

MP427



Nutrition *of* Meat Goats

U of A UNIVERSITY OF ARKANSAS
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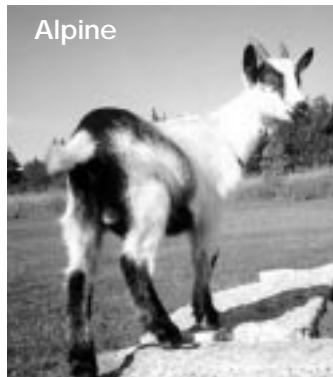
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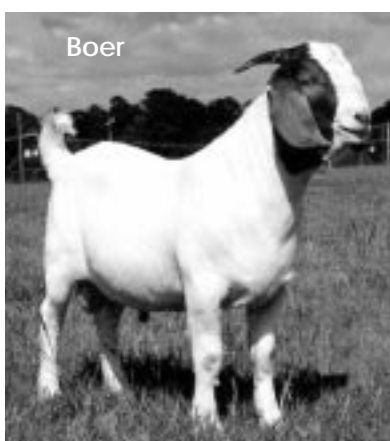
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Breeds of Goats



Many meat goats are crosses of more than one breed.



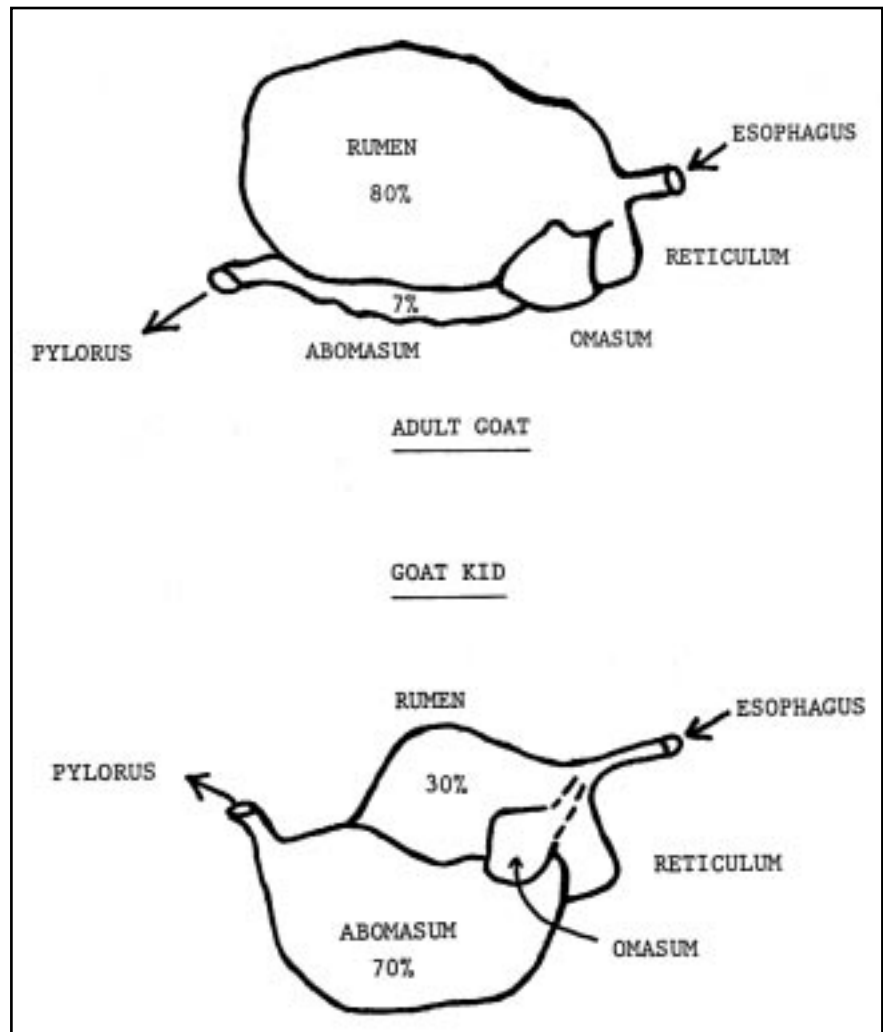
Photos courtesy of Oklahoma State University,
www.ansi.okstate.edu/breeds/goats/.

