Sheep and Goat Nutrition
Why is Nutrition Important?

- Nutrition is the foundation of good production!
- Feed is the largest cost of production in SC.
- Poor nutrition and nutritional imbalances can cause many health problems.
- Livestock with poor nutrition are more susceptible to diseases.

Image Source
Sheep are ruminant animals, meaning they have a four-compartment stomach.
The Compartments Explained

Reticulum-Organ that catches and traps consumed foreign objects and prevents damage to the rest of the digestive tract. Plays a vital role in the rumination process, where feed is regurgitated and re-chewed.

Rumen-Low-quality forage is fermented by microbes and made into higher quality products better utilized by the animal.

Omasum-Main function is to filter and absorb nutrients leaving the rumen.

Abomasum-Known as the true stomach, which acts like the stomach of other monogastric animals. The digestion process is started and then continues into the small and large intestines.

Small Intestine-Three segments make this up: the duodenum, jejunum and the ileum.

Large Intestine-Furthers fermentation of products and absorption of nutrients. Any products making it past the large intestines are excreted.
Five Basic Nutrients

1. Water
2. Protein
3. Carbohydrates and fats (or energy)
4. Minerals
5. Vitamins

Image Source
Water

• The most essential and most limiting nutrient of every animal.
• Lean tissue consists of more than 70% water. Without water, the body cannot maintain itself. If an animal loses more than 20% of its body water, it will die.
• Clean, fresh water is required daily to keep the body functioning at optimum levels. Sheep/goats drink less water than other species, but require better quality water.

Image Source
## Water Requirements

<table>
<thead>
<tr>
<th>Class</th>
<th>Daily consumption gallons per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young lamb</td>
<td>0.1 to 0.3</td>
</tr>
<tr>
<td>Feeder lamb</td>
<td>1.0 to 1.5</td>
</tr>
<tr>
<td>Gestation</td>
<td>1.0 to 2.0</td>
</tr>
<tr>
<td>Lactation</td>
<td>2 to 3</td>
</tr>
<tr>
<td>Ram</td>
<td>1 to 2</td>
</tr>
</tbody>
</table>

1 gallon per 4 lbs. of DM consumed.  
1 quart of water for every pint of milk produced.

Chart Source: University of Maryland Extension
Protein

• The primary constituent of the animal body is protein.
• Dietary protein maintains protein in body tissues, provides for carriers of other nutrients, and is a major component of various products such as meat, milk and fiber.
• Protein requirements for lambs vary according to their size, age and maturity. Young, fast growing animals need rations that contain 16 to 18 percent protein to allow them to grow and develop their muscle potential.
• Lambs can be fed lower protein diets during the fattening stage and during the hotter summer months, because feeding high protein diets can cause heat stress.
• Older animals can be fattened on rations containing 11 to 12 percent protein.
Protein is Expressed in Different Ways

- CP—crude protein
- DP—digestible protein
- MP—metabolizable protein
- DIP—rumen degraded intake protein
- UIP—undegraded intake protein
Improper Feeding of Protein to Livestock

**Not enough protein**
- Impaired reproduction
- Reduced growth rates
- Reduced hoof and horn growth
- Reduced milk production
- Decreased fiber production
- Reduced resistance to disease—especially parasites
- Reduced rumen function
- Reduced nutrition absorption

**Too much protein**
- Expensive and inefficient source of energy
- Risk of pizzle rot in males
- Can cause metabolic harm
  - Reduces performance as energy is required for removal
Carbohydrates and Fats

- The most common limiting nutrients in lamb rations are energy-producing carbohydrates and fats.
- Inadequate energy intake will reduce growth and cause weight loss. An adequate supply of energy is necessary for efficient nutrient utilization.

Image Source
Energy

• Most feed stuffs will provide energy. Energy comes mainly from carbohydrates but will also be found in fats and protein.
• Best sources of energy are fat, oils, and grains.
• Excess energy is stored as fat.
• TDN (total digestible nutrients) is most used to balance small ruminant rations.
Minerals

Mineral supplementation is a common practice in all livestock. Many commercial feeds are formulated to meet vitamin and mineral requirements. When supplementing, be sure to use correct amounts. Sheep are highly sensitive to copper and can only have trace amounts. Goats require some copper in their diets.

