Nutritional Feeding Management of Meat Goats

NC STATE EXTENSION

Meat Goat Notes

Introduction

Feeding may be the highest expense of any meat goat operation. Goats raised for meat need high quality feed in most situations and require an optimum balance of many different nutrients to achieve maximum profit potential. Because of their unique physiology, meat goats do not fatten like cattle or sheep, and rates of weight gain are smaller, ranging from 0.1 to 0.8 lb/day. Therefore, profitable meat goat production can only be achieved by optimizing the use of high quality forage and browse and the strategic use of expensive concentrate feeds. This can be achieved by developing a year round forage program allowing for as much grazing as possible throughout the year.

Many people still believe that goats eat and do well on low quality feed. Attempting to manage and feed goats with such a belief will not lead to successful meat goat production.

Feeding Requirements

The goat is not able to digest the cell walls of plants as well as the cow because feed stays in its rumen for a shorter time period. A distinction as to what is meant by "poor quality roughage" is necessary in order to make decisions concerning which animal can best utilize a particular forage. Trees and shrubs, which often represent poor quality roughage sources for cattle, because of their highly lignified stems and bitter taste, may be adequate to high in quality for goats. This is so because goats avoid eating the stems, don't mind the taste, have the ability to detoxify tannins, and benefit from the relatively high levels of protein and cell solubles found in the leaves of these plants. On the other hand, straw, which is of poor quality due to high cell wall and low protein, can be used by cattle but will not provide even maintenance needs for goats because goats don’t utilize the cell wall as efficiently as cattle.

In addition, goats must consume a higher quality diet than cattle because their digestive tract size is smaller with regard to their maintenance energy needs. Relative to their body weight, the amount of feed needed by meat goats is approximately twice that of cattle. When the density of high quality forage is low and the stocking rate is low, goats will still perform well because their grazing/browsing behavior allow them to select only the highest quality forage from that on offer. Thus, they are able to perform well in these situations, even though their nutrient requirements exceed those of most domesticated ruminant species.

Nutrient Requirements

Meat goats require nutrients for body maintenance, growth, reproduction, pregnancy, and production of products such as meat, milk and hair. The groups of nutrients that are essential in goat nutrition are water, energy, protein, minerals and vitamins. The nutrient requirements of bucks, young goats and does with a high production potential and at various stages of development and production are shown in Table 1. Goats should be grouped according to their nutritional needs to more effectively match feed quality and supply to animal need. Weanlings goats, does during the last month of gestation, high lactating does and yearlings should be grouped and fed separately from dry does, bucks, etc. which have lower nutritional needs.

When pasture is available, animals having the highest nutritional requirements should have access to lush, leafy forage or high quality browse. In a barn feeding situation such as during the winter months, these same animals should be offered the highest quality hay available. Whether grazed or barn fed, goats should be supplemented with a concentrate feed when either the forage that they are grazing or the hay that they are fed do not contain the necessary nutrients to cover their nutritional requirements. Total digestible nutrients (TDN) and protein requirements are shown in Table 2. Comparing the nutrient requirements to the chemical composition of feeds shown in Table 1 should give producers an idea of how to match needs with appropriate forages. To give producers an idea where these requirements fall, low quality forages contain 40-55% TDN, good quality forages contain from 55 to 70% TDN, and concentrate feeds contain from 70 to 90% TDN.

Table 1. Estimated Nutrient Composition of Various Feeds.[1]

Plant Type	TDN, %	Crude Protein, %
Whole cottonseed	88	22
Corn	86	9
Soybean meal (48%)	82	44
Soybean hulls, ground	75	14
Wheat middlings	80	19
Pasture, vegetative	60-76	12-24
Pasture, mature	50-60	8-10
Pasture, dead leaves	35-45	5-7
Fescue hay, 6 weeks growth	58-62	8-11
Fescue hay, 9 weeks growth	48-53	7-9
Bermuda hay, 7 weeks growth	54-58	9-11
Bermuda hay, 12 weeks growth	47-50	7-9
Alfalfa hay	50-63	13-20
Honeysuckle, leaves + buds	70+	16+
Honeysuckle, mature	68+	10+
Sumac, early vegetative	77	14
Oak, buds and young leaves	64	18
Persimmon leaves	54	12
Hackberry, mature	40	14
Kudzu, early hay	55	14
Juniper (leaves)	64	6

Plant Type	TDN, %	Crude Protein, %
Acorns, fresh	47	5
Curled dock	74	13
Chicory	65	15
Mimosa (leaves)	72	21
Mulberry (leaves)	72	17
[1] Nutrient Requirements of Goats in Temperate and Tropical Countries. 1981. National Research Council.		

