

## **FORAGE NEEDS, GRAZING MANAGEMENT AND FEEDING PROGRAM FOR MEAT GOATS AND SHEEP IN THE HUMID SOUTHEAST**

**J-M. Luginbuhl, J.T. Green, Jr., J. P. Mueller, and M.H. Poore**

### **FORAGES FOR GOATS**

Goats offer an alternative to utilizing forage and vegetation which is otherwise "wasted", while producing products (milk, meat and fiber) which are currently marketable and in demand by a growing segment of the US population. In addition, goats offer the potential for biological control of unwanted vegetation in pastures and forests, which will reduce dependence on certain pesticides.

Goats consume only the best parts of a wide range of grasses, legumes, and browse plants. Browse plants include brambles, shrubs, trees, and vines with woody stems. The quality of feed on offer will depend on many things, but it is usually most directly related to the age or stage of growth at the time of grazing. The nutrient composition for several common feed types found on many farms is shown in Table 1.

### **GRAZING BEHAVIOR**

Goats are very active foragers, able to cover a wide area in search of scarce plant materials. Their small mouths and split upper lips enable them to pick small leaves, flowers, fruits and other plant parts, thus choosing only the most nutritious available feed.

The ability to utilize browse species, which often have thorns and small leaves tucked among woody stems and an upright growth habit, is a unique characteristic of the goat compared to heavier, less agile ruminants. Goats have been observed to stand on their hind legs and stretch up to browse tree leaves or throw their bodies against saplings to bring the tops within reach.

The feeding strategy of goats appears to be to select grasses when the protein content and digestibility are high, but to switch to browse when the latter overall nutritive value may be higher. This ability is best utilized under conditions where there is a broad range in the digestibility of the available feeds, giving an advantage to an animal which is able to select highly digestible parts and reject those materials which are low in quality.

Grazing goats have been observed to:

- select grass over clover.
- prefer browse over grazing.
- prefer foraging on rough and steep land over flat, smooth land.
- graze along fence lines before grazing the center of a pasture.
- graze the top of pasture canopy fairly uniformly before grazing close to the soil level.

Because of their inquisitive nature and tolerance of "bitter" or high tannin material goats may eat unpalatable weeds and wild shrubs that may be poisonous, such as cherry or milkweed. The absence or the severity of poisoning is related to the quantity of material consumed, the portion

and age of the plant eaten, the season of the year, the age and size of the animal, and a multitude of other factors. In addition, several ornamental plants that are grown outdoors or indoors are highly toxic. For example, goats should not have access to, or be fed clippings of yew, azaleas, delphinium, lily-of-the-valley and larkspur.

In a pasture situation goats are "top down" grazers. This behavior results in uniform grazing and favors a first grazer-last grazer system using a goat flock as the first group and cattle as the last group. This management is most appropriate with lactating does or growing kids.

Goats naturally seek shelter when it is available, and do not like to get wet. Goats seem to be less tolerant of wet cold conditions than sheep and cattle because of a thinner fat layer. A wet goat can easily become sick. Therefore, it is usually necessary to provide artificial shelters, such as open sheds.

## **NUTRIENT REQUIREMENTS**

The goat is not able to digest the cell walls of plants as well as the cow because feed stays in their 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 represent poor quality roughage sources for cattle, because of their highly lignified stems and bitter taste, may be adequate in quality for goats, which may avoid eating the stems, don't mind the taste and benefit from the relatively high levels of protein and cell solubles 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 utilize the cell wall even less.

Goats must consume a more concentrated diet than cattle because their digestive tract size is smaller relative to their maintenance energy needs. When the density of high quality forage is low and the stocking rates are low, goats will still perform well because of their grazing behavior, even though their nutrient requirements exceed those of most domesticated ruminant species. Total digestible nutrients (TDN) and protein requirements are given 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. For comparison, low quality forages have 40 to 55% TDN, good quality forages have from 55 to 70% TDN, and concentrates have from 70 to 90% TDN.

High quality forage and/or browse should be available to does during the last month of gestation and to lactating does, to developing/breeding bucks, and to weanlings and yearlings. Female kids needed for reproduction should be grazed with their mothers during as much of the milk feeding period as possible and not weaned early. When the quantity of available forage and/or browse is limited or is of low quality, a concentrate supplement may be considered to maintain desired body condition, depending on cost:benefit. Whole cottonseed makes an excellent supplement for goats when fed at no more than 0.5 lb/head/day. Dry does and non-breeding mature bucks will meet their nutritional requirements on low to medium quality forage (10-12% protein and 50-60% TDN).