Introduction

Proper nutrition for goats is important at all ages in order to maximize profit potential in the kids, yearlings or adult animals. Nutrient requirements differ in various stages of maintenance, growth, pregnancy and lactation, but it is important to feed a balanced ration at all times as goats that are too fat, too skinny or receiving too much or too little of specific nutrients are more prone to other health problems (see FSA4006, *Herd Health Program for Dairy Goats*). Conversely, goats that are sick, wormy or injured also will not benefit maximally from proper nutrition.

Goats are ruminants. The stomach of a goat is divided into four compartments: rumen, reticulum, omasum and abomasum. This combination of compartments allows ruminants to digest cellulose and other complex carbohydrates that cannot be digested by non-ruminants. Microorganisms in the rumen and reticulum possess the cellulase enzymes that break down cellulose to more simple compounds which the animal uses as an energy source. The abomasum functions as the true stomach by secreting digestive juices (enzymes, etc.) similarly to the simple stomach in non-ruminants such as man and swine.

When a goat kid is born, the abomasum is functional, but its rumen, reticulum and omasum are small and non-functional. The kid depends on low fiber milk, not forage, for its source of nutrition. When the kid swallows milk, the milk goes directly to the abomasum



The four stomach compartments of young and adult goats, showing relative changes in dimensions from pre-ruminant status. Drawing courtesy of D.L. Ace, Pennsylvania State University.

through the esophageal groove. Every time the kid swallows, this flap of skin at the entrance to the reticulo-rumen folds over to form a groove that bypasses the reticulum and rumen. This diversion sends the milk directly to the abomasum to be digested by stomach acids. As the kid gets older, it starts consuming forage. Then the rumen with its microorganisms becomes active and starts to

enlarge. Its population of microorganisms increases, which slowly and more efficiently allows it to digest forages. The reticulum and omasum also respond to the changes in diet by getting bigger. **By the time the kid is an adult goat, forage is the main source of food, and the rumen is much larger than the abomasum.**

Nutrient Requirements *for* Goats

Nutrients are chemical substances that are used for body maintenance, growth, pregnancy, reproduction and production of products such as meat, milk and/or hair.

All goats require the same basic nutrients: carbohydrates and fats for energy, protein, 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), fats or excess protein. Maintenance requirements are used for basal metabolism such as maintenance of body temperature and support of vital functions plus physical activity. The daily maintenance requirements may vary from 50 to 100 percent of the total daily nutrient requirements.

The basic nutrients are:

Carbohydrates and fat for energy

Most energy is supplied to the goat as carbohydrates and fats in forages and grains. Energy is essential to supply body heat, activity, growth, reproduction, lactation and fattening. It is most often limiting for production of meat, milk or fibers. To increase meat production and growth of kids, goats may require some amount of grain or concentrate as a supplement to its diet based primarily on forages. If the ration offered to the goats contains an excess of energy, it can be stored in the body of the goat as fat.

Protein

Protein makes up the basic animal tissues of the body. It is vital for growth, milk production, disease resistance, reproduction and general well-being of the goat. The quality of the protein relates to the amino acid content. Protein is the most expensive component in the goat diet. The body of the goat does not store excess protein. Excess protein is broken down and may be used for energy. Therefore, it becomes important to feed just enough to meet the requirements of the goat. The microorganisms in the rumen can convert limited amounts of urea to protein.

Minerals

Goats require minerals for basic body functions and optimum performance. The major minerals are salt (sodium chloride), calcium, phosphorus and magnesium. The ratio of calcium to phosphorus in the diet is important and should be kept about 2:1 except for bucks where urinary calculi can be a problem. Most other minerals required by the goat can be found in good forage and a regular concentrate mixture. Selenium, iodine, copper, zinc, molybdenum and manganese are trace minerals that are most often supplemented in the diet. Usually, a commercial trace mineral and salt is provided to goats as insurance against a deficiency.

Vitamins

Vitamins are needed by the body of the goat in very small amounts to maintain body

functions, acting as a catalyst for routine activities. All B vitamins and vitamin K are formed by the microorganisms in the rumen. Body tissues synthesize vitamin C in quantities that meet body needs. Vitamins A, D and E are usually the only vitamins that need to be supplied in the feed. Animals grazing on fresh, green pasture will usually get all they need of these vitamins. However, if the animals are not on excellent pasture, vitamins A, D and E need to be supplied. As a precaution during the winter months, when feeding hay and stored feed, supplementation of the feed with vitamins A, D and E is necessary and is a good insurance against a deficiency.

