

# GETTING STARTED IN THE MEAT GOAT BUSINESS

Bulletin I, Vol. VI



## Nutrition and Pasture Management For Meat Goats



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# To My Producers

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## Acknowledgments

Special appreciation and gratitude is extended to Dr. Jean Beaudouin, Dr. Lawrence Carter, Dr. Pam Hunter, Dr. Ray Mobley, Mr. Godfrey Nurse and Mr. Gilbert Queeley for their constructive criticisms and advice while reviewing and editing this publication.

New publications from the "Getting Started in the Meat Goat Business" series are coming soon

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## INTRODUCTION

Today, many people still believe that goats will eat anything from old rusty tin cans to newspapers, garbage or clothing. Like most animals, goats will consume many things including poisonous plants when they are famished, but never tin cans. Goats are active foragers and will selectively consume a wide variety of roughages to meet most of their nutritional demands.

### Dispelling the Myth

Under favorable conditions, goats prefer good quality forages. If given a choice, they prefer grass over clover, browsing over grazing, grazing alone fence lines instead in the center of pastures, grazing the top of the pasture canopy before grazing close to the ground level and foraging on rough, steep terrain over flat smooth land (McCall, Date).

In dietary terms, goats also have selective eating habits and will consume young plant shoots in preference to woody stems, consume young leaves instead of old plant leaves, and consume shoots and leaves on bushes and trees instead of eating brown, dead grass (McGregor, date) hence, they do not eat everything. They change their eating behavior based on the availability of the vegetation, the stage of growth of the vegetation and the

digestibility of the forage species. In essence, goats will only resort to consuming poor quality feedstuff, if they are managed under less than desirable conditions. Unfortunately, some goats will resort to consuming non-edible feedstuff out of curiosity even when conditions are favorable.

Research has shown that goats acquire their eating habits from the herd they were raised with earlier in life (Stanton, 1999).

Therefore, when you decide to purchase new animals, try to find goats that have been raised in similar feeding systems as you plan to raise

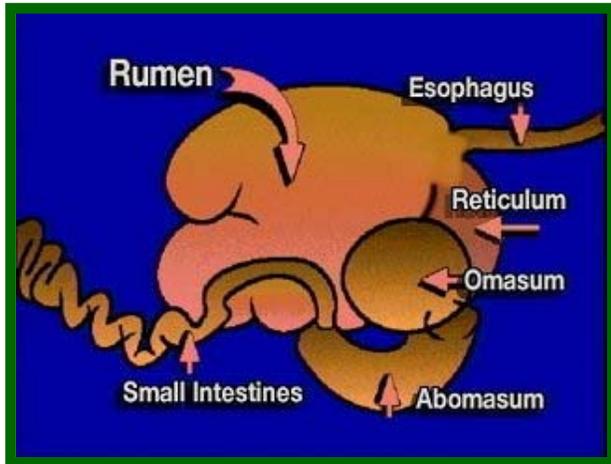
your own animals. Goats that are managed under intensive condition (i.e., may find it very difficult to adjust to a pasture management system at first even if there are plenty of edible plants around to graze. After quarantining the new animals, place the new arrivals in an area where the dominant does are grazing to train the new goats. This process may make the transitional period easier for the newcomers.

### The Digestive System of the Goat

Like cattle and sheep, goats are ruminants (i.e., four chamber stomach) and can consume large quantities of forages that are relatively indigestible



to monogastric (simple stomach e.g. primates, horses, swine) animals. The digestive track of ruminants consist of a four chambered stomach, a cecum



and the large and small intestines which enables the animal to utilize roughages as a source of energy. The animal will typically take little to no time to chew its food before swallowing. Eventually, the food will be regurgitated back into the mouth and the animal will spend its time ruminating.

Goats may spend one-third of their lives in this process. The food is then reswallowed and passes into the first stomach (rumen). At birth, the rumen is undeveloped and begins to develop when the young animal starts to consume solids. The rumen (paunch) is the site where anaerobic bacterial fermentation takes place.

