On-Line Goat Nutritional Calculator

**Goat Ration Balancing Nutrient Calculator Companion**

Terry K. Hutchens,  
Extension Goat Specialist

This ration balancing calculator was developed by Langston University, Langston Oklahoma, E (E)ka de la Garza American Institute for Goat Research in Small Ruminants. The developers of this program are Drs. Terry Gipson, Art Goetsch and Steve Hart.

**Step 1.** Connect to the internet and type in or click on the URL below.

www2.luneseed.edu/goats/index.htm

**Step 2.** At the Langston University Goat Research web page, look for Nutrient Calculator in the list on the left side of the page. Log on to the calculator. Choose the “Producer Version” of the calculator.

**Nutrient Calculator**

<table>
<thead>
<tr>
<th></th>
<th>Select the biotype of goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Click on one)</td>
</tr>
<tr>
<td></td>
<td>Boer goat and Boer crosses</td>
</tr>
<tr>
<td></td>
<td>Spanish or indigenous goat</td>
</tr>
<tr>
<td></td>
<td>Dairy Goat</td>
</tr>
<tr>
<td></td>
<td>Angora</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Select the class of goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Suckling goat</td>
</tr>
<tr>
<td></td>
<td>Growing goat or less than 1.5 yr. old</td>
</tr>
<tr>
<td></td>
<td>Mature goat including late pregnancy</td>
</tr>
<tr>
<td></td>
<td>Lactation meat or milk goat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Select gender of the goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>(Click if appropriate)</td>
</tr>
<tr>
<td></td>
<td>Doe</td>
</tr>
<tr>
<td></td>
<td>Buck</td>
</tr>
<tr>
<td></td>
<td>Wether</td>
</tr>
</tbody>
</table>

**Is goat over 90 days pregnant?**
On-Line Goat Nutritional Calculator

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Input body weight of the goat</td>
<td>Over estimate rather than under estimate</td>
</tr>
<tr>
<td>5</td>
<td>Select the pounds of weight that you expect the goat to gain in a month</td>
<td>Pregnant goat should gain 10-15 pounds in the last trimester not considering weight gain from pregnancy</td>
</tr>
<tr>
<td>6</td>
<td>Nutrient energy requirements must be adjusted for grazing, walking and browsing activity</td>
<td>Very Low Energy — Stable Feeding or minimum activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Energy — temperate or tropical rangeland conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium Energy — semiarid rangeland or slightly hilly pastures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Energy — Arid rangeland or sparse vegetation or mountainous pastures</td>
</tr>
<tr>
<td>7</td>
<td>Observe</td>
<td>TDN Level</td>
</tr>
<tr>
<td>8</td>
<td>Observe</td>
<td>CP Level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Nutrient Requirements of Goat Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Crude Protein</td>
</tr>
<tr>
<td>Buck</td>
<td>10</td>
</tr>
<tr>
<td>Dry Doe</td>
<td>9</td>
</tr>
<tr>
<td>Late Gestation</td>
<td>11</td>
</tr>
<tr>
<td>Lactating Doe</td>
<td>11</td>
</tr>
<tr>
<td>Weaned Kid</td>
<td>11</td>
</tr>
<tr>
<td>Yearling</td>
<td>12</td>
</tr>
</tbody>
</table>
Essential Minerals for Goats

• Macro-Minerals
  – Ca, P, Na, Cl, K, Mg, S

• Micro-Minerals
  – Co, Cu, I, Fe, Mn, Se, Zn
Minerals

• Forages can be good sources of:
  – Ca, P, Mg, K, Fe

• Forages are deficient in:
  – Na and most trace minerals

• Legumes are better sources of minerals than grasses
Minerals

- Goats are very sensitive to selenium deficiency (mineral supplementation and by injection at birth)

- Commonly deficient in copper although copper toxicity does occur

- True toxicity level for goats is unknown
MILK FEVER - HYPOCALCEMIA

• PREVENTION
  • Limit calcium intake from legumes or minerals 3 weeks prior to kidding
    ✓ Forces animal to start mechanism to mobilize body stores
  • Balance lactation ration
URINARY CALCULI

- Obstruction of urinary tract
  - Due to excessive grain in diet
  - Mainly in young males and show bucks
URINARY CALCULI