Water

Water is the least expensive feed ingredient in most parts of the world. However, a deficiency of water will affect production, growth and the general performance of the goat. Water is important for body functions, transport of nutrients, regulation of body temperature and excretion of wastes. **Goats need fresh, clean water at all times.**

The nutritional requirements for goats are published by the National Research Council, Washington, D.C. The figures in Table 1 should be considered as guidelines in feeding goats. Further research will "fine tune" these guidelines, but they are based on the research now available.

Table 1. Nutrient requirements for meat and fiber producing goats^{1, 2}

Nutrient	Young Goats ³		Does (80 lbs)			Buck (80-120 lbs)
	Weanling (30 lbs)	Yearling (60 lbs)	Dry Pregnant	Lactating		
				Average Milk	High Milk	
Daily Feed, lb (forage + grain)	2.0	3.0	4.5	4.5	5.0	5.0
TDN, %	68	6.5	60	60	65	60
Protein, %	14	12	10	11	14	11
Calcium, %	0.6	0.4	0.4	0.4	0.6	0.4
Phosphorus, %	0.3	0.2	0.2	0.2	0.3	0.2

¹ Nutrient Requirement of Goats. 1981. National Research Council.

² Pinkerton, F. 1989. Feeding Programs for Angora Goats. Bulletin 605. Langston University, OK.

³ Expected weight gain >.44/day.



Goats in browse.



Green grass is one of the best forages for goats.



Wrapped roll bales preserve the quality of the forage.



Goats will generally get most of their nutrients from grazing.

Feeds *for* Goats

The composition of feedstuffs commonly eaten by goats varies widely (Table 2).

For information on composition of specific feedstuffs, see FSA3043, *Composition of Some Beef Cattle Feeds*. In grazing situations, goats consume an ever changing combination of these feedstuffs with selection reflecting seasonal availabilities and relative palatabilities. The daily dry matter intakes of maturing goats usually range between three to five percent of body weight but can be higher. The actual quantity of feedstuffs eaten per day will be influenced by palatability, dry matter content, digestibility and rate of passage from the rumen. The major feeds that are fed to goats can be broken up into two different groups. Basically, these two groups are forages and concentrates.

Forages are high in fiber (18 percent crude fiber or more) and should be the primary component in the diet of adult goats. Fiber adds bulk to the goat's diet and keeps the digestive tract functioning well. Fiber has a laxative effect. The green vegetative parts of the plant, for example, blades of grass, provide most forages. Forages tend to be lower in energy than concentrates.

In contrast, concentrates are low in fiber and higher in either energy or protein than forages. They often come from the seeds of a plant. Examples of concentrates include corn, wheat, oats, barley, milo, brewers' grains and soybeans.

The types of feeds fed to goats are primarily:

Dry forages

These feeds are cut and cured, usually in the sun, and stored for later use. Hay is the primary dry forage that is cut before or at maturity. It is either cut before it has formed seeds or while the seeds are still on it. Straw is forage that is cut after it is past maturity and the seeds have already dropped or been harvested. Stored feeds usually cost 50 to 100 percent more per pound of dry matter than fresh feeds.

Fresh, green forages

Pastures and browse are the primary fresh, green forages. Pastures are either grasses or legumes. Grasses include fescue, bermuda, orchardgrass and annuals such as ryegrass, wheat and rye. Alfalfa, lespedeza and vetch are legumes. Both grasses and legumes have greater nutritional value when they are growing rapidly in a vegetative state. It is best to keep them grazed or clipped to prevent them from getting too mature. As with high energy concentrates, goats can get sick (overeating, disease, founder, digestive upsets) if they eat too much green forage too quickly. Always introduce your goat to fresh pasture and cuttings gradually.

Browse is the tender shoots, twigs or leaves of trees or shrubs that are acceptable for grazing. Goats browse like deer and giraffes. They can eat parts of a woody plant like a

blackberry bush by using their mobile upper lip to select the tender, highly digestible new leaves and leave behind the less digestible branches and thorns. Because of this ability to select different parts of the plant, goats are called **selective eaters**. Sheep and cows do not have mobile upper lips and, thus, have less ability to pick and choose the parts of a plant they want to eat. Goats are particularly adept at selecting the most palatable parts of browse plants; fortunately, greater palatability generally is associated with lower fiber, higher protein and increased digestibility. Spring growth is the most palatable and, therefore, has the highest nutritive value.

