Supplementation of Browsing/Grazing Goats

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Disclaimer: The discussion herein focuses on the use of supplements in meat goat production systems where goats are expected to browse/graze forages as their primary source of nutrition.

Introduction

For those interested in profiting from the production of goats for meat, **the secrets to success** center around **reproductive performance, the cost of production and market price**. Adequate nutrition is a prerequisite for reaching the animal's genetic potential for reproductive performance, lactation and growth. Nutrition (feed, supplements, hay, etc.) is almost always among the three largest enterprise costs associated with goat raising. Reproduction and seasonal trends in the goat market and market preferences are discussed elsewhere in these proceedings.

Characterization of Feeds vs. Supplements

Goat Feeds	Supplements
def. – *n.* food for animals or birds; (informal) a meal.	def. – *n.* something added to complete a thing, make up for a deficiency, or extend or strengthen the whole.
- developed to be a complete balanced diet protein, energy, minerals, vitamins, fiber	- compliments a forage base + browse, forbs, grasses + harvested forage (i.e. hay)
- intended to be fed in larger quantity than supplements	- greater nutrient concentration than a "feed"
- typically 12-18% crude protein	- crude protein content ranges from 10-45 %
- typically pelleted in $\leq$ ¼" pellets	- nutrient content not balanced with animal requirements
- intended to be a complete balanced diet protein, energy, minerals, vitamins, fiber	- includes pellets, cubes, blocks, tubs, licks
-often includes medications or nutriceuticals for coccidiosis, urinary calculi, …	- by-products like whole cottonseed, oilseed meals, soy hulls, etc.
- developed to be fed at 1.5 - 4% of body weight	- whole grains like corn, oats
	- typically fed at no more than 0.5% of body weight

Grazing Preferences
Goats prefer to harvest browse (leaves from shrubs and trees). If browse is absent or of limited availability, goats are will alter their preference and make use of forbs (weeds) and grasses.

Cattle have a broad muzzle and a large rumen capacity, which enables them to harvest and utilize lower quality forages like mature grasses. In comparison, goats have a narrow mouth and flexible lips, which allow them to be very selective harvesters. Their relatively small rumen is not well suited for processing poor quality forages.

The plants being grazed by goats can provide some indication of the diversity, quantity and quality of the available forage. The photos below represent excellent

Excellent browse availability (*upper left*), a well established browse line on a preferred species (*lower left*), and heavy use of juniper, a plant low on the preference list (*lower right*).

availability (upper left) where ample forage is available and supplementation should not be warranted except during periods of the highest nutrient demand (i.e. late pregnancy, early to mid lactation). The photo on the lower left demonstrates significant use of a preferred browse species (oak) and might warrant pasture rotation or a reduction in stocking rate. Lastly, establishment of a well-defined browse line on less preferred plants like juniper (lower right) is likely a reflection of overstocking, the absence of more preferred browse plants and a need for significant supplementation.

Grazing Behavior
Most domestic ruminants follow a bimodal daily pattern of grazing. If the forage supply is adequate, grazing animals will forage in the morning, seek shade and ruminate (chew their cud) during the midday hours, and then graze again during the late afternoon and evening. During the summer months, animals may shift the pattern and graze more during the night in an attempt to avoid the intense mid-day heat.

Normally, goats will be found near the water source or in the shade during the mid-day hours. If goats or other ruminants are found grazing all day long and especially during the middle of the day, such behavior could indicate that forage availability is limited.

If possible, observe grazing patterns and provide/distribute supplements during the time of the day when goats are not grazing in order to avoid interruption of the grazing pattern.

Providing Supplements and Promoting Health

The purpose of supplementation is to "fill the voids" between nutrient demand and nutrients provided by the browse/forage. Supplements provide the protein, energy, minerals and/or vitamins required by the goat to achieve the desired level of performance. Performance comes in several forms – weight gain, lactation, and reproduction. The goal is to either simply "add to" the nutrients in the forage being consumed or use supplements to actually increase forage consumption.

Sometimes goats replace forage with supplement (substitution). For example, suppose grazing conditions allow a goat to harvest 3 pounds of forage daily. Yet when fed 1 pound of supplement, this goat might consume only 2.3 pounds of forage.

