Nutrition of Meat Goats

Introduction

Feeding is an essential aspect of goat raising and 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 do, and rates of weight gain are smaller. 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.

Feeding Requirements

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 rates are 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. Weanling goats, followed by does during the last month of gestation and high lactating does, and yearlings, require a higher quality diet than average lactating does, adult bucks and dry does. In order to feed them adequately, animals should be grouped according to their nutritional needs. Therefore, weanling goats, does during the last month of gestation, high lactating does and yearlings should be grouped and fed separately from the rest of the herd having lower nutritional needs. In a grazing situation, 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 some 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. 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.

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.

Energy

Energy comes primarily from carbohydrates (sugars, starch and fiber) and fats in the diet. 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. 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. 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 levels of protein are low in the diet, digestion of carbohydrates in the rumen will slow down and intake will decrease. Inadequate levels of protein in the diet can affect growth rate, milk production, reproduction and disease resistance negatively, 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. Therefore, it is important to feed enough protein to cover the nutritional requirements of the animal. Protein nutritional requirements vary with developmental and physiological stages and level of production.
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. Most forages are high in calcium, so calcium is low only if high grain diets are fed, which would be unusual for goats. Low quality, weathered forages will be deficient in phosphorous, especially for high and average lactating does. The ratio of calcium to phosphorous in the diet is important and should be kept about 2:1. Grass tetany can occur when goats in early lactation are grazing lush, leafy small grain, annual ryegrass of grass/legume pastures. Under those conditions, it is advisable to provide a mineral mix that contains 5% to 10% magnesium.

Trace minerals likely to be low in diets are copper, zinc and selenium. 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. Producers should make sure that the trace mineralized salts they buy contain selenium. In case selenium is absent, they should encourage their local feed store to include it in the mix or to order trace mineralized salts that contain selenium.

Vitamins

Vitamins are needed by the body in very small quantities. The vitamins most likely to be deficient in the diet are vitamin 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. 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 hay are excellent sources of vitamin D. A deficiency in vitamin D results in poor calcium absorption leading to rickets, a condition where the bones of young animals and joints grow abnormally.

FACTORS INFLUENCING ANIMAL REQUIREMENTS

A certain amount of each nutrient is required for maintenance of the body, which is the need for nutrients the animal has to keep warm, and to maintain its body weight. A mature dry doe or a mature wether are examples of animals having maintenance requirements only. Additional requirements above those needed for 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 lactating twins or triplets have greater nutritional requirements than does lactating 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 on difficult terrain.

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NUTRITIONAL MANAGEMENT OF MEAT GOAT

Nutrition of Newborn Kids:

Colostrum is the first milk produced after parturition. 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 sucking 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 parturition. 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 24 hours of life for optimum immunity. 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 tetanus and enterotoxemia (over-eating disease) 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 overcooked during the thawing process.

Nutrition of Replacement Does

Doe kids needed for replacement should be grazed with their mothers during as much of the milking period as possible and 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 does 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, does require a relatively high level of nutrients. In fact, nutritional requirements are as high during late pregnancy 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, large 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 in twin and 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

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 show 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 phosphorus relative to calcium, supplemental calcium from feed grade limestone is required to maintain a calcium:phosphorous ratio of 2:1 to 4:1.

Body Condition

Producers should be concerned with the body condition of their breeding animals. The term body condition refers to the fleshing of an animal. Does should not be allowed to become too thin or too fat. Failure in reproduction, low twinning rates and low weaning rates will result if does are too thin. Overly fat does can suffer pregnancy toxemia, but fat does are rarely a problem.

Simply looking at an animal to determine its body condition 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. Practice makes perfect, thus use your animals to get a feel for it. An easy way to start is to select a few animals that are over conditioned and some others that are thin to get a feel for extreme cases. Then introduce a small group of animals and compare their condition to the animals having extreme body condition. 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 supplemental feed is needed or that animals should be moved to a higher quality pasture. Waiting until goats become thin to start improving their feeding regime may lead to large production losses.