Browse plants may produce a significantly smaller quantity of forage per acre than native or improved pastures but may support the nutritional needs of one to two goats per acre for an extended period or several goats for a few days. Underbrush associated with pine and oak forest is a good source of protein and energy for meat goats. **However, some plants are very deadly to goats, but goats will eagerly eat them. Do not feed your goats yew clippings, rhododendron clippings or prunings from cherry, apricot or peach trees as these fruit tree leaves contain HCN (prussic acid) and are toxic when they wilt.** Before you cut and carry any fresh feed to goats, make sure it does not contain poisonous material.

Table 2. Estimated nutrient composition of various feeds

Plant Type	TDN %	Crude Protein %
Whole cottonseed	88	22
Corn	86	9
Soybean meal (48%)	82	44
Annuals, vegetative (wheat, ryegrass, millet)	60 - 76	12 - 24
Annuals, mature (wheat, ryegrass, millet)	50 - 60	8 - 10
Annuals, dead leaves (wheat, ryegrass, millet)	35 - 45	5 - 7
Fescue hay, six weeks growth	58 - 63	8 - 11
Fescue hay, nine weeks growth	48 - 53	7 - 9
Bermuda hay, seven weeks growth	54 - 58	9 - 11
Bermuda hay, twelve 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
Acorns, fresh	47	5
Curled dock	74	13
Chicory	65	15
Mimosa (leaves)	72	21
Mulberry (leaves)	72	17

Silages

These forages have been cut and then ensiled or “pickled” rather than dried to store them. They are cut and then stored without air. In the absence of oxygen, bacteria are able to ferment the carbohydrate in the forage and preserve it. Silage can be made from grasses, such as wheat and ryegrass; legumes, such as alfalfa; and also from corn plants. Goats that have not previously eaten silage may need a transition period to learn to eat it. If improperly fermented or stored, the silage can develop molds that are deadly to goats.

Energy concentrates

As the name suggests, these feeds are high in energy. They include feeds that have less than 20 percent protein and less than 18 percent crude fiber. Energy concentrates include grains, such as corn and oats; flour mill by-products, such as wheat middlings; and certain roots crops, like turnips and beets.

Protein concentrates

These concentrates contain at least 20 percent crude protein. They are often also high in energy. They can be of plant or animal origin. Examples include soybean meal, cottonseed meal, brewers' grains and blood meal.

Urea

An inexpensive source of nitrogen, urea can be converted to protein by rumen microorganisms. However, it is not a dietary protein and can be highly toxic if used to substitute for too much protein. Always introduce goats to urea gradually. It should not make up more than 1 percent of the complete ration or 3 percent of a concentrate feed. Commercial dairy concentrates that contain 1 to 2 percent urea are safe for goats, but the nitrogen in urea may not be used as efficiently by the goat as nitrogen in protein.

Mineral supplements

Salt or sodium chloride is the most common mineral. Other mineral sources include limestone or calcium carbonate and dicalcium phosphate. Minerals should be added carefully to the feed as excesses can be toxic (poisonous) to the goat. Some minerals, for example, selenium, copper, magnesium and cobalt are best fed as salt blocks or mixed into the grain ration or into a complete diet as the goat may eat too much of them if fed free-choice in the form of loose salt. A **cattle-type trace mineralized salt** should always be available to goats.



Water is essential for goats in all stages of development.

Nutrition *of* Kids

Feeding of colostrum to the kid is essential. Colostrum is the first milk produced after kidding or parturition. It contains a high content of immunoglobulins or antibodies, vitamins, minerals and energy. Antibodies are proteins which help the body fight diseases. As the amount of antibodies in the colostrum decreases rapidly after parturition, kids should receive milk produced in the first 12 hours after kidding.

The kid's ability to resist disease is greatly affected by the quality and quantity of the colostrum and the timing of the colostrum intake. The producer must be certain that all newborn kids get colostrum soon after birth. The kid's ability to absorb antibodies in the colostrum decreases rapidly after parturition. Therefore, newborn kids should receive

colostrum in the first 12 hours after birth. It is a good idea to freeze good quality colostrum from an older, healthy doe in small amounts (4-6 ounces) for later use in case a doe dies or a kid cannot nurse her. Frozen colostrum should be thawed at approximately 100-120°F and fed at about 100°F; boiling will coagulate the protein forming the antibodies.

