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Managing Warm-season Improved Pastures

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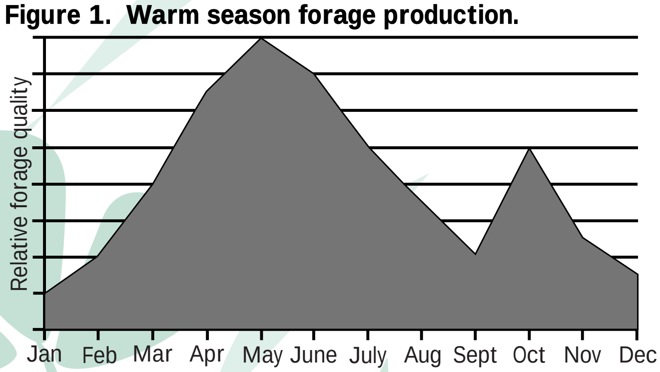
The quality and quantity of forage in pastures can vary greatly and are constantly changing throughout the year. The goal of forage management is to provide uniform, high quality forage to meet the nutritional needs of livestock. Proper management should result in sufficient quantities of forage throughout the year to maximize animal performance without the need for supplemental feeding.

The type of livestock on pasture will determine the quality and quantity of forage needed. The quality of forage, in turn, determines animal performance. Non-lactating, mature, breeding animals require a different diet than lactating or young, growing animals. Timing the varied nutritional needs of animals to match forage production cycles can dramatically reduce supplemental feeding costs and improve overall animal performance. The principles are the same whether the forage is for beef cattle, horses, sheep or goats.

The graph (Fig. 1) charts the general rise and fall of forage production in warm-season perennial grass pastures in Texas. Perennial grasses are dormant in January and, if any standing forage is available, the quality is very poor. As temperatures warm and rainfall increases, grasses begin to grow. Succulent, immature growth is highly digestible and will be high in digestible energy and protein if properly fertilized.

The quality and quantity of forage continue to increase until the beginning of summer when rainfall declines. The increased temperatures and reduced rainfall of summer slow or stop the production of new growth. With increased rainfall and cooler temperatures in September, grasses and winter annuals begin to grow and immature forage is again high in quality. After frost during wet winters, the quality rapidly deteriorates.

Figure 1. Warm season forage production.



Plant Maturity

Immature plants cells have a thin cell wall and soft flexible tissue that is high in water and water soluble nutrients. Succulent, immature leafy forage plants contain easily digestible nutrients. Old, mature leaves and stems contain complex nutrients and mature, indigestible fiber. As plants grow, cells mature and a secondary wall composed of cellulose and lignin begins to develop to add rigidity to the plant. Complex cellulose and lignin, which are comparable to wood or cardboard, are indigestible.

For example, 12-inch-tall coastal bermudagrass can be 58 percent digestible in the top third of the plant, 54 percent digestible in the middle third, and only 50 percent digestible in the bottom third. Coastal bermudagrass harvested at 6 weeks of age has only

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50 percent of the crude protein and 80 percent of the energy of hay harvested at 4 weeks of age.

As plants mature, the leaf-to-stem ratio also changes. Young plants are primarily composed of leaves and have a high leaf-to-stem ratio. Older plants have more stems and a lower leaf-to-stem ratio. Leaves are more digestible than stems and leaves contain most of the nutrients. A high leaf content of a plant means greater forage quality, while a high number of stems translates to poorer quality.

Forage Management

Weed control

When an undesirable plant (weed) grows in a space, a desirable plant is eliminated. Weeds are generally less palatable and lower in quality than grasses. Over-grazing is the most common cause of weed problems in pastures.

At least a pound of grass can be grown for every pound of weed controlled. Seldom will herbicides alone control weeds. Successful weed management in forages is the result of proper fertilization, mowing, grazing, herbicide selection and application. Table 1 illustrates the effectiveness of the combination of fertilization and weed control practices in improving forage yields. Additional information can be found in the publication entitled “Suggestions for Weed Control in Pastures and Forages,” available from local county Extension offices. Because product labels change frequently, specific herbicides are not listed here.

