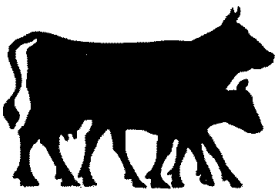
Texas Agricultural Extension Service
The Texas A&M University System

SCS-1998-32



Management of Improved Pastures for Optimal Performance

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Forages are the foundations of a successful cow-calf program. In general, the better the ranch's forage system, the greater the resulting animal production. Forage systems provide the **QUANTITY** and **QUALITY** of feed needed to meet the cattle's nutritional needs by a sustainable year round program. Adequate climatic conditions, responsive soil types and adapted forage species in the Eastern half of Texas allow for intensive forage production. Successful forge systems require both long and short term management, and are constructed with emphasis on maintaining forge quality as well as quantity in grazed pastures with extra forages harvested as hay or silage.

The key to a successful forage program is balancing the following throughout the year.

- ✗ Quantity and quality of forages available.
- ✗ Seasonal requirements of forages available.
- ✗ Optimal supplemental feeding programs.

The success for matching these three aspects on a day-to-day basis will result in optimal animal performance.

Animal performance is partly a result of the *intake of digestible nutrients* by the cow and calf. Intake of digestible nutrients depends on the *quantity* or availability of the forge and the *quality* or digestible nutrient component of the forage eaten. The problem with forge systems in Texas is that forage quantity and quality vary greatly and are constantly changing in the pasture throughout the season. Management to maintain forage quality, while at the same time providing forage quantity and matching both with animal requirements to minimize or eliminate supplemental feeding, should be the goal of forage production.

Maintaining Forage Quantity and Quality in Texas Pastures

Forages vary in quality and quantity throughout the year in Texas. Some of this variation is the response to climate conditions, soil types, and forage management. Some of the differences are due to the type of forage that is being produced and the variety that is selected.

Plant Species and Variety

Forage quality refers to digestible nutrient content (i.e., energy, protein), palatability and digestibility of the forage plant. Legumes (alfalfa, medics, cloves, vetch) are the highest quality group of forage grown in pastures. They are high in protein, energy (digestibility), and minerals. They also "fix" nitrogen fertilizer, making them very economical to grow. Incorporating legumes into our pastures increases forage quality, increases animal performance, and reduces pasture costs per animal. Although forage legumes can require more management than grasses, their high quality can make a big difference in animal performance even if legume production is limited. I often point out that a limited stand of legumes will be equal to feeding range cubes for cattle using dormant grass or dry hay. Legume varieties can be region and soil specific, so check with your County Extension Agent for recommended varieties and management requirements to make legume plantings successful.

Most of the legumes grown in Texas are reseeding annuals that are planted in the fall. They have limited production in the months of December thru February, with most of their production from February thru April/May (depending on the variety). Alfalfa is the main warm season legume, and the principal perennial legume used in Texas pastures.

Next to legumes, the highest quality group of forage plants are the cool season annual grasses such as oats, rye, ryegrass and wheat. These are very high in quality, but can be fairly expensive to plant. They should be managed to produce forage in the December thru February months. They typically will produce forage in March thru April and will stay ahead of grazing animals during that period. Management to produce early forage for winter use includes planting from September 15 to October 1, utilizing prepared seedbed along with overseeded pastures, using proper seeding rates, proper fertilization, and grazing management to stretch winter forage in the fall. Grazing management to stretch fall forage includes limit grazing, creep grazing, and feeding hay with the winter pasture. In southern Texas, ryegrass will produce as early grazing as oats, will have better disease resistance and cold tolerance, and will last from 2 to 6 weeks later in the spring than oats or wheat. All are very high in quality during the growing season. Contact your local County Extension Agent for variety test results near your county.

Warm season perennial grasses (bermuda, bahia, klein, bluestem) are typically the group of forages with the lowest quality grown in Texas pastures. They are, however, the group that is suited to our climate and are the most productive. Management for increased forage quality is especially important for these warm season perennial grasses. Quality (energy value) of these grasses often just barely meets the animal's requirements, or is below requirements of the beef animal during the season. Hence a 1% increase in digestibility or energy will result in a 5% increase in animal performance. Management to increase forage quality includes variety selection, harvesting at proper maturity, weed control, proper fertilization and utilizing grazing plans for optimal utilization.

New grass varieties have often been released because of high quantities of production (pounds per acre, more hay per acre than other varieties). While this is important, it is even more important to know when production occurs, and what quality the forage contains. Tifton 9 bahiagrass, for example, produces more tons per acre during the year than Pensacola bahiagrass, yet quality (energy content) is the same.

Bermudagrass dry matter production occurs primarily from mid- to late- April through October in Texas. Actual beginning and termination of growth is controlled by temperature (night lows above 60-65°F) and day length (13 plus hours of daylight per day). Bermudagrass production decreases or even stops when conditions are below these thresholds. Growth during the season is a response to nitrogen fertilizer and rainfall with high and low production periods occurring and reoccurring often during the season. The response to moisture and fertility will depend on the species of summer pasture grass and, to a lesser extent, the variety utilized. The better "the fit" between the grass variety and the soil, climatic and management conditions, the better the sustained production.