Most kids from does of meat goats will nurse the doe until weaned at 2 to 6 months of age. However, a doe may not produce enough milk for her young throughout her lactation, especially if she is raising more than one kid. To ensure adequate daily gain, free choice starter and high quality hay should be available to kids from birth. The transition from milk to concentrate at weaning is made easier when the kids can

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recognize the feed. Table 3 contains examples of feeds for kids. If milk replacers are used, they should contain not less than 5 percent fat, at least 20 percent crude protein and be made from milk protein and not from soybean or fish products. Usually, high quality cow milk replacers are less expensive than goat milk replacers and can provide good nutrition to the kid.

Table 3. Samples of a complete ration for starter and growing goat kids (The et al., 1985; Sahu et al., 1992)

Feedstuff	Kid Starter %	Growing Ration %	Feedstuff	Kid Starter (% dry matter basis)
Corn	27.6	12.9	Ground corn	70.17
Crimped oats	37.9	10.0	Crimped oats	2.00
Soybean meal (44%)	10.0	8.6	Soybean meal (44%)	24.00
Alfalfa leaf meal	18.0	10.0	Alfalfa meal	2.00
Cane molasses	5.0	5.0	Calcium carbonate	0.81
Cottonseed hulls	0.0	51.9	Dicalcium phosphate	0.37
Trace mineral salt	1.0	1.0	Trace mineral salt*	0.45
Limestone	0.3	0.4	Vit. A, D and E (premix)**	0.2
Vit. A, D and E (premix)	0.2	0.2		

Crude Protein = 20%

Calcium = 0.6%

Metabolizable Energy, Mcal/kg = 3.06

Phosphorus = 0.5%

* Composition: 98% common salt (NaCl), 0.35% zinc, 0.28 manganese, 0.175% iron, 0.035% copper, 0.007% iodine and 0.008% cobalt

** Contains (per 2.2 lbs): 6600 International Units (IU) of vitamin A, 2200 IU of vitamin D and 33 IU of vitamin E.



Creep feeding increases the growth rate of young goats.



The nutrition of the mother affects milk production for the kids.



Mineral feeders, such as the one above, allows goats to obtain salt and other minor nutrients essential for proper metabolism.



Flushing ewes or ewe kids before and during breeding increases the number of kids born.

Nutrition *of* Does (Nannies)

Meat goats are expected to raise kids, in contrast to dairy goats, which are expected to produce milk for nine to ten months at high levels of up to one gallon per day. Dairy goats are offered forage and concentrates to enhance milk production, but meat goats are expected to wean kids with minimal concentrates. For many operations, the cost of concentrates may be greater than the value of the greater growth rate achieved by the kids. However, if adequate forage is not available to the doe, grain supplementation may be necessary. The amount of nutrients required by the doe is related to amount of milk she produces, which converts to kid growth.

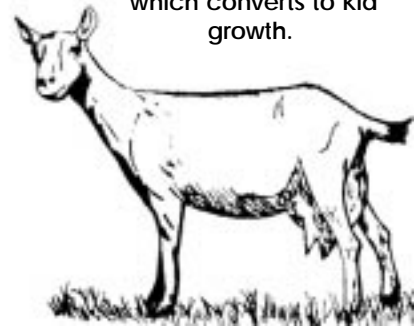
During the production cycle of the doe, nutrient requirements change (see Appendix). The dry period, or non-lactating period, after the kids are weaned should be considered at the beginning of the next breeding and lactation cycle. Generally, kids are weaned before the doe is bred. During the dry period, the doe is recovering nutrients used when nursing the kids. Nutrient demand is the lowest, and the concern is to keep the goat alive and healthy. Before breeding, the doe should be flushed if she is thin; it also may benefit does that are in average body condition. Flushing is the practice of increasing feed access to the does which will increase ovulation rate. Flushing should begin 30 days prior to the introduction of the bucks to the herd and continue for 30 days after bucks have

started breeding. If goats have been on pasture or brush, flushing can be done by turning goats on a lush pasture or by feeding grain. Increase availability of grain gradually to avoid enterotoxemia. Corn can be used to flush at a rate of one-half to three-quarter pound per day per doe in most meat goat operations.