Microorganisms break down the fiber in the feed and produces energy, protein, vitamin B and K for the animal. The digesta then passes into the reticulum (honeycomb) where additional

fermentation occurs and foreign metal objects (i.e., nails, screws) are trapped. The omasum (manypiles) is the third stomach where further absorption of moisture from feedstuff occurs. The digesta then passes into the fourth stomach which is called the abomasum or true stomach. In this region, the digesta is further broken down by the action of hydrochloric acid and enzymes that can be absorbed by the stomach walls and the intestines.

### Nutrient Requirements for Goats

Nutrition involves a series of processes by which food is ingested to nourish the body, repair injured or worn tissues and to aid in the support of life. Other physiological processes that nutrition is necessary for is to promote growth, for maintenance, for lactation, for fattening and for reproductive processes.

Goats raised for meat purposes require high quality feeds and forages to obtain their maximum genetic potential. They may require additional supplements such as grain and concentrate during the breeding season, during lactation or when the forage quality is poor. An improper feeding program can lead to low birth, weaning and yearling weights among the offspring in the herd.

There are five classes of nutrients that are of importance and must be taken under consideration when

developing a feeding program. These nutrients are energy, protein, vitamins, minerals and water.

## **Energy**

Energy primarily comes from two sources, carbohydrates and fats. These energy sources are derived from the breakdown of fiber in forages and feed. Total Digestible Nutrients (TDN) is one of the most common ways of expressing energy for ruminants.

According to McDowell (1990), goats that are fed high energy rations (70-80 %TDN) are able to obtain average daily gains (ADG) between 200-300g/day. These gains will also depend on the age, sex, health and breed of the animal. ADG will decline when goats consume rations or forages with less than 40% TDN.

Energy is usually the nutrient that is frequently deficient in the diet of goats. Poor quality pastures and roughage are generally the primary cause of energy deficiencies. Low levels of energy often leads to retarded growth, delayed onset of puberty, low milk production, abortions, low fertility rates, and low resistance to diseases and parasitic infestations.

When goats consume excess energy, it is stored in the body as fat. Fat should never be added more than 5% of the total ration because it may interfere with the fermentation process in the rumen. Examples of forages that have

high energy values are white clovers (80%TDN), red clovers (TDN 75%), crimson clover (67%TDN), rye (69%TDN) and ryegrass (62%TDN). High energy feeds include corn (87% TDN), barley, oats, wheat grain and molasses. Molasses is often used in cattle feeds to increase energy levels, to increase palatability while reducing dustiness from feeds that contain meal (i.e., soybean meal, peanut meal). If too much molasses is added in the ration, the feed will attract unwanted pests such as ants and the feed will become too sticky, thus digestibility of the other feed sources in the ration are reduced. Therefore, molasses should not be supplemented more than 10% of the total ration for goats.

## **Protein**

Protein is usually the most expensive nutrient in the animal's diet. It is necessary for growth, milk production, disease resistance, reproduction and maintenance of the body. Protein and energy are two nutrients that interact with each other to some extent. Therefore, deficient levels of protein in the diet will cause the digestion of carbohydrates in the rumen to decrease and at the same time intake will decrease. Like energy, protein deficiencies can lead to poor growth rates, delayed onset of puberty, lengthen of the anestrous period,

retarded fetal growth and low milk production.

Leguminous forages such as red clover, cowpea, white clover often



contain 25% crude protein while grasses seldom exceed 17% crude protein (Huston, 1992). Other sources of protein include, soybean meal, cotton seed meal, peanut meal and linseed oil. Urea and other non-protein products is also used as a source of protein in the diets of cattle, however, the appropriate use of this feed source for goats is not known by the author at this time.

Young goats generally require 14 to 18% crude protein in their daily diet and adults generally will need 12 to 14%

crude protein. Unlike energy, protein is not stored in the body. Excess protein is excreted out of the body through the urine. Since protein is



usually the most expensive nutrient in the ration over feeding protein is wasteful and economically unsound.