Season Variations

Warm season grasses vary greatly in quality during the growing season. Typically these grasses are highest in quality in the spring, declining from June through August, then increasing to October or November and rapidly declining after a freeze. This pattern can result in low or negative animal gains in midsummer (July through August). Plants also become mature more rapidly during July and August, which further decreases quality. Higher quality varieties do not decrease as far as lower quality varieties.

Plant Maturity

As forage plans mature, forage quality decreases. Immature plants are composed of mostly leaves, which are very highly digestible. Nutrients found in young, immature, leafy forages are in a simple, easily digested form. As the plant matures, vegetative growth gives way to reproductive growth and seed heads appear. More mature plants are thus composed of more stem and older leaves, which are not as digestible as the immature forage. Nutrients found in old, mature, stemmy forages are in a complex, less digestible, fiber form. Coastal bermudagrass which is 12 inches tall, for example, can be 58% digestible in the top one-third of the plant, 54% digestible in the middle one-third, and only 50% digestible in bottom one-third of the plant. In result demonstrations, Coastal hay harvested at six weeks of age had only 50% of the crude protein content and 80% of the energy as hay harvested at four weeks of age. Bermudagrass should be harvested every four to six weeks to optimize the quantity/quality relationships. Harvesting every 21 to 28 days is done if quality is desired but at a reduced quantity level.

Fertilization

Pastures should be fertilized according to a recent (within 2 to 3 years) soil test recommendation. Proper fertilization will enhance vigorous plant growth. A ton of forage with 10% crude protein contains 50 pounds of nitrogen, 10 pounds of phosphorus, 40 pounds of potassium and varying amounts of the other chemical elements needed for growth (r.e., sulfur, calcium, magnesium, iron, zinc, copper, boron, manganese, molybdenum, and chlorine). A ton of forage will not be produced if any of these nutrients are lacking. Most soils have enough nutrients and nitrogen to produce one to two tons of forage per acre. Improved grasses were selected for higher yield potentials and need additional nutrients (especially nitrogen,

phosphorus, and potassium) to produce at an economical level. Increasing the amount of nitrogen fertilizer along with other nutrients has increased production for various summer grass species (Table 1).

Increased nitrogen fertilization will increase the forage's protein percentage, but will not change the energy content.

The amount of fertilizer recommended based on a soil test depend on the nutrient content of the soil, the desire of production level (tons/acre, stocking rate) and whether the pasture will be used for hay, grazing or both.

In grazing systems only a small amount of the nitrogen, phosphorus and potassium contained in the forage that a cow eats is retained in the animal's body (Table 2). Most is recycled by urine and/or feces back to the soil. This in grazing systems, once phosphorus and potassium levels are brought up to a high level, they should remain there without extra fertilization. Nitrogen will still be required.

In hay systems, every ton removed from the field will remove 50 pounds nitrogen, 10 pounds phosphorus, and 40 pounds potassium. This will eventually have to be replaced by fertilization. Therefore, the best system is rotational grazing and harvesting hay from the excess growth in the spring and fall.

Table 2. Fertilizer removed by different forage management alternatives

	Grazing Selling 500 pounds beef/acre	Hay Removing 6 tons hay/acre
Nitrogen	18	300
Phosphorus	9	60
Potassium	1	240

Weed Control

Weed control in pastures greatly affects forage quantity and quality. Broadleaf and grassy weeds infest many pastures in Texas. Adequate rainfall, large weed seed populations, and a long growing season are conducive for weed growth; but, at the expense of forage growth. Many weed species germinate earlier than spring grass greenup, using soil moisture and fertility for rapid growth. Only small amounts of forage are produced in weedy pastures, even with proper fertilization. Conversely, thick turf keeps weeds out.

Weeds can be controlled or prevented through maintaining a thick, vigorous grass stand, or by using mechanical (shredding or plowing) or chemical methods. In native pastures one pound of grass is produced per each pound of weed controlled. In result demonstration in improved pastures, 2 to 7 pounds of grass was produced for each pound of weed controlled. A study with Dr. Paul Baumann quantified the amount of grass produced in a dry and wet growing season in a weed infested Coastal bermudagrass pasture. The combination of applying a herbicide early (when weeds were 4 to 6 inches tall) and fertilizing according to soil test recommendations resulted in the most forage growth in either year. Fertilization without weed control increased weed growth but did little to increase grass production.

How to Determine Forage Quality in a Pasture

Since forage quality is important in grazing warm season pastures, hand selecting samples representing the forage that is being selected by the animal should give better results than clipping samples. Usually hand plucked samples are 2% lower in crude protein and 6 to 10% lower in TDN than what a steer selects. In hand picking samples, try to select plant parts that a cow is selecting under grazing. In hay, core sampling of bales is encouraged. For visual evaluation of a pasture for good versus poor quality, evaluate the percent of young leaf material available for animal selection. In general, think like a cow when you look at pastures for forage quality. Look at maturity of the plants, leafiness, density and height of forage, along with the species of forage present.