One should also be concerned with the body condition of the breeding bucks. Bucks will have reduced fertility if they are too thin. On the other hand, if bucks are overfed and become too fat, they may have no desire to breed does.
FEEDING PROGRAMS FOR MEAT GOATS

By: Frank Pinkerton and Bruce Pinkerton

Introduction
The nutritional needs for goats are shown in a booklet, "Nutrient Requirements of Goats", published by the National Research Council, Washington, D.C. (NRC, 1981). It is also available commercially for about $8. Please note that the figures given as recommendations are "approximate"; at this time they should be considered as guidelines only. Further research and field experience will eventually increase the reliability of future published figures.

Nutrient Requirement of Goats
All breeds, sexes and ages of goats require the same basic nutrients: protein, energy, minerals, vitamins and water. The diet must contain adequate protein; no other nutrient can substitute for it. However, energy needs may be derived from dietary carbohydrates (starches and/or fiber) or fats or even from excessive protein. Nutrients are required by the goat for: maintenance, growth, gestation, lactation, and fattening. Maintenance requirements are used for basal metabolism (maintain body temperature and support vital functions) and for physical activity. The daily maintenance requirements may range from 50 to 100% of total daily nutrient requirements, depending on whether the animal is also growing, lactating, gestating or fattening.

The nutritional requirements of goats managed primarily for milk production and those managed primarily for meat production are quite similar with perhaps two notable differences. First, dairy goats are expected to milk at relatively high and persistent levels throughout a 9-10 month lactation; meat goats need only achieve a 4-7 month lactation with high initial milk flow, persistency beyond 4 months being of lesser concern. Secondly, dairy goats are typically fed considerable concentrates (grain mixtures) to encourage maximum and persistent milk flow. In contrast, lactating meat goats are not usually fed concentrates in addition to their forage diet because the extra kid growth achieved from the extra milk may well not repay the added costs. As always, special circumstances may occasionally alter normal cost-benefit calculations.

Forage Supplementation
To be economically viable, meat goats must get most of their required nutrients from forages. See the related chapter for detailed information on types of forage, nutritive value and stocking rates.

In those situations in which the available forage is insufficient in protein or energy or minerals to support desirable levels of goat performance, proper supplements should be offered in adequate quantities but, as always, with due respect to the likely cost-benefit exchange involved. In actual practice, most owners provide extra minerals to their goats year round. Typically these may be in the form of trace mineralized salt (loose or block), individual sources of calcium and/or phosphorus (offered separately or in combination with salt), or commercial mineral mixtures. Phosphorus content of forages is usually much lower than calcium content. Adequate phosphorus being necessary for reproduction and milk production, supplementation is usually economical. Goats apparently have a much higher tolerance to copper than sheep so typical cattle mineral mixes are usually safe for goats.
In those grazing situations in which the plants are too low in protein (or in which forage quantity is much reduced), additional protein must be offered to maintain acceptable goat performance. Protein supplementation may take many forms and cost per unit of protein may vary widely. Experienced goat feeders compare protein costs, presence of other dietary components, palatability, feeding facilities required, labor cost/convenience, and likelihood of achieving fairly uniform intake per animal. Feeding a hay of sufficient protein level is frequently the optimum solution. In other cases, a lb or so of 20% crude protein (CP) cubes or 0.5 lb of 40% CP supplement or 0.5-1.0 lb of whole cottonseed may be economically sound and nutritionally adequate. Protein blocks of about 37% CP are widely used during southwestern winters. Some owners have observed that grazing small grain pastures for only 1-2 hours per day will provide adequate supplemental protein (and energy) to their dry pastures or, lower quality hays. The continuous availability of roughage, even poor quality hay, is important during such protein supplementation; it allows the animals to economically use the protein supplied.

High protein supplemental feedstuffs, used only occasionally by meat goat owners, are cottonseed meal and soybean meal. Whole cottonseed, cull pea seed and cracked mungbeans have also been used when conveniently available and priced competitively. Other protein feeds, such as gluten feeds, mill feeds and urea (in range blocks), are used as sources of protein. Choosing between alternative high protein feedstuffs is largely an economic decision. Dividing the price of a cwt of feed by its protein content (lb protein/cwt of feed) will yield the cost of 1 lb of protein and thus facilitate comparisons.