## Vitamins

Vitamins are required by ruminants in small quantities for normal body functions. There are two classifications of vitamins fat soluble and water soluble. The fat soluble vitamins include A, D, E and K and are stored in the body. The water soluble vitamins are not stored in discernible amounts (except for vitamin B<sub>12</sub>) in the body and these include the vitamin B-complexes and vitamin C. They must be supplied in the diet on a daily basis in non-ruminant animals. Under normal conditions, the water soluble vitamins requirements in ruminants is met through microbial synthesis in the rumen or synthesis in the body tissue as in the case of vitamin C. Any changes in feed-intake may reduce the availability of these vitamins.

## Minerals

Goats require minerals to maintain basic body functions and for optimum production. Most minerals can be obtained from high quality forages. The macro minerals are calcium, phosphorus, sodium, chlorine, magnesium, potassium and sulfur which must be available in the diet in large amounts. Most forages generally have

adequate levels of calcium, thus, grazing conditions are usually efficient for goats. However, urinary calculi is a condition that usually occurs in male goats that consume too much phosphorus in relation to calcium.

Urinary calculi is a disease that can occur in wethers and less often in intact males. The condition is brought on by the presence of crystals or calculi in the urinary tract. The crystal can irritate the lining of the urinary tract, causing cystitis or urethritis. The crystals may become lodged in the urethra, thus obstructing partially or the complete passage of urine from the body. Animals affected with this disease may show evidence of colicky pain such as kicking at the belly, pain when urinating, straining to urinate, distension of the abdomen "water belly," blood tinged urine, they may go off feed or become depressed. Thus, the calcium to phosphorus ratio should always be 2:1 (calcium:phosphorus) to prevent this condition.

Magnesium is required for normal skeletal development, activation of enzymes, calcium and phosphorus metabolism and sulfur is usually sufficient in most feed-stuff. Deficiency in potassium is seldom seen unless the animal is fed a high concentrate diet. Potassium supplements can be added in the ration to reduce this problem.

Deficiency in sodium or chlorine can lead to consumption of soil or rubbish.

Lack of these nutrients can also reduce voluntary feed intake and may lead to poor growth and a wobbly gait. Goats normally require 5 to 18 pounds of salt per year. The level will vary depending on the animal's production requirement (Van Horn, 1998). Salt is commonly supplied in the diet as free choice. It is also used as a carrier for trace minerals in the form of a trace mineralized block.

Trace minerals include iron, iodine, copper, molybdenum, zinc, manganese, cobalt, fluorine and selenium. Selenium deficiencies are usually found in areas where the soil is deficient of this nutrient such as in the state of Florida. Does may experience early embryonic death, retained placenta after kidding, metritis or weak newborn kids otherwise known as white muscle disease. Vitamin E/Se injections can be given prior and during pregnancy to prevent this problem.

Since goats are active foragers, they can generally meet all of their vitamins and mineral requirements through the consumption of lush green pastures and sun shine (vitamin D) during late spring, summer and early fall. Good quality sun-cured hay is an excellent source of vitamin D, especially when forages are unavailable.

## **Water**

Goats can generally consume 1 quart to 1 ½ gallons of water per day. Feed-

intake is influenced by water consumption, therefore fresh water must be provided for the herd each day. Water is also required for digestion, regulation of body temperature, to transport nutrients through out the body, for excreting waste from the body and milk production. Water requirements may increase or decrease depending on the physiological state of the animal (i.e., gestation, lactation).

### **Production Systems**

Operating a profitable meat goat enterprise will largely depend on how much weight the animal can gain with the least amount of expense. Pastures are the cheapest means of feeding the goat herd, however, grazing areas require clipping, liming and fertilizing on a routine basis to yield the highest forage quality. Pastures that are overstocked perpetuates' overgrazing, encourages the growth of weeds and will increase the chance that the herd will be burden with a heavy parasitic load or other infectious diseases.

There are three basic systems that goats can be managed under in the southeast. They are the extensive, semi-intensive and the intensive system. Goats that intensively managed are confined and provided with hay, concentrate or grain. This is the most expensive system for raising goats. Some dairy goat producers and

breeders may implement this system on their farm.

Semi-intensive and extensive management systems are commonly seen on meat goat farms in the southeast. In the case of the semi-intensive system, the goats are grazed on improved pastures that has been fertilized and limed and the animals are supplemented with feed at the rate of 0.5 - 3 pounds per head per day (McGown, 1995).