Table 1. Forage management in Brazos County pasture. *

Treatment	Dry matter (lbs.) per acre 1990-dry season	Dry matter (lbs.) per acre 1991-wet season
Early herbicide - fertilized	2142	8322
Early herbicide - unfertilized	1330	4988
Late herbicide - fertilized	881	7610
Late herbicide - unfertilized	477	4896
Shredding - fertilized	577	5088
Shredding - unfertilized	341	4787
Fertilizer only - no weed control	645	2587
Unfertilized and no weed control	377	1385

*Evaluations conducted by David Bade, Extension Forage Specialist, The Texas A&M University System.

Table 2. Nutrients removed by different forage management alternatives.

Nutrient	Nutrients (lbs./acre) removed to produce 500 lbs. beef/acre	Nutrients (lbs./acre) removed to produce 6 tons of hay/acre
Nitrogen	18	300
Phosphorus	9	60
Potassium	1	240

Fertilization

Many factors impact the decision to fertilize pastures. They include:

- the variation of rainfall across the state;
- varying types of grazing systems;
- irrigation or the lack of irrigation;
- type of livestock being produced;
- different management objectives.

In general, the addition of fertilizer will improve forage quantity and quality. Table 1 shows that the fertilized plots consistently produced more forage during both dry and wet seasons than non-fertilized plots.

The way in which a producer utilizes forage determines if it is profitable to fertilize. Table 2 demonstrates the amount of nutrients removed from soil by different forage management alternatives.

One ton of grass hay will remove about 50 pounds of nitrogen, 15 pounds of phosphorus, 40 pounds of potassium, 5 pounds of sulfur and 3 pounds of magnesium from the soil.These nutrients, mined from soils, must be replaced by nutrients from commercial fertilizers or manures. Forage production will be reduced if nutrients are not replaced. In low fertility soils, desirable forages may slowly die and be replaced by weeds or brush.

Nitrogen, when added to soils, causes an acidic reaction and, in sandy areas of Texas, will contribute to low pH. Liming will be necessary to raise the pH to prevent growth problems and also increase nutrient absorption. Table 3 shows the effects of pH on the absorption of nutrients.

When plants have adequate available nutrients, growth is not slowed. The chart (Fig. 2) shows the influence of nitrogen on water efficiency in coastal bermudagrass.

Under any moisture situation, grasses must have sufficient plant nutrients available to produce maximum forage levels. Adequate fertilization also causes grasses to be more water efficient. Numerous research and county forage demonstrations have shown that, without fertilization, 16 to 20 inches of water are necessary to produce 1 ton of low quality forage (Table 4). With adequate fertilization, plant growth is not restricted by a nutrient deficiency and the grass can produce 1 ton of good quality forage with only 4 to 6 inches of water.

Grazing management

The amount of plant material above the ground determines the depth and extent of the root system. In plants, the root system develops from excess energy produced by the leaves. The greater number of leaves on a plant translates to greater energy production and increased leaf and root growth. There is a priority system in plant development. Leaves are more important than roots. When a plant has a limited size and number of leaves, little energy is produced for growth.

A plant that has its leaves repeatedly cut off will begin to rob the root system of energy in order to regrow leaves to capture sunlight. As the root system is robbed of energy, the root system begins to shrink in size. A small root system cannot supply adequate water and nutrients needed by new leaves, so the leaves quit growing, then the roots quit growing. The plant has entered a deteriorating cycle. Faced with this situation, producers often "run out of pasture" from overstocking. This only aggravates the problem. Unpalatable weeds and brush begin to take the place of grasses, thus further restricting grass growth. Only a "rest" period where undesirable weeds are controlled and no foliage is harvested will restore the grass plant. Newly established pastures should not be grazed the first year in order to allow the grass to properly establish itself.

Table 3. Effects of soil pH on the relative efficiency of nutrient uptake as percent of applied fertilizer.*

Soil pH	Nitrogen	Phosphorus	Potassium
4.5	21	8	21
5	38	10	30
5.5	52	15	45
6	63	15	60
7	70	30	60

*Tony Provin, Extension Soil Chemist, The Texas A&M University System.

Table 4. Potential production of forage per year (tons/acre).