Table 2. Daily Nutrient Requirements for Meat Producing Goats. [1, 2]

	Young Goats[3]		Does (110 lb)				Bucks (80-120 lb)
Nutrient	Weanling (30 lb)	Yearling (60 lb)	Pregnant (Early)	Pregnant (Late)	Lactating (Avg Milk)	Lactating (High Milk)	
Dry matter, lb	2.0	3.0	4.5	4.5	4.5	5.0	5.0
TDN, %	68	65	55	60	60	65	60
Protein, %	14	12	10	11	11	14	11

	Young Goats[3]		Does (110 lb)				Bucks (80-120 lb)
Calcium, %	.6	.4	.4	.4	.4	.6	.4
Phosphorus, %	.3	.2	.2	.2	.2	.3	.2

[1] Nutrient Requirements of Goats in Temperate and Tropical Countries. 1981. National Research Council.
[2] Pinkerton, F. 1989. Feeding Programs for Angora Goats. Bulletin 605. Langston University.
[3] Expected weight gain > .44 lb / day.

Water

Water is the cheapest feed ingredient. However, production, growth and the general performance of the animal will be affected if insufficient water is available. Water needs vary with the stage of production, being highest for early lactating does, and during times when the weather is warm and forages are dry. In some instances, when consuming lush and leafy forages, or when grazing forages soaked with rain water or a heavy dew, goats can get all the water they need out of the feed. However, water is almost always needed by some members of the herd such as lactating does. Because it is difficult to predict water needs, goats should always have access to sufficient high quality water. Clear, flowing water from a stream is preferable to stagnant water; the latter may contain excessive levels of blue-green algae, which may be toxic. Nitrate in drinking water should also be of concern because it is becoming the predominant water problem for livestock. Safe levels in drinking water are as follows (in parts per million): less than 100 for nitrate nitrogen, or less than 443 for nitrate ion, or less than 607 for sodium nitrate.

Energy

Energy comes primarily from carbohydrates (sugars, starch and fiber) and fats in the diet. Lush leafy forage and browse, and tree leaves contain sufficient energy to cover the nutrient requirements of every goat on the farm (Tables 1 & 2). Feed grains that are high in energy are whole cottonseed, corn, wheat middlings, soybean hulls, soybean meal and corn gluten feed. Bacteria that are present in the rumen of goats ferment sugars, starches, fats and fibrous carbohydrates into volatile fatty acids. These acids are absorbed and used for energy. Fat is efficiently used for energy, but the amount that can be included in the diet is limited. Usually added fat should not represent more than 5% of a diet because it depresses ruminal fermentation. For example, if whole cottonseed (25% fat)

is used as a supplement, it should not be more than 20% of the diet. Whole cottonseed also contains a good level of protein and phosphorous, and fed at 0.5 to 1.0 lb per day makes an excellent supplement to low quality forage. If the diet consumed by goats contains an excess of energy, that extra energy can be stored in the body as fat, mainly around certain internal organs.

Protein

Protein is usually the most expensive component of the goat diet. As for energy, lush leafy forage and browse, and tree leaves contain sufficient protein to cover the nutrient requirements of every goat on the farm (Tables 1 & 2). Feed grains that are high in protein are whole cottonseed, soybean meal, wheat middlings and corn gluten feed. Protein is required both as a source of nitrogen for the ruminal bacteria and to supply amino acids for protein synthesis in the animal's body. When the level of protein is low in the diet, digestion of carbohydrates in the rumen will slow and intake of feed will decrease. Inadequate levels of protein in the diet can negatively affect growth rate, milk production, reproduction and disease resistance because insufficient amino acids are getting to the intestines to be absorbed by the body. Unlike energy, excess of protein is not stored in the body of the goat; it is excreted in the urine as urea. Therefore, it is important for animals to have access to enough protein to cover their nutritional requirements. Protein nutritional requirements vary with developmental and physiological stages and level of production (Table 1).