Goats that are managed extensively, select a wide variety of browse, shrubs, briar, forbs and other forages as their primarily source of nutrition. Grain is only supplemented in late July and August or prior to breeding when the nutrient content of the forages has declined. The extensive system is the cheapest means by which to raise goats, but may not be the most productive for raising market kids or feeding pregnant does.

### **Grazing Management Systems**

Once you have decided which production system that will best assist you in meeting your production goals, next consider which type of grazing management system will be appropriate for your farm. The grazing system that can best be used on your farm will depend on forage availability, pasture size, class of goats and your objectives. The two broad areas of grazing management systems that are used on

farms in the southeast are continuous grazing and controlled grazing (rotational grazing).

Continuous grazing permits the animals to have access to an unrestricted fixed pasture unit throughout the year or growing season. This system requires fewer inputs and the animal's performance is improved because the goats are able to select a wide variety of vegetation to meet their nutritional needs.

If the herd is not managed properly, soil erosion and parasites may become a problem because there is no interim period for rest to allow the vegetation to recover and the goats are at risk of becoming heavily latent with parasites. Another disadvantage that may occur in this system is the inability of the herd to make efficient use of most of the vegetation in the pasture areas.

Controlled (rotational) grazing, is a method by which the animals are limited to the amount of time they can spend on the pasture in order to control the quality, the yield and consumption of the pasture. Controlled grazing attempts to optimize the animal's performance and reduce wastage of the forages. By grazing a set number of animals on a given pasture for a certain period time, it is possible to control the amount of vegetation that is eaten, its quality and how long each paddock is rested between grazing. The herd may graze as little as a few hours to a few days.

Controlled grazing provides the greatest benefit for meeting the nutritional requirements of the goat herd. The practice of moving livestock from field to field, allows the grass or other plants they eat to recover and grow. Furthermore, the life cycle of most parasites in the paddock will be interrupted because without a host to ingest the larvae, the parasites will die.

To determine the best time to rotate the herd to a new paddock consider the following: (1.) Rotate the herd when the grass is lower than four inches from the ground, (2.) Rotate the herd when most of the goats in the herd have BCS (body condition scores) lower than five, (3.) Rotate the herd when everywhere you step in the pasture there is a pile of feces, (4.) Rotate the herd when the herd is consistently burden with a heavy parasitic load or (5.) Rotate the herd when the pastures are flooded from a heavy rainfall. Another method you can try is to rotate the herd on a scheduled date. For example rotating the animals on a weekly or bi-weekly basis, however after trying these methods and soil erosion and the herd

1 Acre Bahiagrass	1 Acre Pearl Millet	1 Acre Bahiagrass	Browse Area
1 Acre Bahiagrass	1 Acre Cowpea	1 Acre Bahiagrass	Browse Area

Figure 1. Spring and Summer Rotational Grazing System

health are still an issue on your farm you may have to rotate the herd even sooner than your scheduled date.

1 Acre Rye and Oats Grass	1 Acres Rye and Oats Grass	1 Acre Rye and Oats Grass	Browse Area Dormant
1 Acre Rye and Oat Grass	1 Acre Rye and Oats Grass	1 Acre and Rye Grass	Browse Area Dormant

Figure 2. Winter Rotational Grazing System

**The Benefits of Controlled Grazing Include:**

- Increased animal production per acre.
- Improved botanical composition of pasture (increased legume).
- Improved yield and monthly distribution of forage.
- Improved distribution and recycling of nutrients from animal manure and reduced mechanical handling .
- Improved soil conservation and water quality.
- Improved animal handling and allocation of pasture forage due to positive changes in animal behavior.
- Reduced need for machinery, fuel and facilities.
- Reduced supplemental feeding requirements.
- Reduced fluctuations in the quantity and quality of forage grazed by animals.
- Reduced wasted forage from pasture (Mueller et. al., 1995).

The disadvantages to this type of system include:

- The cost of constructing fences, gates and lanes.
- The need for drinking water and shade in every paddock. is a perceived problem which can be economically solved.
- The small paddock size could make it inconvenient to use the currently owned machinery.
- The concern about increased soil compaction and treading damage from high stock density on small paddocks.
- The managerial abilities will have to change to more fully realize the potential of the system. In other words, simply developing more paddocks without improving grazing skills will not give good return on investment.
- Labor will have to increase because the frequent moving the goats to new paddocks (Muller et.al., 1995).