In early gestation or the first 100 days of pregnancy, the fetus(es) grow slowly, and the doe can be fed a maintenance diet or turned back on pasture/brush. In late gestation or the last 50 days of pregnancy, fetal growth explodes. Seventy percent of the initial weight of the kid is gained during the last 50 days of gestation. Requirements of protein and energy increase drastically in this last third of gestation. Weather must be taken into account in any goat operation. If the seasonal reproductive cycle has been followed, late gestation occurs during January to March when the weather is cold. A supplemental feeding program with light flushing may be required to promote overall health of the doe and survival of the fetus(es). After kidding, the lactating doe is in the most nutritionally demanding period, often more than double the dry period. If does are properly fed, peak milk production will occur at two to four weeks after kidding and then will start to decline rapidly.

When the available forage is insufficient in protein, energy or minerals to support desirable levels of goat performance, proper supplements should be

The amount of nutrients required by the doe is related to amount of milk she produces, which converts to kid growth.



offered in adequate quantities. Always consider the cost-benefit of supplementation. Most owners provide minerals to their goats throughout the year. Typically, these minerals are in the form of trace mineralized (loose or block) salt. Individual sources of calcium and/or phosphorus (offered separately or in combination with salt) or commercial mineral mixtures are available. Fescue and bermuda that are growing well have a good ratio of calcium and phosphorus, but most winter annuals are lower in calcium and may require supplementation with limestone. For legumes, such as alfalfa and clover, phosphorus content of forages is usually much lower than calcium content, and supplementation with phosphorus is usually economical. Goats (with the possible exception of Angora) apparently have a much higher tolerance to copper than sheep, so typical cattle mineral mixes are usually safe for goats.

In grazing situations in which the plants are too low in protein or in which forage quantity is limited, 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. Compare protein costs, presence of other dietary components, palatability, feeding facilities required, labor cost/convenience and likelihood of achieving uniform intake per animal when supplementing protein in the diet. Feeding a hay of high protein level is frequently the most economical solution. In other cases, a pound or so of 20 percent crude protein (CP) cubes, .5 lb of 40 percent CP supplement or 0.5-1.0 lb of whole cottonseed may be economically sound and nutritionally adequate. Protein blocks may be used for convenience but may be costly. Some owners have observed that grazing small grain pastures for only one to two hours per day will provide adequate supplemental protein and energy to their dry pastures

or non-legume, lower quality hays. The continuous availability of forage, even poor quality hay, is important during such protein supplementation; it allows the animals to obtain energy and more efficiently use the protein.

When existing pastures and/or browse are unacceptably low in energy, you may offer good quality hays to maintain performance of the goats; 0.5 to 1.0 lb of shelled corn or cottonseed also may be used as a supplement. Without adequate energy, conception rates, milk production and kid growth rates will be reduced. If hay or pasture quality and availability is limited, protein blocks and additional hay free choice may provide adequate nutrition to the goats.

Goats can be grazed with beef cattle. Generally, up to eight goats eat about the same amount of feed as one beef cow (Table 4). Because of the complementary grazing habits, the differential preferences for various plants and the wide variation in vegetation within

most pastures, one to two goats can be grazed with one beef cow without adversely affecting the feed supply of the beef herd. The selective grazing habits of goats in combination with cattle eventually produce pastures which are more productive, of higher quality and less contaminated with weeds as a result of the mixed grazing of the goats and cattle.

When planning grazing and supplementation practices, always remember that a meat goat enterprise generates cash income from the sale of surplus kids and cull adults as well as non-cash benefits from brush control and pasture improvement – perhaps \$40 to \$70 per breeding female per year. Adequate year-round grazing with only mineral supplementation is normally the best option for feeding as other options increase costs but may be economical. However, the economics of hay or grain supplementation must be considered when pasture is limited and the most economical method of feeding utilized.

Table 4. Estimated stocking ratings or feed needs for goats, sheep and cattle on pasture

Pasture Type	Goats	Cow
	Head/Acre	
Good quality pasture system	6 - 8	1
Good quality brush-browse system	9 - 11	1
	Head/Acre	
Wheat/alfalfa system	10 - 12	1.5
Alfalfa pasture, Oklahoma	12 - 15	1.9

Nutrition *of* Bucks (Billies)

Mating places high nutritional demand on bucks. Therefore, bucks should be enrolled in an increased nutrition program similar to flushing the does six weeks before being introduced to the herd. If bucks have been on pasture or brush, the nutritional increments need to be gradual to avoid enterotoxemia. Also, a calcium: phosphorus ratio of 2.0 to 2.5 may be necessary to avoid urinary calculi. Salt and water should always be available to the buck and 0.5 percent ammonium chloride may be added to the concentrate mix of the buck if urinary calculi is a problem.