A complete goat mineral or a 50:50 mix of trace mineralized salt and dicalcium phosphate should be offered free choice during the first 90 days of lactation in herds with a controlled breeding season (or year round for those without controlled breeding) and for young goats. Selenium is marginal to deficient in all areas of North Carolina. Therefore, trace mineralized salt or complete minerals containing selenium should always be provided to the goat herd year around. It is sometimes advisable to provide a mineral mix that contains 20-25% magnesium oxide to reduce the risk of grass tetany when heavy milking goats are grazing lush small grain or grass/legume pastures in early lactation.

## **FORAGES FOR SHEEP**

Profitable lamb production is highly dependent upon efficient production and use of forage crops. Harvesting of the forage crops by the sheep themselves, with as little supplemental feeding as possible, is the most practical and economical means to ensure the success of a sheep operation. Because feed costs usually amount to 50 to 70% of the total cost of producing sheep, it is essential to develop an economical year round forage supply.

The entire Appalachian mountain chain, extending from Maine south into Alabama, is a region dominated by a mixture of Kentucky bluegrass and intermediate white clover. This region has potential for lamb production with little competition to the existing beef industry. By using good pastures (fescue/orchardgrass/bluegrass - clover or alfalfa), crop residues, waste land forage, hay and silage, it is possible to raise sheep economically in many livestock programs.

## **GRAZING BEHAVIOR**

Sheep are selective grazers, choosing plant parts which are of higher quality (and more digestible) than cattle when both species have access to the same herbage. Therefore, when grazed alone, sheep should be stocked heavily to avoid too much trampling and soiling of the ungrazed forage. As a general rule, sheep eat more browse than cattle, but less than goats, because sheep are not nearly as selective as goats. Sheep also make better use of rough, steep hill pastures than cattle or goats.

## **NUTRIENT REQUIREMENTS**

### ***Ewes***

The nutritional needs of ewes for maintenance and the first 15 weeks of gestation are relatively low. Most can be furnished by medium to low quality forage. However, nutritional needs increase about 1.5 times their maintenance needs during the last 4 to 6 weeks of gestation, and good pasture must be available or additional grain must be fed during this period. Nutritional needs increase to 3 times maintenance during the first eight weeks of lactation, and decrease to 2 times maintenance by the third month of lactation (Table 3). If the ewe is nursing twins, she will need 15% more digestible nutrients than for one lamb. Ewes with two or more lambs should be separated from the flock and given extra feed. After weaning, the ewes go back to maintenance level, until flushing. The forage and supplemental feed program should be designed to fit these nutritional cycles, the lambing period, and the cost:benefit structure.

During maintenance periods, ewes can be used to clean up paddocks after lambs or other livestock. Be careful that ewes aren't kept on poor quality forage for too long, or a reduced

number of lambs may be born the next spring. It is better to alternate a day of grazing low quality pasture with a day of grazing higher quality pasture. Grazing ewes on forage that is better than their minimal needs will result in them weighing more and consistently giving birth to more and larger lambs that gain weight faster, but can also be associated with lambing difficulties.

### **Lambs**

Pastures for lambs should be of very high quality because of their nutritional requirements (Table 4). Forward grazing is a management technique enabling the lambs to have access to the best quality forage. If a high quality forage is not available for the entire flock, the lambs can be creep grazed on adjacent pastures. Fast rates of gain cannot be achieved with low quality pasture, because the bulk of feed in the rumen will limit the intake by the lambs before enough energy has been ingested to meet their nutritional requirements.

Lambs will consume approximately 2 to 4% of their body weight in dry matter daily. Most immature, leafy grazable forages will contain about 80 to 85% water. Therefore, lambs will consume from 10 to 20 lbs of green forage daily, depending upon their body weight. The daily performance of lambs is generally improved by the addition of a legume to a cool-season grass pasture. Sheep have shown to clearly prefer clover when it is readily available. Suckling lambs have shown average daily gains of 0.4 lb when grazing orchardgrass pastures compared with 0.6 lb from an orchardgrass-ladino clover mixture. Data from New Zealand have shown an 18% increase in gain by sheep grazing a perennial ryegrass-ladino clover mixture compared with sheep grazing a pure stand of perennial ryegrass. Weaned lambs grazing alfalfa have had daily gains of 0.3 to 0.45 lb, even during summer months.