Frontal and creep grazing can be a component of the continuous and controlled grazing management systems. Those animals with the highest nutritional requirement (i.e., kids, pregnant does) will be permitted to graze first followed by the goats with the lower requirements (i.e., dry does) in a frontal grazing system. Creep grazing can also provide extra supplement for the growing kids. This

system involves providing a separate area where the does are unable to graze, but the kids can.

### **Pasture Maintenance**

In order for forages to grow and thrive, they need a number of different chemical elements. The most important are the following:

- Carbon, hydrogen and oxygen - Available from air and water and therefore in plentiful supply
- Nitrogen, phosphorus, potassium (potash) - The three macronutrients and the three elements you find in most packaged fertilizers
- Sulfur, calcium, and magnesium - Secondary nutrients
- Boron, cobalt, copper, iron, manganese, molybdenum and zinc - Micronutrients

The nutrients that are needed in the largest quantity by a plant are nitrogen, phosphorus and potassium. Without nitrogen, phosphorus and potassium, forages simply cannot grow because they are unable to make what they need. If any of the macronutrients are missing or hard to obtain from the soil, this will limit the forages growth rate. In nature, the nitrogen, phosphorous and potassium often come from decayed plants. In the case of nitrogen, the recycling of nitrogen from dead to living plants is often the only source of

nitrogen in the soil (Mylavarapu, date unknown).

To make forages grow faster, they will require elements that the plants need in readily available forms, which is why we use fertilizer. Most fertilizers supply just nitrogen, phosphorus and potassium because the other chemicals are needed in much lower quantities and are generally available in most soils. The numbers on the bag of fertilizer will tell you the percentages of available nitrogen, phosphorus and potassium found in the bag. So, 12-8-10 fertilizer has 12% nitrogen, 8% phosphorous and 10% potassium. In a 100-pound bag, therefore, 12 pounds is nitrogen, 8 pounds is phosphorous and 10 pounds is potassium. The other 70 pounds is known as ballast and has no value to the plants (Mylavarapu, date unknown).

The word "lime" refers to products derived from burnt (calcined) limestone, such as quicklime and hydrated lime. Limestone is a naturally occurring and abundant sedimentary rock consisting of high levels of calcium and/or magnesium carbonate, and/or dolomite (calcium and magnesium carbonate), along with small amounts of other minerals. It is extracted from quarries and underground mines all over the world.

Lime and limestone products are among the oldest materials used by humans for a very diverse range of applications. Today these products

serve as an essential building block in every industrial process. In agriculture, lime is used to adjust the pH in the soil and reduce toxic levels of manganese, iron and aluminum.

### Application Rates

Fertilizer and/or lime should be applied (1) if an increase in forage growth is desired, (2) if extra forage is needed, (3) if a return on the investment can be expected (Mylavarapu et. al., date unknown) or if a soil test indicates that fertilizer and/or lime is required. Fertilizer should usually be applied at the beginning of the growing season for the particular forage in question.



Warm-season perennial grasses should be fertilized in the early spring (February to March) to stimulate production at a critical time. To extend the grazing season, some grasses can be given an additional application of nitrogen in the late-summer/fall.

Limpoggrass, rhodesgrass, and stargrass will respond to the additional applications readily. However, this has not been found true in the case of bahiagrass (Mylavarapu et. al., date unknown).

Applying fertilizer in a timely manner can not only extend the grazing season, but also increase forage yield and quality, improve stand persistence and

provide better distribution of forages across the growing season. Pastures that are overgrazed limit the plants' ability to respond to the added nutrients and thereby, reduces potential yield (Mylavarapu et. al., date unknown). Therefore, don't graze the herd closer than 4 inches to the ground. This strategy can also reduce the likelihood that the animals will become heavily infested with parasites since most larva are only able to climb up the first inch of the plant.