Male goats must be properly fed to be fertile.



Llamas can protect the goat herd.

Summary

Nutrient requirements for goats vary with the stage of maintenance, growth, pregnancy and lactation. Some goats are used as browsers to clear brush from land, while other goats are fed for maximum growth or lactation. In all cases, goats should be fed in an economical manner to ensure that they do not get too fat or too skinny. Other management practices, such as deworming, should be conducted so that goats can efficiently utilize the feed that they consume.

Additional information concerning goats can be obtained at www.uaex.edu.

APPENDIX: Nutrient Requirements of Goats

Daily Feed Requirements												Dry Matter Intake per Animal per Day	
Body	Weight ¹	Daily Energy				Daily Protein		Daily Requirements				When 1 kg or 2.2 lb feed = 2.0 Mcal ME	When 1 kg or 2.2 lb feed = 2.4 Mcal ME
(lb)	(kg)	TDN ² (g)	DE ³ (Mcal)	ME ⁴ (Mcal)	NE ⁵ (Mcal)	TP ⁶ (g)	DP ⁷ (g)	Ca (g)	P (g)	Vitamin A (1000 IU)	Vitamin D (IU)	% of kg BW	% of kg BW
Maintenance only (includes stable feeding conditions, minimal activity and early pregnancy)													
22	10	159	0.70	0.57	0.32	22	15	1	0.7	0.4	84	2.8	2.4
44	20	267	1.18	0.96	0.54	38	26	1	0.7	0.7	144	2.4	2.0
66	30	362	1.59	1.30	0.73	51	35	2	1.4	0.9	195	2.2	1.8
88	40	448	1.96	1.61	0.91	63	43	2	1.4	1.2	243	2.0	1.7
110	50	530	2.34	1.91	1.06	75	51	3	2.1	1.4	285	1.9	1.6
132	60	608	2.68	2.19	1.23	86	59	3	2.1	1.6	327	1.8	1.5
154	70	682	3.01	2.45	1.38	96	66	4	2.8	1.8	369	1.8	1.5
176	80	754	3.32	2.71	1.53	106	73	4	2.8	2.0	408	1.7	1.4
198	90	824	3.63	2.96	1.67	116	80	4	2.8	2.2	444	1.6	1.4
220	100	891	3.93	3.21	1.81	126	86	5	3.5	2.4	480	1.6	1.3
Maintenance plus low activity (= 25% increment, intensive management, tropical range and early pregnancy)													
22	10	199	0.87	0.71	0.40	27	19	1	0.7	0.5	108	3.6	3.0
44	20	334	1.47	1.20	0.68	46	32	2	1.4	0.9	180	3.0	2.5
66	30	452	1.99	1.62	0.92	62	43	2	1.4	1.2	243	2.7	2.2
88	40	560	2.47	2.02	1.14	77	54	3	2.1	1.5	303	2.5	2.1
110	50	662	2.92	2.38	1.34	91	63	4	2.8	1.8	357	2.4	2.0
132	60	760	3.35	2.73	1.54	105	73	4	2.8	2.0	408	2.3	1.8
154	70	852	3.76	3.07	1.73	118	82	5	3.5	2.3	462	2.2	1.8
176	80	942	4.16	3.39	1.91	130	90	5	3.5	2.6	510	2.1	1.8
198	90	1030	4.54	3.70	2.09	142	99	6	4.2	2.8	555	2.1	1.7
220	100	1114	4.91	4.01	2.26	153	107	6	4.2	3.0	600	2.0	1.7
Maintenance plus medium activity (= 50% increment, semiarid rangeland, slightly hilly pastures and early pregnancy)													
22	10	239	1.05	0.86	0.48	33	23	1	0.7	0.6	129	4.3	3.6
44	20	400	1.77	1.44	0.81	33	38	2	1.4	1.1	216	3.6	3.0
66	30	543	2.38	1.96	1.10	74	52	3	2.1	1.5	294	3.3	2.7
88	40	672	2.97	2.42	1.36	93	64	4	2.8	1.8	363	3.0	2.3
110	50	795	3.51	2.86	1.62	110	76	4	2.8	2.1	429	2.9	2.4
132	60	912	4.02	3.28	1.84	126	87	5	3.5	2.5	492	2.7	2.3

