



Fundamentals of goat nutrition

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Introduction

We thought a practical explanation of the basics of meat goat nutrition could be useful for producers to make informed decisions about economical feeding practices and make more astute feedstuff purchases. This information should enable you to reduce—perhaps even avoid—costly errors in feeding and management of your goats.



Photo courtesy of [Montero/Clinger Goat Farms](#)

Required nutrients for production

All goats require the same nutrients: protein, fat, carbohydrates (sugars and starches), fiber (cellulose and hemicellulose) minerals, vitamins, and water. The proportions of these dietary requirements needed vary with the stages of goat life (growth, gestation, lactation, maintenance, dry period).

Digestion and utilization of nutrients

All goat diets, regardless of their composition of feedstuffs, go through the same digestion processes. Every feedstuff or diet contains

a given quantity of energy expressed in kilocalories (1,000 calories). Dietary energy is a composite figure reflecting the amounts of dietary protein, fat, carbohydrate, and fiber in feeds eaten, with exception to dietary minerals and vitamins, which do not furnish energy.

Accordingly, goats ingest a number of kilocalories per day which nutritionists call gross energy (GE) intake. Portions of this gross energy are lost to the goats in their feces, and the remaining energy is called digestible energy (DE). Additional energy is lost in the urine and fermentation gases (belching and farting) and the remaining energy is called metabolizable energy (ME). A portion of this ME is lost due to a process called heat increment, which accounts for digestion and bodily maintenance needs (maintaining body temperature, routine movement, and work performed). The remaining energy is called the Net Energy Value (NEV).

This net energy is used by the animal for productive purposes such as growth, gestation, and lactation. Excessive exercise, work or extreme environmental temperatures can reduce the net energy available to the goat.

While there are calculated NEV for many individual feedstuffs, producers commonly use the simpler terms, crude protein (CP) and total digestible nutrients (TDN), to compare feedstuffs and to furnish dietary needs of the various classes of goats. When you get a laboratory analyses of a feedstuff, there will be two sets of figures for %CP and %TDN. One column will report results on a 'dry matter basis' and the other will use 'as-fed basis'. The as-fed values for CP and TDN will be 10-12% lower than those for dry matter values because the water content (10-12% moisture in feedstuffs) 'dilutes' the dry-matter basis values. I use the 'as fed' values because that is how you buy feedstuff, and that is how your goats consume it.

Total mixed ration

Nutritionists use the phrase "total mixed ration" (TMR) to describe the combinations of feedstuffs needed for a goat at a given stage. More specifically, TMR describes the practice of mixing all feed ingredients into a single homogenous blend for ad lib feeding once or twice daily.

Most commercial goat enterprises use forages fed separately from the supplemental grain mixtures. An exception is found in the use of commercial TMR blends for feeding show kids. Such blends are formulated to meet dietary needs of the kids with one mixture.

Green forages and hays generate higher heat increment than grains and concentrates and thus have lower net energy. The high heat increment is useful in cold weather but detrimental in hot weather because the animal has to expend energy to dissipate excessive body heat.

Using concentrates to supplement forages and understanding feed tag information

Producers can buy concentrates composed of individual feedstuffs to use as supplements to their forages. These individual feedstuffs vary in their CP, TDN, and fiber contents and the quantities of each feedstuff are chosen to achieve a final %CP in the concentrate. Typically, the %TDN in these concentrates falls within an acceptable range.

The selling price of concentrates can vary considerably. It reflects the continuous price fluctuation of individual feedstuffs plus the costs of milling, mixing, bagging, merchandizing, and markups. The array of feedstuffs, minerals, vitamins, and additives used in each batch of concentrate may vary widely over time even though the values for protein, fat, fiber, etc. guaranteed by the feed

tag will remain unchanged. Only custom-ordered concentrate formulations will contain the same amounts of the same feedstuffs.

The feed tag must have a product name, list the name and location of the manufacturer and provide a Guaranteed Analysis. The Guaranteed Analysis must show the percentages of: Crude Protein minimum (including the amount of non-protein nitrogen—typically urea), Crude Fat minimum, Crude Fiber maximum, Calcium minimum and maximum, % Phosphorus minimum, Salt minimum and maximum, and the quantities of various minerals (parts per million per lb) and vitamins (International Units per lb).



Photo courtesy of [North American Savannah Association](#)

To find the amount of non-protein nitrogen (NPN) in a concentrate, multiply the tag figure by 2.62. This is the amount of equivalent protein in the concentrate; the remaining protein guaranteed is from natural sources.

For example, a concentrate tagged as 16% CP and 0.73% NPN would = 1.9% equivalent protein (0.73% X 2.62). The other ingredients would provide 14.1% natural protein (16% CP minus the 1.9% of equivalent protein). Feed companies use NPN to lower the cost of the protein component. At the levels typically used (1-2 %), there are no adverse effects on dairy or meat goat productivity or health based on research findings.

Tags must also provide a list of ingredients used in the formulation. This listing is not required to identify individual feedstuffs by name, but instead uses generic group nomenclature. For example,

- Processed Grain By-Products may contain brans, shorts, meals, etc.

- Grain Products may be corn, hominy feed, oats, barley, wheat, rye, etc.
- Plant Protein Products can be soybean meal and/or cottonseed meal, distillers grains, corn gluten meal, etc.
- Roughage Products alfalfa meal, ground hays or straws, hulls, etc.; all are high in fiber

The tag must also identify the name and quantity of any antibiotic present and note any usage restrictions.

Feed tag structure, content, and nomenclature are consistent across time and place because they are under control of the National Association of Feed Control Officials. Each State has a Feed Control Agency domiciled in either the state Land Grant University or the State Department of Agriculture). Their employees inspect feed stores, take random samples of various products and their tags for lab analysis, and they take action, including stop-sale orders, when samples differ appreciably from tag guarantees.



Practical application

In nutritional physiology, there is the principle of 'least limiting nutrient'. In practical terms, this means that if a given nutrient (e.g., protein or TDN or a mineral or vitamin) is insufficient for optimum growth, gestation or lactation, the animal will only produce at the level sustained by the deficient nutrient.

For example, if the diet offered only has enough protein for a daily gain of .2 lb by a growing kid, that level would be realized even if the other dietary components would support a daily gain of .4 lb. Clearly, limiting quantity of a given necessary nutrient will result in loss of performance and of feed monies.

However, overfeeding a dietary component such as protein will not increase production either and could result in a loss of money spent for feed. A goat can only metabolize and utilize so much.



About the author

Dr. Frank Pinkerton is one of the industry's most highly regarded writers and speakers on meat goat nutrition, marketing and management. His book, A Compilation of the Wit and Wisdom of the "The Goat Man" is available at the Goat Rancher Store. He can be reached by phone at 512.392.4123 or email, akathegoatman@icloud.com.