Keeping the grass in a more vegetative stage, and tall enough to provide the animal with adequate forage, will provide better nutrition which will keep the animal healthier, strengthening the immune system to prevent the adult worms from producing eggs from parasites (Coffey, 2006).

### Stocking Rates

Irregardless of which grazing system is used on your farm, do not overstock your pastures. The general rule of thumb used to determine stocking rates for goats is to provide two acres of improved pasture for 7-10 goats for a year-round basis. The number of goats can be increased depending on the quality and quantity of vegetation that are available. Cattle can also be co-grazed with goats in this system. The stocking rate should be 1 cow to 6-8 mature goats .

### Testing Feed and Forage Quality

The success of any animal production system will depend on the producer's ability to supply enough nutrients in the appropriate proportions to sustain the animal's life. Formulating rations based on foraged analysis is one way to ensure the herd is receiving adequate nutrition. The samples must be first submitted to a soil or forage testing laboratory. The analysis will have information on the following: (1) dry matter (DM) content, (2) crude protein (CP) content, (3) digestible protein (DP) content, (4.) neutral detergent fiber (NDF), (5.) acid detergent fiber (ADF), (6.) crude fiber (CF), (7) metabolizable energy, (8) moisture content, (9) mineral content and (10.) net energy for growth, lactation and maintenance.

The amount of forage or feed that is consumed by the goat is determined by the DM content which is usually higher in hay, grains and concentrates. Goats can consume between 3.5-5.5% of their body weight per day in dry matter (Pinkerton and Pinkerton, date unknown). This means a 100 pound goat will consume 3.5 pound of dry matter per day ( $100 \text{ pound animal} \times .035 = 3.5 \text{ pounds}$ ). Total dry-matter-intake is influenced by the nutritional needs of the animal and by the digestibility of the feed consumed. Higher quality feeds are usually more palatable thus, increasing feed intake.

NDF (neutral detergent fiber) measures the digestibility of the forage. The higher the NDF value (45%

and over), the lower the digestibility of the forage. NDF values are usually higher in crop residues and forages. Therefore, forages generally have lower energy values than concentrate and grain. ADF also measures digestibility. As the ADF value increases digestibility of the sample decreases. This is because the fibrous portions of the plant are less digestible. Like most animals, goats will try to eat large quantities of poor quality feeds in order to sustain a sufficient nutrient intake. However, production performances will be poor as a result of being sustained on low quality feed.

Crude protein will generally be higher in leguminous crops (17% CP) such as alfalfa, cowpea, soybeans and perennial peanuts. Good sources of energy include corn, molasses, wheat, barley and citrus pulp where the TDN value is greater than 50%.

After the analysis has been carefully reviewed, your next concern should be whether your current ration is sufficient to meet the production goals for your herd. If you desire to develop your own ration, visit Langston University's website to use a nutrient calculator to formulate a balance ration for your goat herd (see references for website address).

### **Forage Species**

There is a diversity of forage species that can be grown in a grazing system.

These species are classified as either legumes or grasses. Legumes have the ability to fix nitrogen from the atmosphere into the root nodules of the plant. Thus legumes are able to meet part of its nitrogen needs which lowers their dependence on fertilizer. The protein content of legumes is usually around 25%. Grasses on the other hand, do not have the ability to fix nitrogen from the atmosphere, therefore, they have a lower protein content (< 17%) and depend on fertilizer to meet its nitrogen needs. Forages are further classified according to the length of their growing season. Annual grasses or legumes complete their life-cycle in one growing season while perennials return year after year. The following is a list of forages grown in the state of Florida.

### Cool Season Annual Grasses

#### *Ryegrass*

- Tolerates wet and poorly drained soils better than small grain.
- It is somewhat tolerant moderate soil acidity.
- Commonly grown with rye.
- Tolerates close continuous grazing.
- Gives excellent animal performance.



- Can be over-seeded into dormant bahiagrass or bermudagrass pastures.
- Seeding dates between Oct. and Nov.
- Seeds can be broadcasted.
- Seeding rate is 20-25 pounds per acre.
- Forages production last until May to early June.