Pure stands of annual or perennial grasses can increase the incidence of grass tetany, especially in the early spring. This can be controlled by providing a mineral mix that contains 20-25% magnesium oxide. Legumes will reduce the risk of grass tetany because of their high magnesium content. It is most convenient to use a complete commercially prepared sheep and goat mineral which will provide selenium and other minerals plus phosphorous, salt and magnesium. **Never use cattle minerals because a good cattle mineral will kill sheep due to its copper content!**

### **GRAZING MANAGEMENT FOR GOATS AND SHEEP**

Grazing of forage generally provides the least expensive way of supplying nutrients to the animals. Therefore, it is essential to develop a year round forage program which allows for as much grazing as possible every month of the year. The principles of controlled grazing of goats or sheep are similar to those used for cattle. The primary goal is to have enough control of the animal's grazing pattern one can dictate the amount of defoliation and the frequency of defoliation. However, good pasture management involves much more than simply turning the animals to pasture. To obtain efficient animal production over a number of years, the needs of the plants as well as the needs of the animals must be taken into consideration. The development of a successful forage systems/grazing management entails:

1. Adjusting the number of animals grazing a certain area (stocking density) of pasture because some forage must be left at the end of the grazing period to maintain adequate plant production. Otherwise, overuse will weaken the plants and regrowth will be slower. Adjusting

the stocking rate requires experience because forage growth is not uniform throughout the year or from year to year.

2. Harvesting ungrazed forages as hay or silage at an immature stage of growth when forage growth is more rapid than it can be grazed in order to provide high quality feed when grazing is not available. Cross fencing will keep animals concentrated on small areas while excess growth accumulate on other paddocks. Under those circumstances, short duration rotational grazing through a series of paddocks, or strip grazing a rapidly growing pasture by allowing animals access to only enough forage to carry them for one day using a movable fence, are alternatives to consider.
3. Overseeding bermuda pastures with legumes, ryegrass, small grains, or brassicas to extend the grazing season and to provide some high quality feed during the winter and spring.
4. When in short supply, restricting the use of high quality forage for the supplementation of other low quality pastures, hay or silage. This can be achieved by letting goats or sheep graze high quality forage a few hours at the end of each day, or by grazing the limited high quality supply every other day.

When the aim is to kill or reduce the amount of unwanted vegetation, then the severity and frequency of grazing is much greater. Goats will actively select major weeds at particular stages of growth. As a rule, effective control of unwanted vegetation can be achieved in two years. Therefore, the advantages of the goat in feeding strategy must be weighed against its disadvantages. Being a browsing animal, the goat stunts tree growth and prevents the regeneration of forests and thus should be managed closely in areas desired for forests. Goats could be very useful, however, in areas where regrowth of brush and trees is not desirable.

### **GRAZING TIME**

Some livestock producers confine their animals at night for protection from straying or predation. However, confinement means that grazing time is reduced and that the animals spend more time in unsanitary lots or pens. Reduced grazing time due to confinement at night is even more critical during the hot and humid summer months, because animals may not forage efficiently during the hottest periods of the day. If animals must be confined at night, allowing the animals to graze during the cooler parts of the day would increase production as a consequence of improved feed intake resulting from increased grazing time.

### **FENCING FOR GOATS AND SHEEP**

Goats and sheep can be controlled with 4-5 strands of smooth **electrified wire**. The wire spacings vary from 6 to 8 inches near the ground to 8 to 12 inches for the top strands. Perimeter fence height should be at least 42 inches tall. A high wire, or an offset wire set one foot inside the fence near the top, may be needed if goat jumping is a problem. As a rule, goats crawl rather than jump, so the bottom wire should be kept close to the ground. A grounded barb wire laid along the ground will help with predator control, especially in mountainous areas. Training animals to respect electric wire can be done effectively by forcing animals to stay in a small paddock which encourages them to "test" the wire.

**Woven wire** is effective, but costs at least twice that of a 5 strands electric fence and horned goats frequently get caught. To address this problem with existing fences, an electric wire offset about 9 inches from the woven wire fence and about 12 to 15 inches from the ground will reduce the number of animals caught in the woven wire fence. However, this practice also reduces control of forage growth on the fence line. Dehorning goats will eliminate this problem.

Boundary fences should control all stock at all times. However, interior fences may be made of 3 to 4 wires, assuming animals are well trained. Because goats like to climb, the corners of fences should not have the diagonal bracing for posts or the animals will climb out of the pasture. Corner posts should be driven with a deadman or H-braces.