When existing pastures and/or browse are unacceptably low in energy, experienced goat owners offer good quality hays to maintain performance; 0.5 to 1.0 lb of shelled corn is also used, as is whole cottonseed. Cost per unit of energy is always a consideration but, without adequate energy, conception rates, milk flow, and kid growth rates will be compromised and gross income reduced. Some producers compensate in advance for expected declines in forage quality and availability by keeping protein blocks and hay available free choice, noting rises in consumption as pasture conditions worsen.

Concerning the composition of high energy feeds, experienced livestock owners know that there are only small differences between corn, milo, barley, and wheat. Choosing one over the other is mostly a question of relative costs per cwt. However, some goat producers feel that milo should be used only sparingly, if at all, as it can promote urinary calculi in males (Ca:P ratio lower than about 1.5:1 predisposes the formation of calculi). In the absence of definitive research, wheat should probably not constitute over 50% of a grain mixture. Price frequently may preclude the use of oats, even though it is an excellent goat feed. Costly grinding of the grains for goats is seldom necessary.

The use of salt-limited protein and/or energy feeds for goats is rarely practiced. However, we have found a mixture of ground milo, cottonseed meal and 8 - 15% salt to be useful. This 16% (or 20%) protein feed will supplement open, pregnant, and lactating goats on either dry grass or hay or late summer or limited grazing. Consumption is slow initially but then rises to 0.75/1.25 lb/hd/day depending on roughage intake.

"Flushing" is the practice of feeding breeding age goats supplemental protein and/or energy for 30 days prior to and 30 days following the introduction of bucks to achieve a weight gain during this period. This weight gain is usually accompanied by improved fertility, increased conception and twinning. Flushing may or may not be necessary for meat goat production, depending on quantity and quality of available forage. If flushing is necessary, 0.5 lb or corn and/or 0.5 lb of protein supplement day/head will usually suffice.

When planning grazing and supplementation practices, it is prudent to always remember that a meat goat enterprise generates cash income from the sale of surplus kids and cull adults as well as non-cash, but real, benefits from brush control and pasture improvement--perhaps $10 - 15
per breeding female per year. Obviously, adequate year round grazing with only mineral supplementation is the optimum option; all other options increase costs but likely would be economically wise.

**Creep Feeding**
Commercial meat goat raisers do not ordinarily creep feed their kid crops on the premises that: a) their does are capable of weaning kids acceptable to the market, b) it would not be cost-beneficial, and c) the logistics would be unworkable or at least inconvenient. Relatively recent changes in goat marketing strategies (premium prices for high quality kids and potential need for heavier, better conditioned kids for the supermarket and restaurant trade) may come to alter one or more of these premises. Widespread use of the newly arrived Boer bucks on Spanish does of limited milk production capability may also encourage creep feeding to support the well-known rapid pre-weaning gaining ability of Boer kids.

Should you elect to creep feed your kids, a number of commercial feed mixtures are available, e.g., lamb grower, beef calf creep, dairy calf starter or grower, and horse/mule feed. For best results, the percent protein should be 12-14 (as-fed basis) and the percent fiber should be no more than 18. However, simple grain mixtures of corn, oats, barley, or milo would probably also suffice. The crucial characteristic of a creep feed is that it be palatable enough to promote adequate intake; coarse grinding or pelleting (3/16") may improve intake over meal forms.

Research on creep feeding of range-raised kids is virtually non-existent and dairy goat kids are only infrequently raised on their dams. Dairy kids weaned at 8 wks have been shown to eat 2-4 oz of concentrate/ädchen/day and increase intake rapidly thereafter with feed efficiencies on the order of 6 lb feed/lb of gain depending on body weight.

**Conditioning Goats**
There are very few goat enterprises that are analogous to beef cattle feed-lots. The explanations are several: 1) the market does not want "fat" goats, 2) goats are not very efficient in converting high energy feeds to body weight gains, and 3) the likely cost-benefit ratio is such that it would be seldom profitable.