#### *Rye*

- All small grain forages are high in quality.
- Produces good animal performances.
- Most commonly used as a winter grazing crop.
- If planted early before the cool weather begins, the seedlings will become diseased and result into a poor stand.
- Seeding rate is 20-30 pounds per acre.
- Seeds can be broadcasted.



#### *Oats*

- It is generally the most-cold sensitive of the small grain plants.
- Planting dates are between Oct.



and Jan.

- Seeding rate is 20-30 pounds per acre.
- Seeds can be broadcasted.

### Cool Season Annual Legumes

#### *Crimson Clover*

- Crimson Clover is reseeded winter annual.
- The flowers are red in color.
- Best adapted in heavy well-drained soils in Florida.
- Performs poorly on dry, sandy and poorly drained soils.
- Plant from Oct. to Nov.
- Seeding rates is 20-26 pounds of seeds per acre.
- Delay grazing until the plant has reached 6 to 8 inches in height.



### Cool Season Annual Grasses

#### *White Clover*

- Spreads by creeping stems that develops roots at the nodules on the plant.
- White Clover is a perennial in most places, but in some management systems in



Florida it behaves as an annual.

- High quality forage
- Best grown under cool temperatures and fertile well-drained soil.
  - Should be seeded at 3 to 4 pounds per acre between Oct. and mid November.

#### Red Clover

- Can be grown throughout Florida when planted on moist fertile soil.
- Nematodes are serious pest to Red Clover.
- May be harvested for hay.
- Red Clover can cause bloat.
- Plant between Oct. to mid November.
- Seeding rate 12 to 15 pounds per acre.



### Warm Season Annual Grasses

#### *Pearl Millet and Sorghum-Sudan Hybrids*

- Grows rapidly (leafy 4-8 ft.)
- Grows throughout the state on well-drained soils.



- Tolerant to drought and acidic conditions
- Harvested as hay, green chop or silage.
- Plant from mid-March to June in south Florida.
- Broadcast 24 to 30 pounds/acre.
- Sorghum-Sudan hybrids has prussic acid (HCN) which is poisonous to livestock, so don't graze less than 4 inches from the ground.

- species in Florida
- Tolerates a wide range of soil conditions.
- Produces moderate yields on soil with low fertility.
- Easy established from seeds.
- Withstands close grazing.
- Varieties include Common, Pensacola, Argentina, Tiff etc.
- Best to plant in the summer.
- Broadcast at 12 to 15 pounds/acre.

**Warm Season Annual Legumes**

**Hairy Indigo**

- Grows 4 to 7 feet tall.
- Ability to re-seed itself
- Covered with bristle-like hair.
- Sandy soils with good drainage.
- Use for hay, for silage and as a cover crop or green manure chop.



*Bermudagrass*

- Expensive to establish.
- Establish vegetative parts (sprigs).
- Plant from mid Feb. through July.
- Plant on well prepared, moist seed beds.
- Young immature grasses is more nutritious.



**Warm Season Perennial Grasses**

*Bahiagrass*

- Used on more land area than any other single pasture



**Warm Season Perennial Legumes**

*Rhizoma Perennial Peanut*

- Crude protein 13-16%.
- Tolerate drought and periodic



overgrazing.

- Do not tolerate saturated soils for over 1 to 2 weeks.
- Varieties include Floriagraz and Arbrook.
- Established by planting rhizomes.
- Plant late Jan. to February which will result in a high number of sprouts per acre.
- Broadcast by hand or ground-driven slinger 1 inch deep (Chambliss, 1999).

### **Providing Supplement**

When quality forages and browse are not available, hay, grain or concentrates may be required to supplement the diet of the herd. Grain feeding will also depend on the condition of the herd, if the does are pregnant and their litter size. Lactating does may require additional feed for milk production if the energy content of the grass is not sufficient enough to support production. In essence, the ideal nutrition program should include high quality forages to support optimum production, thus meeting most of the nutritional requirements of the meat goat herd to keep production costs down.

If affordable, feed processed grains rather than whole grains because it is more digestible. Grains should be

rolled, crimped, flaked or cracked which helps improve digestibility of the feed. Be careful to store grains and concentrates in clean dry areas and out of the reach of the herd. Grain-overload (lactic acidosis) can occur when the animal has consumed too much feed in a short time.