Generally, if the amount of supplement fed per day is held to 0.5% of body weight or less, supplementation occurs. As the amount of supplement fed daily moves closer to 1% of body weight and beyond, substitution begins to occur.

Live weight, lb	0.5% of body weight, lb
40	0.2
60	0.3
80	0.4
100	0.5
120	0.6
140	0.7
160	0.8
180	0.9
200	1.0

Note (from the table at left) that 0.5% of body weight for a 120-pound doe is only 0.6 pound of feed per day.

One of the most commonly used feed measuring containers is a 3 pound coffee can (actually a net weight of 39 oz. of coffee). For reference purposes, a 3 pound coffee can will hold the following amounts of feed:

¾" cubes ……... 4.75 lb.
5/32" pellets ……. 5.00 lb.
whole shelled corn …… 6.25 lb.

Ideally, supplements should be provided in clean troughs 12 to 18 inches above the soil surface. Feeding in troughs reduces the chance of picking up infective stomach worm larvae or other soil borne pathogens. However, supplementing in troughs is not always practical, especially in larger herds and in large pastures. Consequently, many pasture

goats are fed on the ground. If so, move the feeding area frequently for sanitation purposes. If providing a pelleted feed, consider 3/8 to ½ inch cubes to minimize wastage.

Managing the Cost of Supplementation

Following is a prioritized list of suggestions for getting a grasp on supplement costs.

1. An **appropriate stocking rate** is essential if efficiency and economy are expected of the supplementation program. The success or failure of a supplementation program is often dictated by the browse/forage being supplemented.

2. Nutrient **requirements** of the doe must be **matched with the productivity** of the environment. In a stress-free environment, those does with larger mature size, later maturity and greater milk production potential will have a production advantage. However, in the environments where goats have a competitive advantage (over cattle and sheep), seasonal nutrient deficiencies will occur; in these environments, early maturing, smaller mature size goats will be more efficient producers.

3. The period of greatest **nutrient demand** (last 1/3 of gestation through lactation) should coincide with the greatest expected **nutrient availability**. Does kidding in the spring are in perfect time with Mother Nature. Marketing opportunities may warrant kidding at other times. If so, higher market prices will be required to offset the increased cost of production. Unless intensively managed, kids born mid-May through September in the southern US will grow slower and gain less weight.

4. Where possible, **sorting does by physiological status and age** will improve supplementation efficiency and reduce costs. Older does will dominate the feedground and consume more than their share of supplements. Late-bred and lactating does have much greater nutrient demands than open does. Body condition adjustments are most efficiently made during the first and second trimesters of pregnancy. Such sorting is not feasible if bucks are continually mating does (year-round breeding).

5. Deciding **when to begin and end supplementation** are critical decisions. The tendency for many producers is to start too late and quit too early. Body condition is less expensive to maintain than to replace. Dormant forages and the environmental stress of winter normally warrant supplementation. Drought requires providing a forage substitute such as hay.

6. **Nutrient content of the supplement** has a significant impact on the response observed and cost of the program (see table below). The table focuses on the protein content of four different feeds, their contribution to a doe's daily protein requirement and the respective cost of each. When fed at the same level (0.6 lb/day), the supplements provide from 22 to 89% of the doe's daily protein requirement.

Amount of protein provided if a 120 lb doe* in early pregnancy is offered 0.5% of her body weight (0.6 lb)			
Supplement	lb crude protein	% of doe's daily requirement	Cost** ($/day)
Corn	0.06	22%	0.05
Pellet - 15% protein	0.09	32%	0.07
Cube - 20% protein	0.12	43%	0.08
Cube - 41% protein	0.25	89%	0.09
*A 132 lb. doe requires 126 g (0.28 lb) of total protein per day. **Using winter 2004-05 Southwest Texas feed costs.			

When comparing supplements, perhaps the most effective method is to compare on a cost per unit of nutrient basis. The four feeds are compared on a dollar per unit of crude protein basis in the following table.

		Cost*	**Cost**
Supplement	**% CP**	**$/50 lb**	**$/lb protein**
Corn	10	4.25	0.85
Pellet – 15% CP	15	5.95	0.79
Cube – 20% CP	20	6.70	0.67
Cube – 41% CP	41	7.20	0.35
CP = crude protein * Typical Southwest Texas prices for winter 2004-05.			