### **MIXED GRAZING AND STOCKING RATES**

The differences in feeding behavior among cattle, sheep and goats uniquely fit each species to the utilization of different feeds available on a farm. These differences should be considered in determining the best animal species to utilize a particular feed resource. Feeding behavior is also important in determining whether single or multi-species will best utilize available plant materials. Most studies indicate greater production and better pasture utilization are achieved when sheep and cattle or sheep, cattle and goats are grazed together as opposed to grazing only sheep or goats or cattle alone. This is especially true where a diverse plant population exists.

Under mixed grazing conditions (more than one ruminant species grazing in the same paddock) on fescue/orchardgrass-clover where the forage supply is low and the nutritive value is high, goats and sheep may be at a disadvantage. Under those conditions, the animal with the largest mouth (cattle, horse) has an advantage because it can grasp more material per unit of time. In addition, food intake by goats is rapidly reduced and may stop if the pasture is soiled or trampled, even with an ample amount of pasture remaining.

Generally one cow eats about the same amount of feed as 6 to 8 goats (Table 4). Because of the complimentary grazing habits, the differential preferences and the wide variation in vegetation within most pastures, one to two goats could be grazed with every beef cow in NC without adversely affecting the feed supply of the beef herd. The

selective grazing habits of goats in combination with cattle would eventually produce pastures which would be more productive, of higher quality, and with little weed problems as a result of the mixed grazing.

In grass-legume mixtures cattle will generally graze the grass species more readily than sheep, which will prefer legumes and other broadleaf species. As a rule of thumb five to six ewes and their lambs will consume similar amounts of feed as one cow and her calf. Therefore, if the area available for grazing usually carries one cow-calf pair, five to six ewes and their lambs can safely graze on the same area (Table 4).

**TABLE 1. ESTIMATED NUTRIENT COMPOSITION OF VARIOUS FEEDS<sup>1</sup>**

PLANT TYPE	TDN, %	CRUDE PROTEIN, %
Whole cottonseed	88	22
Corn	86	9
Soybean meal (48%)	82	44
Pasture, vegetative	60-76	12-24
	50-60	8-10
Pasture, dead leaves	35-45	5-7
Pasture, mature	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	64	6
Acorns, fresh	47	5

<sup>1</sup> Nutrient requirements of Goats in Temperate and Tropical Countries. 1981. National Research Council.

TABLE 2. DAILY NUTRIENT REQUIREMENTS FOR MEAT PRODUCING GOATS<sup>1</sup> <sup>2</sup>

NUTRIENT	YOUNG GOATS		DOES (110 LB)				BUCK (80-120 lb)
	Weanling (30 lb)	Yearling (60 lb)	Pregnant		Lactating		
			Early	Late	Avg Milk	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
Calcium, %	.6	.4	.4	.4	.4	.6	.4
Phosphorus, %	.3	.2	.2	.2	.2	.3	.2

<sup>1</sup>Nutrient Requirements of Goats in Temperate and Tropical Countries, 1981. National Research Council.

<sup>2</sup>Pinkerton, F. 1989. Feeding Programs for Angora Goats. Bulletin 605. Langston.

**TABLE 3. NUTRIENT REQUIREMENTS FOR SHEEP<sup>1</sup>**

ITEM	BODY WEIGHT	DAILY GAIN OR LOSS	DAILY INTAKE	TDN	PROTEIN	Ca	P
	lb				%		
Mature ewes, maintenance	154	.02	2.6	55	9.5	.21	.20
Mature ewes, gestation, last 4 weeks	154	.4	4.0	60	10.6	.34	.31
Mature ewes, lactating, suckling singles	154	-.06	5.5	65	13.3	.37	.28
Mature ewes, lactating, suckling twins	154	-.13	6.2	65	15.0	.39	.29
Finishing lambs	88	.6	3.5	75	11.6	.41	.21
Replacement ram lambs	132	.7	5.3	65	11.0	.35	.18
Replacement ewe lambs	110	.26	3.3	60	9.1	.32	.16

<sup>1</sup>Nutrient Requirements of Sheep. 1985. National Research Council.

**TABLE 4. ESTIMATED STOCKING RATES OR FEED NEEDS FOR GOATS, SHEEP AND CATTLE ON PASTURE<sup>1</sup>**

PASTURE TYPE	GOATS	SHEEP	COW
	Head <sup>1</sup>		
Good quality pasture system	6-8	5-6	1
Good brush-browse system	9-11	6-7	1
	Head/acre		
Wheat/alfalfa system	10-12	8-9	1.5
Alfalfa pasture, Oklahoma	12-15	10-11	1.9

<sup>1</sup>Number of animals to consume similar amount of feed.