Annual inches of rainfall or irrigation	Without fertilizer	With fertilizer
30	1.0 - 1.5	5 - 7
35	1.5 - 2.0	7 - 8
40	2	8 - 10
45	2.5	10

Rotational grazing systems

A rotational grazing system is designed to maintain or increase the presence and vigor of desirable plant species. In this system, a harvest of the forage is followed by a "rest" period wherein the grass can regrow foliage without damaging the root system. Usually, more grass can be harvested from a given area under rotation than from an area under constant grazing. When grass is constantly grazed at a height of less than 2 to 3 inches, the root system does not grow into the deeper part of the soil profile where water and nutrients are stored.

In the higher rainfall areas of eastern Texas, where deep root systems are not required for adequate water uptake, rotational grazing may not increase the amount of forage produced. However, forage quality is improved through the harvest of immature grass when grazed every 21 to 28 days.

Rotational grazing systems require effective management. Rotation should be based on how quickly the standing forage is consumed. The amount of available forage should be checked daily to ensure that animals are moved on the appropriate day. Higher stocking rates on pasture increase the weight gain per acre, but not the average daily gain per animal.

Birthing season for cattle, sheep and goats

In a 15-year study conducted in east Texas, where good winter moisture benefits improved clover or small grain pastures, fall calving produced higher weaning weights than spring calving (Table 5). This is because winter calving coincided with maximum forage quality and quantity production

Figure 2. Effects of nitrogen application (pounds/acre/year) on percent protein, yield and water efficiency.

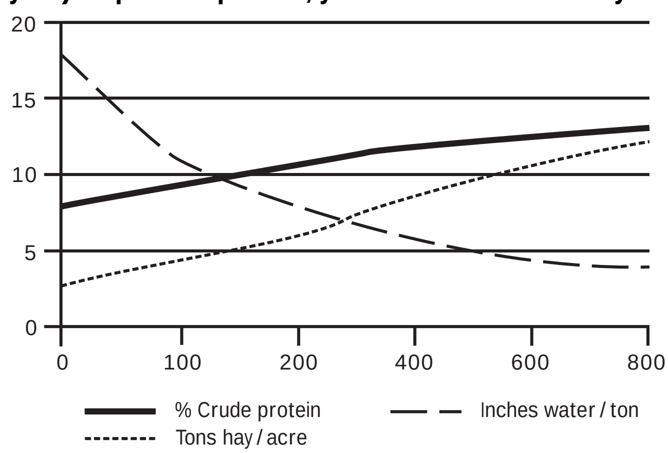

Table 5. Weaning weights by season.

Stocking rate	Average for all seasons	Fall calving	Winter calving	Spring calving
Low with creep		840	751	
Low	652	707	600	512
Medium	622	668	568	485
High	521	569	492	419

*TAES Overton Field Day Report, 1992

in pastures benefitting from seasonal winter moisture and good management.

However, west of a line from Corpus Christi through San Antonio to Fort Worth, rainfall is greatly reduced year round and spring calving is preferred. The rainfall pattern in this area corresponds to forage production as shown in Fig. 1. Spring calving season corresponds to better forage quality and quantity in native rangeland and improved pastures.

Because improved small grain pastures must be irrigated in many areas of west Texas, the cost of producing improved winter forages for cow-calf operations is prohibitive. Many producers have opted instead for spring calving. Thus, cows are able to utilize early spring pastures for increased milk production, early grazing for young calves and higher weaning weights. Cows also breed back better because the spring forage provides better nutrition. The calves are weaned in the fall and sent directly to small grain pastures where high quality winter forages enable calves to gain rapidly. At the end of the spring grazing period when small grains mature, calves are sent to feed yards.

In an ongoing study, Extension specialists Robert Lyons and Rick Machen have demonstrated the nutritional benefits to spring calving in west Texas. Both the crude protein and energy requirements of livestock are met when cows, sheep and goats are bred to give birth in the spring.

Summary

At one time, pasture crops were perceived as minimal-input crops. However, improvements in grass species, fertilizer, herbicides, and an increased understanding of the potential importance of pastures in nutrition have contributed to the development of intensive management practices. With proper management, forage quality and quantity can be utilized to their fullest potentials.

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