This is a life threatening situation in which starches from the feed ferments rapidly in the rumen, thus, lactic acid is produced. Once lactic acid is present in the blood stream in dangerous levels it disrupts the normal chemistry of the body and death may occur 2 to 4 days later. Corn toxicity can also result in the disease enterotoxemia (overeating disease), so don't feed your goats more than  $\frac{1}{2}$  a pound of corn per head per day.

### **Storing Feed and Hay**

When feed and hay are protected from the weather it can be stored indefinitely with minimum nutrient losses. A storage shed can be built to protect the hay and feed from various environmental conditions. The size of the shed will depend on the kind of feed that will be used, the climate, the proportion of feed that will be produced on the farm, how much hay will be required to feed the herd during the winter months and if the shed will be used to store equipment.

When feed is improperly stored, mold, a wooly-like growth, frequently

develops on the surface of the damp feed under aerobic conditions (presence of oxygen) at temperatures between 45 and 100 F. Feed that has been exposed to excessive moisture levels (over 13%) are favorable for developing mold. Most molds produce substances called aflatoxins that can be toxic to livestock. Grains that are usually affected by aflatoxins are corn, barley, sorghum, wheat, cottonseed, peanuts and soybeans.

Aflatoxins are considered carcinogenic (cancer causing) and can interrupt the breakdown and absorption of nutrients in the feed. Some possible signs that might indicate an animal may have been exposed to moldy feeds are reduced feed consumption, reduced gains, diarrhea, depression, sluggishness, lethargy, loss of hair, rough hair, runny eyes, nasal discharge, abortions, just to name a few (Boyles and Eastridge, date unknown). So if the feed is moldy, throw it out.

Large quantities of feed can be stored in a feed bunk, a bulk grain bin, an upright silo or a trench silo. For storing smaller quantities of feed, purchase a metal trash can or a plastic pickle barrel. Pickle barrels can be purchased from a feed store and can hold up to 260 pounds of feed. However, since the drums are made from plastic rats and other rodents will chew through the drums to get into the feed. So to prevent from being bitten,

check for holes in the barrel, keep the lid closed tightly and always look in the barrel before you stick your hands in.

People who handle livestock feeds or hay may also become infected with the bacteria Leptospirosis. Leptospirosis is a disease that can occur in farm animals and rodents. It is caused by the bacteria known as leptospire. These organisms can multiply in the kidneys of animals and are shed through the urine. Urine that is infected with this microorganism can spread the disease (OSH Health Bulletin, date unknown).

Hay should also be protected from severe climatic conditions. It can be covered using plastic or stored in a barn or shed, but never bale or store wet hay. Baling and storing hay with a high moisture content can result in spontaneous combustion or a hay fire.

Round bales can be placed on top of crushed rocks, a concrete slab, wooden pallets or on any surface that keeps the hay from making direct contact with the ground to reduce deterioration. Line the round bales in rows that run north and south with the flat ends of the bales touching each other (fig. 21). Unless a cover is used to protect the hay from the rain, never allow the rounded ends of the bales to touch. This will allow the water to drain properly and prevent the quality of the hay to decline. The hay should be stored in sunny areas and never in flood zones or under trees (Ball et. al., 1998).

Lastly, always keep your feed and hay where the goats have no access and free from rodents, rain, insects whenever possible.

### A FINAL NOTE

Nutrition is an important modulator of the immune system and the reproductive processes in livestock. It can often tip the balance between health and disease and reproduction efficiency and low productivity in the goat herd. Supplying the proper nutrients in the appropriate proportions is essential to enable the animal to carry out all of its physiological processes of life. Good quality forages are able to provide most the nutritional demands for the goat herd.

However, when forage quality is poor, provide grain or concentrate as a supplement. Barley, corn and wheat are a good source of energy while soybean meal, cottonseed meal are good sources of protein. If you are unsure of the nutrient composition of your feed, have it analyzed to make sure it is balanced.

Always store your feedstuff in airtight containers to keep the rain, insects and rodents from contaminating it. Hay should also be protected from extreme environmental conditions so, store it in a shed, a barn or covered it with plastic.

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