154	70	1023	4.52	3.68	2.07	141	98	6	4.2	2.8	552	2.6	2.2
176	80	1131	4.98	4.06	2.30	156	108	6	4.2	3.0	609	2.5	2.1
198	90	1236	5.44	4.44	2.50	170	119	8	4.0	3.3	666	2.5	2.0
220	100	1336	5.90	4.82	2.72	184	128	7	4.9	3.6	723	2.4	2.0
Maintenance plus high activity (= 75% increment, arid rangeland, sparse vegetation, mountainous pastures and early pregnancy)													
22	10	278	1.22	1.00	0.56	38	226	2	1.4	0.8	150	5.0	4.2
44	20	467	2.06	1.68	0.94	64	45	2	1.4	1.3	252	4.2	3.3
66	30	634	2.78	2.28	1.28	87	60	3	2.1	1.7	342	3.8	3.2
88	40	784	3.46	2.82	1.59	108	75	4	2.8	2.1	423	3.5	3.0
110	50	928	4.10	3.34	1.89	128	89	5	3.5	2.5	501	3.3	2.7
132	60	1064	4.69	3.83	2.15	146	102	6	4.2	2.9	576	3.2	2.7
154	70	1194	5.27	4.29	2.42	165	114	6	4.2	3.2	642	3.0	2.6
176	80	1320	5.81	4.74	2.68	182	126	7	4.9	3.6	711	3.0	2.5
198	90	1442	5.35	5.18	2.92	198	135	8	5.6	3.9	777	2.9	2.4
220	100	1559	6.88	5.62	3.17	213	150	8	5.6	4.2	843	2.8	2.3
Additional requirements for late pregnancy (for all goat sizes)													
		397	1.74	1.42	0.80	82	57	2	1.4	1.1	213		
Additional requirements for growth-weight gain at 50 g per day (for all goat sizes)													
		100	0.44	0.36	0.20	14	10	1	0.7	0.3	54		
Additional requirements for growth-weight gain at 100 g per day (for all goat sizes)													
		200	0.88	0.72	0.40	29	20	1	0.7	0.3	108		
Additional requirements for growth-weight gain at 150 g per day (for all goat sizes)													
		300	1.32	1.08	.060	42	39	2	1.4	0.8	162		
Additional requirements for milk production per kg or 2.2 lb at different fat percentages (including requirements for nursing single, twin or triplet kids at the respective milk production level)													
	Daily Energy					Daily Protein		Daily Requirement					
	%Fat	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)	Ca (g)	P (g)	Vitamin A (1000 IU)	Vitamin D (IU)		
	2.5	333	1.47	1.20	0.68	59	42	2	1.4	3.8	760		
	3.0	337	1.49	1.21	0.68	64	45	2	1.4	3.8	760		
	3.5	342	1.51	1.23	0.69	68	48	2	1.4	3.8	760		
	4.0	346	1.53	1.25	0.70	72	51	3	2.1	3.8	760		
	4.5	351	1.55	1.25	0.71	77	54	3	2.1	3.8	760		
	5.0	356	1.57	1.28	0.72	82	57	3	2.1	3.8	760		
	5.5	360	1.59	1.29	0.73	86	60	3	2.1	3.8	760		
	6.0	365	1.61	1.31	0.74	90	63	3	2.1	3.8	760		
Additional requirements for mohair production by Angora at different production levels													

Annual Feed Requirements												
		Annual Energy				Annual Protein						
Annual Fleece Yield												
(lb)	(kg)	TDN	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)					
4.4	2	16	0.07	0.06	0.03	9	6					
8.8	4	34	0.15	0.12	0.07	17	12					
13.2	6	50	0.22	0.18	0.10	26	18					
17.6	8	66	0.29	0.24	0.14	34	24					

¹ 1 lb = 454 gm or 1 kg = 2.2 lb

² Total digestible nutrients

³ Digestible energy

⁴ Metabolizable energy

⁵ Net energy

⁶ Total protein

⁷ Digestible protein

Notes

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