Important minerals in lamb rations are salt (sodium & chlorine), calcium and phosphorus. Calcium and phosphorus are necessary for proper growth and development.
Minerals (Two Kinds)

**Macro**
- Sodium (Na)
- Chloride (Cl)
- Calcium (Ca)
- Phosphorus (P)
- Magnesium (Mg)
- Potassium (K)
- Sulfur (S)

**Micro or Trace**
- Cobalt (Co)
- Copper (Cu)
- Fluoride (Fl)
- Iodine (I)
- Iron (Fe)
- Manganese (Mn)
- Molybdenum (Mo)
- Selenium (Se)*
- Zinc (Z)

Salt
Salt (Sodium Chloride-NaCl)

- Salt is required in higher amounts than other minerals, but requirements will vary.
- Salt deprivation may cause livestock to eat things they normally wouldn’t.
- Salt can be used as a carrier for other nutrients.
Vitamins

Vitamins are necessary for normal growth, reproduction, and overall health. Sheep and goats require A, D, and E. Vitamins K and all of the B vitamins are manufactured in the rumen.
Important Nutrition Interactions

• **Calcium and Phosphorus**
  • Ratio should never go below 1:1, however 2:1 is ideal for most rations to prevent urinary calculi

• **Cobalt and vitamin B12**

• **Copper, molybdenum and sulfur**
  • Molybdenum forms insoluble complex with copper
  • Sulfur binds with molybdenum

• **Nitrogen and Sulfur**
  • 10:1 to 12:1 ratio is ideal

• **Energy and Protein**
  • Excess protein reduces nutrient absorption and causes intestinal imbalances
Forages

Lambs are ruminant animals, therefore it is crucial that we maintain rumen health and function. A good rule of thumb is to feed at a minimum, each lamb about 1/4 lb. (~softball size) of a good quality grass/alfalfa hay per day. It is important to feed hay with a minimum 1.5-2 inches of fiber length so that there is enough effective NDF (neutral detergent fiber). If you notice wool chewing or wool pulling in lambs, that is a sign that the forage you are using is lacking insufficient efficient NDF.
# Suggested Energy & Protein Feeds

## ENERGY FEEDS

<table>
<thead>
<tr>
<th>Feedstuff</th>
<th>Percent TDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole cottonseed</td>
<td>91</td>
</tr>
<tr>
<td>Wheat middlings</td>
<td>90</td>
</tr>
<tr>
<td>Corn grain</td>
<td>89</td>
</tr>
<tr>
<td>Wheat grain</td>
<td>89</td>
</tr>
<tr>
<td>Milo (grain sorghum)</td>
<td>89</td>
</tr>
<tr>
<td>Barley grain</td>
<td>84</td>
</tr>
<tr>
<td>Corn gluten feed</td>
<td>83</td>
</tr>
<tr>
<td>Ear corn</td>
<td>82</td>
</tr>
<tr>
<td>Rye grain</td>
<td>81</td>
</tr>
<tr>
<td>Soybean hulls</td>
<td>77</td>
</tr>
<tr>
<td>Molasses</td>
<td>75</td>
</tr>
<tr>
<td>Beet pulp pellets</td>
<td>74</td>
</tr>
<tr>
<td>Oat grain</td>
<td>74</td>
</tr>
</tbody>
</table>

## PROTEIN FEEDS

<table>
<thead>
<tr>
<th>Feedstuff</th>
<th>Percent CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>281*</td>
</tr>
<tr>
<td>Fish meal</td>
<td>62</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>48</td>
</tr>
<tr>
<td>Whole soybeans</td>
<td>42</td>
</tr>
<tr>
<td>Cottonseed meal</td>
<td>41</td>
</tr>
<tr>
<td>Linseed meal</td>
<td>34</td>
</tr>
<tr>
<td>Commercial protein supplement</td>
<td>36-40</td>
</tr>
<tr>
<td>Corn gluten feed</td>
<td>26</td>
</tr>
<tr>
<td>Poultry litter</td>
<td>26</td>
</tr>
<tr>
<td>Distiller’s grains</td>
<td>25</td>
</tr>
<tr>
<td>Brewer’s grains</td>
<td>24</td>
</tr>
<tr>
<td>Whole cottonseed</td>
<td>21</td>
</tr>
<tr>
<td>Alfalfa pellets</td>
<td>17</td>
</tr>
<tr>
<td>Lick tubs</td>
<td>16-24</td>
</tr>
</tbody>
</table>
Dry Matter

- Dry matter is what remains after water has been extracted out of a feed.
- Feed stuffs vary in the amount of dry matter they contain.
- Dry matter indicates nutrient amounts in feeds.
- For sheep and goats, dry matter intake (DMI) varies from ~1.5 – 6 % and is affected by a variety of factors.