As shown in the far right column, there is generally an inverse relationship between protein content and cost per unit of protein. If protein is the first limiting nutrient, the higher protein supplements are usually the most cost effective. Similar comparisons can be made for cost per unit of energy using TDN (total digestible nutrient) content.

7. **Sound decisions** relative to **purchasing and providing** supplements can reduce costs. Where feasible, buying in bulk or by the ton is less expensive than buying supplements or feed 50 pounds at a time. However, the additional cost associated with purchasing supplements on an as needed basis assures fresh feed and takes advantage of the retailer's storage facilities.

   Self-limiting supplements (tubs and blocks) are usually more expensive on a $/lb of nutrient basis than pellets, cubes or by products feedstuffs. Producers are paying for the additional manufacturing and packaging costs and the convenience (fewer/less frequent trips to the pasture) afforded by a self-limiting supplement. Also, in theory, the continuous availability of supplement will result in more uniform consumption across the herd. Such is not always the case.

Research involving grazing cattle indicates that all natural (does not contain a non-protein source such as urea) high protein (>30% crude protein) supplements can be fed infrequently with no adverse effect on grazing behavior, forage digestibility or animal performance. Studies indicate that animal performance was similar when cows were offered supplement daily, every other day or twice weekly.

In contrast, energy dense supplements (corn, barley) should be offered daily, especially if fed at level above 0.5% of body weight. Large doses of grain will reduce rumen pH, reduce forage digestibility and intake, and can result in acidosis or bloat.

Comments on some of the more common supplements and feedstuffs used in the meat goat industry conclude this paper.

	Observations & Comments
Corn	Goat candy. Excellent energy supplement. When combined with a bucket, is a very inexpensive management tool for gathering, moving and penning goats. Can be fed on the ground or in a trough. If fed alone, feed as whole kernel. If mixed in a textured feed, cracking is suggested to reduce sorting.
Pellets, cubes	Excellent supplements, especially those ≥20% crude protein. Convenient, easy to handle. Can be formulated to correct specific deficiencies and deliver medications and nutriceuticals.
Whole oats	Safe. Good energy supplement. Slightly higher protein than corn and grain sorghum. Should be fed in a trough. Disadvantage – more expensive ($/lb energy) than corn.
Grain sorghum	Protein and energy content similar to corn, but less palatable. If fed alone, should be fed whole and in a trough.
Cottonseed	Excellent protein, energy (from oil) and phosphorus supplement. Can be fed on the ground or in troughs. Disadvantage – must be purchased bulk in large quantity and ideally protection from the weather is recommended. If fed at high levels for long periods, gossypol can reduce reproduction. Handling is labor intensive.
Alfalfa hay	Bi-vocational – can be used as a supplement to or a substitute for forage. Very palatable. If fed on the ground, some of the leaves will be wasted.
Sorghum sudan hay	Seldom of high enough quality to be used as a supplement. Leaves and small stems readily consumed. Larger stems often wasted. To make hay for goats, if possible, harvest and bale before seed heads emerge.
Bermudagrass hay	High quality hay is a good browse/forage substitute for mature goats. If more than 20 days old at harvest, will be little more than filler for goats.
Peanut hay	Potentially a supplement. Very palatable. Quality can vary significantly; more leaves and peanuts = better quality. Be careful when purchasing sight-unseen. Disadvantage – limited availability.
Soybean hulls	Excellent energy supplement. By-product of soy oil and soybean meal industry. Energy content similar to corn, but potential for bloat/acidosis is reduced. May be pelleted or bulk. Should be fed in a trough. Disadvantage – freight costs, handled in bulk quantity, must be protected from the weather.
Cottonseed hulls	Never a supplement. Very palatable. Excellent fiber source. Low protein (5%) and very low energy content. Work very well in mixed feeds, pellets and cubes. Disadvantage – expensive ($/unit protein or energy), freight costs, handled in bulk quantity, should be protected from the weather.
Rice hulls, peanut hulls	Never a supplement. Poor quality, relatively low palatability. Used as inexpensive filler in some goat feeds.