Minerals

Goats require many minerals for basic body function and optimum production. Providing free choice a complete goat mineral or a 50:50 mix of trace mineralized salt and dicalcium phosphate is advisable under most situations. Major minerals likely to be deficient in the diet are salt (sodium chloride), calcium, phosphorous and magnesium. Trace minerals likely to be low in the diet are selenium copper, and zinc.

Most forages are relatively high in calcium (grass: less than 0.5%; legumes: more than 1.2%), so calcium is low only if high grain diets are fed, which would be unusual for goats. Low quality, mature or weathered forages will be deficient in phosphorous, especially for high and average lactating does. For example, bermudagrass hay harvested at 7 to 8 weeks regrowth only contains 0.18% phosphorous. The ratio of calcium to phosphorous in the diet is important and should be kept about 2:1 to 3:1 (Table 2).

Grass tetany can occur when goats in early lactation are grazing lush, leafy small grain, annual ryegrass or grass/legume pastures. Under those conditions, it is advisable to provide a mineral mix that contains 5 to 10% magnesium.

Selenium is marginal to deficient in all areas of North Carolina and most of the Southeast, and many commercial trace mineralized salts do not contain it. Trace mineralized salts that include selenium should be provided to the goat herd at all times.

Goats are clearly more tolerant to copper toxicity than sheep. Nevertheless, young, nursing kids are generally more sensitive to copper toxicity than mature goats, and cattle milk replacers should not be fed to nursing kids. In addition, the maximum tolerable copper level for goat has not been established. Until further research, The National Research Council recommends a cautious

approach and to use the cattle level of 40 mg copper per kg dry matter ingested (18 mg/lb) in usual management. Goat mineral mixes available commercially may contain between 1000 to 1800 mg copper per kg of mineral mix (454 to 816 mg copper per lb of mineral mix). Adult goats consuming daily 15 to 20 grams (approximately 0.5 to 0.7 ounces) of a mineral mix containing 1800 mg copper per kilogram of mineral mix would consume 27 to 36 mg copper, below the suggested level of 40 mg indicated above).

Low quality forages may contain concentrations of zinc that are thought to be below recommended levels for ruminants. However, little is known regarding factors that affect zinc availability in forages.

Vitamins

Vitamins are needed by the body in very small quantities. The vitamins most likely to be deficient in the diet are A and D. All B and K vitamins are formed by bacteria found in the rumen of the goat and are not considered dietetically essential. Vitamin C is synthesized in the body tissues in adequate quantities to meet needs.

Vitamin A is not contained in forages, but carotene found in green, leafy forages is converted into vitamin A in the body. In addition, vitamin A is stored in the liver and fat of goats during times when intake exceeds requirements. Goats consuming weathered forages or forages that have undergone long-term storage should be fed a mineral mix containing vitamin A, or should receive vitamin A injections.

Vitamin D may become deficient in animals raised in confinement barns, especially during the wintertime. Animals should have frequent access to sunlight because it causes vitamin D to be synthesized under their skin, or they should receive supplemental vitamin D. Good quality sun-cured hays are excellent sources of vitamin D. A deficiency in vitamin D results in poor calcium absorption, leading to rickets, a condition where the bones and joints of young animals grow abnormally.

Factors Influencing Animals Requirements

A mature dry doe or a mature wether or buck are examples of animals having maintenance requirements only. Additional requirements above those needed for body maintenance are required for growth, pregnancy, lactation and hair production. As the productivity of meat goats is increased through selection and crossbreeding with goats having a higher production potential, such as the Boer goat, nutritional requirements will also increase. Therefore, the more productive goats should be fed high quality feed, especially weaned kids being prepared for market, young replacement doelings and does in late gestation and early lactation. Does nursing twins or triplets have greater nutritional requirements than does nursing a single kid.