<table>
<thead>
<tr>
<th>Feedstuff</th>
<th>% DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hay</td>
<td>88 – 90</td>
</tr>
<tr>
<td>Grain</td>
<td>88 – 90</td>
</tr>
<tr>
<td>Fresh grass</td>
<td>24 – 29</td>
</tr>
<tr>
<td>Fresh clover</td>
<td>19 – 24</td>
</tr>
<tr>
<td>Corn silage</td>
<td>34 – 44</td>
</tr>
<tr>
<td>Grass silage</td>
<td>30 – 40</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>10</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>91</td>
</tr>
<tr>
<td>Straw</td>
<td>90 – 91</td>
</tr>
</tbody>
</table>

Chart Source: University of Maryland Extension
## Signs of Health

**Healthy**
- Chewing cud
- Stretching
- Grooming
- Eating and drinking as normal

**Unhealthy**
- Not eating
- Drooping ears
- Labored breathing
- Snotty nose
- Irregular temperature
Results of Improper Feeding

Not enough energy in diet
• Increases protein requirements (%) of ration
• Reduced growth rates
• Higher critical temperature
• Increases risk of disease
• Risk of pregnancy toxemia (ketosis)
• Reduces fertility and milk production

Too much energy in diet
• Over-conditioned animals have impaired reproduction
• Overweight females are more likely to get pregnancy toxemia and dystocia.
• Wasteful economically
• Excess finish is undesirable to majority of consumers
What Else Can Affect Nutritional Requirements?

**Heat and cold extremes**
Nutrient requirements are based on thermoneutral zone. Critical temperatures vary by coat condition, body condition, and weather.

**Activity**
Nutrient requirements are based on activity levels.

**Adjustment in feed intake**
Animals eat more in cold weather and less in hot weather.
Body Condition Scoring
What is body condition scoring?

- Great way to evaluate nutritional status
- Body condition, or fat cover is an indication of the energy reserves in an animal

Image Source
Body Conditioning Scoring for Goats

Body condition scoring for goats using a range from 1.0 – 5.0, with 0.5 increments
Healthy goats should have a body condition scoring between 2.5 – 4.0
Body Condition Score (BCS) Ratings in Goats

BCS 1.0 = The goat is visually emaciated and weak. The backbone is highly visible and forms a continuous ridge. The flank is hollow and ribs are clearly visible. There is no fat cover and fingers can easily penetrate into the intercostal spaces.

BCS 2.0 = The goat’s backbone is still visible with a continuous ridge. Some ribs can be seen and there is a small amount of fat cover. Ribs are still felt and intercostal spaces are smooth, but can still be penetrated.

BCS 3.0 = The backbone is not prominent, ribs are barely discernible and an even layer of fat covers the ribs. Intercostal spaces are felt using pressure.

BCS 4.0 = The backbone and ribs cannot be seen. The side of the animal is sleek in appearance.

BCS 5.0 = The backbone is buried in fat and the ribs are not visible. The rib cage is covered with excessive fat. (Michigan State Extension)
Body Condition Score (BCS) Ratings in Sheep

BCS 1.0 = Spinous processes are sharp and prominent. Loin eye muscle is shallow with no fat cover. Transverse processes are sharp; one can pass fingers under ends. It is possible to feel between each process.

BCS 2.0 = Spinous processes are sharp and prominent. Loin eye muscle has little fat cover but is full. Transverse processes are smooth and slightly rounded. It is possible to pass fingers under the ends of the transverse processes with a little pressure.

BCS 3.0 = Spinous processes are smooth and rounded and one can feel individual processes only with pressure. Transverse processes are smooth and well covered, and firm pressure is needed to feel over the ends. Loin eye muscle is full with some fat cover.

BCS 4.0 = Spinous processes can be detected only with pressure as a hard line. Transverse processes cannot be felt. Loin eye muscle is full with a thick fat cover.

BCS 5.0 = Spinous processes cannot be detected. There is a depression between fat where spine would normally be felt. Transverse processes cannot be detected. Loin eye muscle is very full with a very thick fat cover. (Oregon State Extension)
Assessing BCS

Figure 1.—Feel for the spine in the center of the sheep’s back, behind its last rib and in front of its hip bone.

Figure 2.—Feel for the tips of the transverse processes.

Figure 3.—Feel for fullness of muscle and fat cover.

Image Source
Sources & Additional Resources

General Sheep Nutrition
https://www.sheepandgoat.com/presentations

Market Lamb Project Reference Guide
https://extension.psu.edu/programs/4-h/members/projects-resources/animal-sciences/sheep/4HMarketProjLamb.pdf/view

Body Condition Scoring of Sheep
https://smallfarms.oregonstate.edu/sites/agscid7/files/ec1433.pdf
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