As always, there are exceptions. Lightweight weaning goats that are in poor condition due to poor nutrition or parasite load could possibly be put through a form of feed-lotting which might be called "conditioning". To reduce costs and avoid problems commonly associated with animal density, a controlled grazing scheme, with no or limited grain might be economically viable.

Experienced stockmen know the principle and practice of compensatory gain, i.e., a more mature animal that has been nutritionally deprived and has a low weight-to-frame ratio can, if healthy, make very rapid and efficient gains—for a short while, prior to beginning fat deposition. Some producers with the right blend of feed and other resources might make a fair return on this type of conditioning program.

A third example of conditioning has been only infrequently practiced but, with excellent management, could likely be done profitably in special circumstances. This program, as demonstrated by Dr. Robert Herr of Narvon, PA, uses underweight young kids or weanlings from traders, auctions, and local sources. The kids are put through a series of medical and dietary treatments featuring, initially, high roughage, and thereafter increases in concentrates. All are fed in loose housing with exercise lots. There are two key features to this program: the health practices and the marketing practices. The kids must survive and do well and they must be bought cheaply and sold any time the nearby market provides a profitable price level. This program is not for everyone; the opportunities for disaster are everywhere and always present.
One last observation on conditioning of meat goats. The typical long and stressful haul from production areas to slaughter plants yield a goat in very poor physical condition—so much so they may well die before they can be scheduled for slaughter. During a recent marketing study, we found no one in the New York trade who thought it would be possible, much less profitable, to off-load and recondition such goats for a few days or weeks prior to slaughter (Pinkerton, et al., 1993).

A possible exception comes to mind. If the animals were properly handled prior to shipment and if the haul was less than 24 hrs, it might be feasible to condition goats in the Carolinas and Virginia prior to sale to the NYC and South Florida areas, either live or in carcass form. Probably the only economically feasible program would be a grazing strategy plus mostly corn and mineral supplement.

Unfortunately, universities rarely engage in the type of research needed to generate the needed information for decision making of this kind. Producers may well have to do it by trial and error and stand the cost personally or perhaps get a slaughter plant to provide partial assistance. But, the potential seems to warrant a further look.

References


**SIMPLE GOAT DUE-DATE ESTIMATOR**

To determine the due date, take breeding date and subtract the number indicated in the table. For example, if bred July 4, the doe will kid December 1. If bred November 10, the doe will be due April 9. Does bred February 18? Look for "Bred in February" and then look across to when she is due "July" and subtract the minus number "0" from the date number "18" when she was bred. So, doe is due July 18. This is based on 150 days.

- Bred in July----------due December-3
- Bred in August--------due January-3
- Bred in September------due February-3
- Bred in October--------due March-1
- Bred in November-------due April-1
- Bred in December-------due May-1
- Bred in January---------due June-1
- Bred in February--------due July-0
- Bred in March----------due August-3
- Bred in April-----------due September-3
- Bred in May------------due October-3
- Bred in June------------due November-3
concentrate on showing. Set up your goat and be ready before the judge gets to you. Be careful not to cover your goat with your body and block the judge’s view. Always keep your goat between you and the judge. In large classes, it may take 20 minutes before the judge handles your goat. Be patient and let your goat relax.

After handling your goat, the judge usually will step back and look at it. Be sure to keep the goat’s head up and body, neck and head in a straight line. Keep one eye on the judge and one eye on your goat. It is your responsibility to watch the judge and not miss a decision.

If your goat is not pulled the first time, keep trying. Continue to keep it set up, remain alert and watch the judge. If your goat is pulled, circle it out of the line and follow the directions of the ring steward while continuing to keep an eye on the judge. Move your goat with style and at a steady, moderate pace.

Remember to keep showing at all times, because a class is not over until the ribbons are distributed. Be courteous to fellow exhibitors. A good showman will emphasize strong points and minimize weak points of a goat. Remain standing at all times and always display a pleasant facial expression. Be a good sport, a graceful loser and a humble winner.