Goats grazing very hilly pastures will have higher nutritional requirements than goats on level pastures of the same quality because they will expand more energy to gather feed.

In some situations where brush control in rough areas is the primary purpose of keeping goats, less productive animals or maintenance animals can forced to consume lower quality feed. If their body condition deteriorates, these animals can then be grazed on better quality pastures or brushy areas. Once desirable body condition is achieved, the same animals can again be grazed to control brush.

Nutritional Management Meat Goats

Nutrition of Newborn Kids

Colostrum is the first milk produced after birth. Colostrum contains a high content of immunoglobulins (antibodies), vitamin A, minerals, fat and other sources of energy. Antibodies are proteins which help the goat kid fight diseases. The ability of kids to resist diseases is greatly affected by the timing of colostrum intake and the quantity and quality of the colostrum fed. Reports from cattle indicate that if left alone, 25% of the young do not nurse within 8 hours and 10 to 25% do not get sufficient amounts of colostrum. Colostrum should be ingested or bottle-fed (in case of weak kids) as soon as kids have a suckling reflex. In cases of extremely weak kids, they should be tube-fed. The producer must be certain that all newborn kids get colostrum soon after birth (within the first hour after birth, and certainly within the first 6 hours) because the percentage of antibodies found in colostrum decreases rapidly after birth. It is crucial that the antibodies in colostrum be consumed before the kids suck on dirty, pathogen-loaded parts of its mother or stall. In addition, the ability of the newborn kid to absorb antibodies also decreases rapidly 24 hours after birth. Newborn kids should ingest 10% of their body weight in colostrum during the first 12 to 24 hours of life for optimum immunity. A goat kid weighing 5 lb at birth should ingest ½ lb of colostrum (approximately ½ pint) during the first 12 to 24 hours of life. The extra colostrum produced by high lactating does during the first 24 hours following kidding can be frozen for later use when needed. Only first milking from healthy animals should be frozen for later feeding, and the colostrum from older animals that have been on the premises for several years is typically higher in antibody content against endemic pathogens than is colostrum from first fresheners. Revaccination against enterotoxemia (over-eating disease) and tetanus 2 to 4 weeks before the kidding date is commonly used to improve the protective value of the colostrum against these conditions. Ice cube trays are ideal containers: once frozen, cubed colostrum can be stored in larger containers and the trays used for another batch. Ice cubes are the perfect size for newborn kids, thus thawed colostrum is always fresh, and wastage reduced to a minimum. It is recommended to thaw colostrum either at room temperature or at a fairly low temperature. Colostrum should never be cooked during the thawing process.

Nutritional Management of Replacement Does

Doe kids needed for replacement should be grazed with their mothers during as much of the milking period as possible and not weaned early. Following weaning, doe kids should be separated from the main herd and have access to high quality forage and receive good nutrition through first kidding at 1-2 years of age, depending on the nutritional plane. Leaving doe kids with the main herd will result in undernourished doelings that are bred too young and too small; these animals will never reach their production potential. A yearly supply of replacement does that are healthy, of good size, and free of internal and external parasites, is essential to the success of any meat goat enterprise.

Pregnancy Disease (Ketosis)

During late pregnancy, nutritional requirements are as high as they are during lactation, especially if the pregnant doe is carrying more than one fetus. Not only are extra nutrients needed by the developing fetuses, but they also crowd the abdominal cavity and reduce ruminal volume. As a result, adequate amounts of feed cannot be consumed. Because of this, does fed a poor quality diet (especially if they are fat) can develop ketosis and die due to inadequate energy intake. Grain and protein meal and to a lesser extent whole cottonseed are the preferred feeds to overcome this problem.

Inadequate nutrition during late pregnancy will also result in small, weak kids at birth, and high early death losses, especially with twin or triplets. When forage or browse is low in quality, (40 to 55% TDN; 10% protein or less), does in late pregnancy and early lactation should be provided with about 1 lb/day of a 16% protein concentrate.