Table 1. Average production due to nitrogen fertilization (from research in Texas, Alabama, Georgia, Mississippi and Louisiana)

	TONS OF DRY FORAGE PER ACRE			
Nitrogen/Acre* (Pounds)	Bahia	Common Bermuda	Coastal Bermuda	Klein 75
0	1.75	1.00	1.33	1.50
50	1.84	1.20	1.46	2.00
100	2.87	2.20	3.61	---
150	3.33	---	---	3.00
200	3.95	---	4.78	---
300	4.65	---	4.73	3.20
400	---	---	5.80	---
600	---	---	6.50	---

**Phosphorus and potassium levels were adequate*

Other Forage Related Management to Enhance Animal Performance

Calving Season

Shifting calving season is a way to match forage quantity and quality with animal requirements. Calving prior to high forage quality will increase dam's milking ability and growth of the suckling calf. A study of 1,909 records of Simmental-sired calves born to F1 dams from 1975 to 1990 at the Texas Agricultural Experiment Station at Overton showed the effect of fall, winter and spring calving (Table 3). The pasture system was bermudagrass overseeded with small grains, ryegrass, and/or clover.

Without a cool season forage in the system, fall calving would not be superior to late winter, early spring calving for re-breeding or increased weaning weights. Calves being born in the hot summer usually results in low weaning weights and cows delaying in re-breeding.

Grazing systems

A lot of attention has been given to various types of grazing systems in the last few years. While each grazing system has it's place, use of the same grazing system on all forage systems will not always be profitable.

Rotational grazing systems on native rangeland are designed to maintain or increase the presence and vigor of desired plant species. The theory is that as these higher quality desirable plants become more vigorous and predominate in the pasture, livestock performances will increase.

Bermudagrass and bahiagrass do not require periods of rest for sand maintenance and vigor, thus the rotation schedules are used to control utilization and quality. Rotating bermudagrass pastures hardly ever increases average daily gain. The goal of rotating such pastures is better utilization of forage to increase gain/acre, or to allow for other management practices. When rotating summer pastures, remember the effect of maturity on quality. Pastures should be grazed within 21 to 28 days of growth. Hay should be harvested from excess growth.

Stocking Rate

Increasing stocking rates on pastures decreases quantity available for each grazing animal. This will decrease the opportunity of selectivity by the animal, and in stocker animals, decrease the ADG. Gain per acre, however, is increased by heavier stocking as long as some forage quantity is present.

Increasing stocking rates on cow-calf systems decreases the level of forage available to the animal. This restricted forage is more drastic on the performance of the cow as compared to the calf. Milk provides a "buffer mechanism" for the suckling calf which allows for acceptable gains, usually at the expense of cow performance under high stocking rates. The effect of cow weight loss, of body condition and hence re-breeding, must be considered.

Higher stocking rates increase gain/acre, but not ADG. Pasture cost per pound of calf gain, however, is lower for higher stocked pastures.

Specialized Management

Creep grazing refers to allowing suckling calves to graze higher quality pastures than those grazed by the dam. Creep gates are placed in the fences of high quality pastures to allow calf grazing. Such pastures may be ryegrass, oats, or clover in the cool seasons, or alfalfa, sorghum or millet in the warm seasons. Increases of 50 to 100 pounds in weaning weights have been achieved with creep grazing.

First-Last Grazers

Quality of a newly grazed pasture in a rotation system is always higher the first days of grazing than the last days. Maximum selectivity of high quality forage occurs at Day 1. As the animals are forced to consume the pasture, lower quality plants and plant parts are eaten. The first grazer concept utilizes this to allow higher quality to be eaten by animals with higher nutrient requirements (young calves, developing heifers, 1st calf heifers). These animals are given first access to the pasture area. After selective grazing occurs, the first grazers are moved to a new pasture, and a second set of grazers are used to consume the lower quality forage left. This concept has been used to increase ADG of stockers on bermudagrass from 1 to 1.2 pounds/day to 1.5 to 1.6 pounds/day. The concept has also been used with creep grazing, allowing suckling calves access to new pastures via a creep gate prior to the lactating cows.

Table 3. Fifteen year average weaning weights from Simmental-sired calves from different calving seasons at different stocking rates.

Stocking Rate	Avg. for All Season	Fall	Winter	Spring
		lbs.		
Low with creep feed		840	751	
L	652	707	600	512
M	622	668	568	485
H	521	569	492	419

Fall = Sept. 1 to Dec. 15 Winter = Dec. 16 to March 15 Spring = March 15 to May 31

From: S.J. Gaertner, F. M. Rouquett, J. W. Turner and C. R. Long. TAES Overton Field Day Report, 1992.