✓ Ca : P ration = 2 : 1 to 4 : 1

✓ Keep diet P < 0.35%
  ✓ don't feed too much high phosphorus feeds

✓ Urinary acidifiers
  ‣ 10 g ammonium chloride per head per day
  ‣ Ammonium chloride at 2% of concentrate ration
  ‣ Ammonium sulfate at .6% to .7% of the total ration
Illustration 12.
KY- Mountain Buck
Goat Mineral
Mineral Asteroid Co, New York,
NY 00842-8888

**GOAT MINERAL**
Free Choice Mineral for Goats

**GUARANTEED ANALYSIS**

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>17.00%</td>
<td>15.00%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>7.00%</td>
<td>7.00%</td>
</tr>
<tr>
<td>Salt</td>
<td>15.00%</td>
<td>12.00%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2.00%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Zinc</td>
<td>2500 ppm</td>
<td>2500 ppm</td>
</tr>
<tr>
<td>Manganese</td>
<td>2500 ppm</td>
<td>2500 ppm</td>
</tr>
<tr>
<td>Copper</td>
<td>700 ppm</td>
<td>700 ppm</td>
</tr>
<tr>
<td>Cobalt</td>
<td>20 ppm</td>
<td>20 ppm</td>
</tr>
<tr>
<td>Selenium</td>
<td>35 ppm</td>
<td>35 ppm</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Minimum IU/Lb</td>
<td>400,000</td>
</tr>
<tr>
<td>Vitamin D₃</td>
<td>Minimum IU/Lb</td>
<td>40,000</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Minimum IU/Lb</td>
<td>300</td>
</tr>
</tbody>
</table>

**INGREDIENTS**
Monocalcium phosphate, dicalcium phosphate, calcium carbonate, processed grain by-products, salt, magnesium oxide, zinc sulfate, manganese sulfate, copper sulfate, ethylenediamine dihydroiodide, cobalt carbonate, sodium selenite, vitamin A supplement, vitamin D₃ supplement, vitamin E supplement, molasses products, mineral oil, yeast culture.

Read Carefully the Guaranteed Analysis
Read Carefully the Ingredients, the source of the minerals in the supplement
Feeding Directions
<table>
<thead>
<tr>
<th>Element</th>
<th>Source compound</th>
<th>Element compound (%)</th>
<th>Bioavailability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Steamed bonemeal</td>
<td>29.0 (23—37)</td>
<td>High</td>
</tr>
<tr>
<td>Calcium</td>
<td>Defluorinated rock phosphate</td>
<td>29.2 (19.9—35.7)</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Calcium</td>
<td>Calcium carbonate</td>
<td>40.0</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Calcium</td>
<td>Soft phosphate</td>
<td>18.0</td>
<td>Low</td>
</tr>
<tr>
<td>Calcium</td>
<td>Ground limestone</td>
<td>38.5</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Calcium</td>
<td>Dolomitic limestone</td>
<td>22.3</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Calcium</td>
<td>Monocalcium phosphate</td>
<td>16.2</td>
<td>High</td>
</tr>
<tr>
<td>Calcium</td>
<td>Tricalcium phosphate</td>
<td>31.0—34.0</td>
<td>—</td>
</tr>
<tr>
<td>Calcium</td>
<td>Dicalcium phosphate</td>
<td>23.2</td>
<td>High</td>
</tr>
<tr>
<td>Calcium</td>
<td>Hay sources</td>
<td>23.3</td>
<td>Low</td>
</tr>
<tr>
<td>Iron</td>
<td>Iron oxide</td>
<td>46.0—60.0</td>
<td>Unavailable</td>
</tr>
<tr>
<td>Iron</td>
<td>Ferrous carbonate</td>
<td>36.0—42.0</td>
<td>Low&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Iron</td>
<td>Ferrous sulfate</td>
<td>20.0—30.0</td>
<td>High</td>
</tr>
</tbody>
</table>
FEEDING DIRECTIONS
For free choice feeding to goats. Place GOAT MINERAL in covered mineral feeders. Locate feeders near the animals' water supply and/or feeding area. Ensure that all animals can easily reach the feed trough. Fill feeders with a quantity of mineral that will be consumed in seven days. If mineral consumption is excessive (greater than 1.5 ounces/head/day) offer salt free choice in an adjacent compartment. Insure that all animals have access and can easily reach a source of clean, fresh water.

CAUTION: DO NOT FEED TO SHEEP DUE TO COPPER CONCENTRATION.

Note the contact information for the company and the total weight of the product.

Net Wt. 50 LBS. (22.67 kg) 400
QUESTIONS?

Eat More Goat