Urinary Calculi (Urinary Stones)

In goats, clinical obstruction of the urinary tract is most frequently seen in young, castrated males and the calculi are usually comprised of calcium phosphate salts. Castrated goats kept as pets and overfed bucks are at high risk for developing the condition due primarily to the feeding of excessive grain in the diet. If the diet contains too much phosphorous relative to calcium, supplemental calcium from feed grade limestone is one way to maintain the calcium:phosphorous ratio between 2:1 to 4:1.

Body Condition

The term body condition refers to the fleshiness of an animal. Producers should be concerned with the body condition of their animals. Does should not be allowed to become too thin or too fat (Refer to ANS00-605MG, *Monitoring the Body Condition of Meat Goats: A Key to Successful Management*). Reproductive failure can result if does are under or over conditioned at the time of breeding. Clinical symptoms of over or under conditioned does may include: low twinning and low weaning rates, pregnancy toxemia and dystocia.

Simply looking at an animal to determine its body condition and assigning it a body condition score (BCS) can easily be misleading. Rather, animals should be touched and evaluated in a chute. The easiest area to feel and touch to determine the body condition of an animal are the rib areas, on either side of the spine, by running a hand over those areas and pressing down with a few fingers. In doing so, one is able to determine the amount of fat covering the ribs. Other areas to monitor are the shoulders, the tail heads, the pins, the hooks, the edge of the loins and the backbone. Producers should develop an eye and a touch for the condition of their animals and strive to maintain a moderate amount of condition on their goats. If you can easily see the backbone and ribs, the goats are most probably undernourished. When body condition starts to decrease, it is a sign that feed supply or quality is limiting. Waiting until goats become thin to start improving their feeding regime may lead to large production losses (Refer to ANS00-605MG, *Monitoring the Body Condition of Meat Goats: A Key to Successful Management*).

One should also be concerned with the body condition of the breeding bucks. Bucks will have reduced fertility if they are too thin (BCS = 4 or lower) at the start of the breeding season. On the other hand, if bucks are overfed and become too fat (BCS = 7 or higher), they may have no desire to breed does.

Flushing

Flushing means increasing the level of feed offered to breeding does, mostly energy, starting about one month prior to breeding, to increase body weight, ovulation rate and litter size. Increasing the level of energy offered to does should continue throughout the breeding season and for approximately 30 to 40 days after removing the bucks, for adequate implantation of the fetuses in the uterus. Body condition is used to determine whether flushing will be of benefit to breeding does. Does in extremely good body condition will tend not to respond to flushing. On the other hand, does that are in relatively poor condition as a result of poor feed quality and supply, high worm loads, late kidding of twins or triplets, will respond favorably to flushing by improving their body condition.

Flushing can be accomplished by moving breeding does to a lush nutritious pasture 3 to 4 weeks prior to the introduction of the bucks. This cost-effective flushing method is underutilized in the Southeast where forage is abundant. Another method is feeding ½ lb/day of a high energy supplement. Corn is the grain of choice for flushing; whole cottonseed is another low cost, high energy and also high protein supplement. The goal being to increase the intake and body weight, breeding does should be grouped according to their body condition.

Suggested Supplemental Feeding Program for Goats

As a general recommendation, trace mineralized salt containing selenium should be given to all goats year around. A complete goat mineral should be offered free choice year-around in most production situations. When goats are raised on browse, abundant supply should be made available to allow goats to be very selective and to ingest a high quality diet that will meet their nutritional requirements. When forage or browse is limited or of low quality (< 10% protein), lactating does (and does in the last 30 days of gestation) and developing/breeding bucks should be fed 1.0 lb/day of a 16% protein mixture (77:20:2.5:0.5 ground corn:soybean meal:goat mineral:limestone). Alternatively, ground corn and soybean meal can be substituted by whole cottonseed for lactating does. Low to medium quality forage (> 10% protein) will meet requirements of dry does and non-breeding bucks. When forage or browse is limited or of low quality (< 10% protein), weanlings and yearlings should be fed 1.0 lb/day of the 16% protein mixture. Goats can be forced to eat very low quality feed including twigs, tree bark, etc., but producers should be aware this practice will hurt the productivity of superior meat and fiber goats.

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