Forage Systems Reduce Winter Feeding Period

Develop a pasture system that best fits your situation.

by ***Gerald Evers***

PHOTO BY SHAUNA ROSE HERMEL

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Livestock require some form of feed every day. Growing or stored forages (grasses, legumes, forbs and browse) are used to support livestock throughout the year. Ruminants (four-stomached animals) such as cattle, sheep and goats can utilize lower-quality or more fibrous forages than monogastrics (single-stomached animals) such as pigs.

Forage systems are year-round programs to provide sufficient nutrients to meet as much of the animal's requirements as possible to produce meat, milk or fiber. Discussion of forage systems here, however, will be limited to beef cattle in the southeastern United States, where Bermuda grass and Bahia grass are the main summer grasses.

Managing a pasture for grazing livestock is more difficult than growing a grain or fiber crop like corn or cotton. When growing a grain or fiber crop, the producer is concerned with the welfare of only one organism, the plant. In a grazing situation, the producer is concerned with two organisms, the plant and the animal. Therefore, the producer must understand the growth and development of both. Both must be managed to provide efficient and economic animal performance.

There are times during the year when the producer must emphasize the plant, and other times when he or she must emphasize the animal. This plant-animal interface is a dynamic, always-changing system.

The nutritive level in forage will vary with the class of forages, plant maturity and season. The amount of forage varies with management level, season and unpredictable climatic conditions. To further complicate matters, the nutritive requirements of livestock vary with age and physiological stage (for example, young growing animal, cow nursing a calf or dry cow).

Forage distribution

Unfortunately, production of warm-season and cool-season forages is not uniform during the growing season in a normal year, much less in an abnormal year. About half of the annual yield of warm-season perennial grasses, such as Bermuda grass, normally occurs in a two-month period from early May through early July. Growth is poor from mid-July through mid-September because of high temperatures and usually lower rainfall.

Cool-season annual grasses such as ryegrass, rye, wheat and oats produce some forage in late fall, very little from late December through mid-February, and have

a large production peak in spring. From 75% to 90% of annual clover production — depending on species — occurs in March, April and May.

Part of the problem with grazing pastures is not total annual forage yield but uneven forage distribution during the year. Excess forage production from warm-season perennial grasses in May through early July can be harvested as hay. Because of poor hay drying conditions in March and April, the peak forage production of cool-season annual pastures is best utilized by adding extra animals or harvesting part of the excess forage as silage or haylage.

Although lower in nutritive value than other forage classes (see Fig. 1), warm-season perennial grasses are the predominant forages grown in the southern U.S. They are well-adapted to the mild winter and hot summer temperatures and will survive summer droughts. The grazing season is usually from sometime in April until the first frost.

The challenge to the forage producer is to maintain the highest nutritive value possible by keeping these grasses in a young, growing stage with a high percentage of leaf. A fertilization program based on an annual soil test is the most efficient and economical way to maintain vigorous grass growth.

Cool-season forages are higher in quality than warm-season forages and can meet the nutritional requirements of all classes of livestock (see Fig. 1).

More than a million acres of annual ryegrass are grown in Texas each year because it is easy to establish, tolerates close grazing and is adaptable to a wide range of soil types. However, it is less productive during the fall and winter than rye, wheat, barley or oats. If grown in an area with annual rainfall of less than 30 inches (in.), irrigation will be necessary to obtain good annual ryegrass yields.

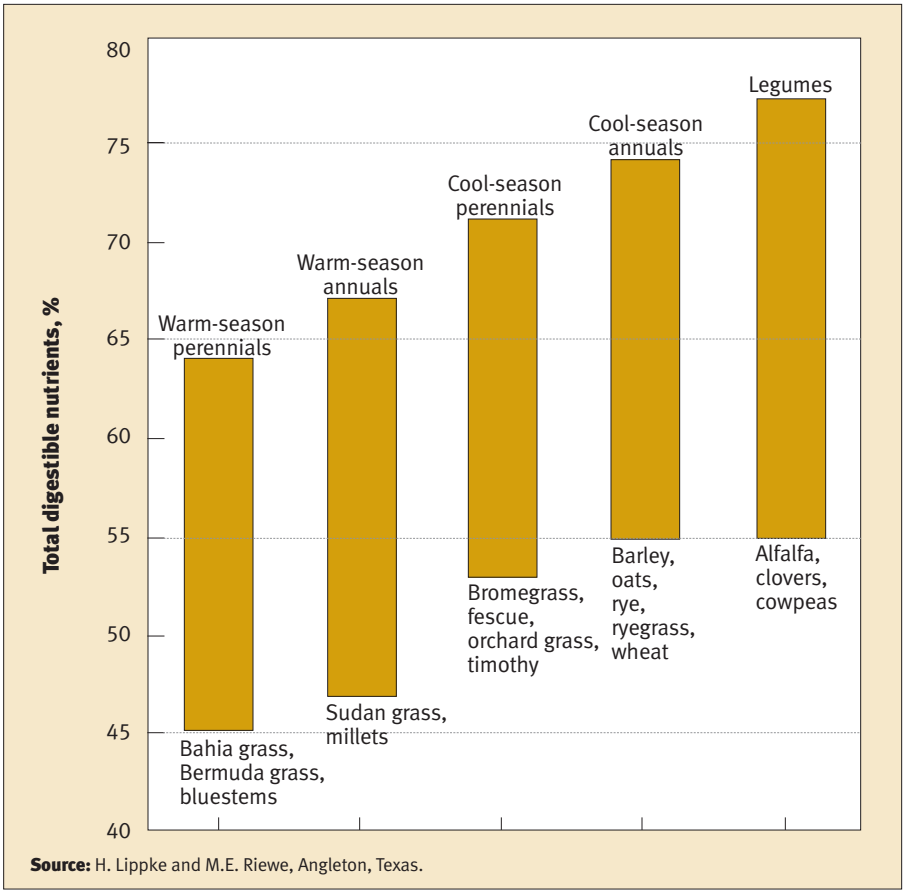
The other cool-season annual grasses (rye, wheat, barley or oats) should not be grazed shorter than 3 in. to maintain forage growth. Cool-season winter pastures are best utilized for growing animals with high nutrient needs, such as stocker calves and replacement heifers.

Nutritive value of plants

The nutritive value of forages is based on the level of energy, protein, etc., and its availability to the digestive system of the animal. Based on digestibility, forages can be divided into the following five categories:

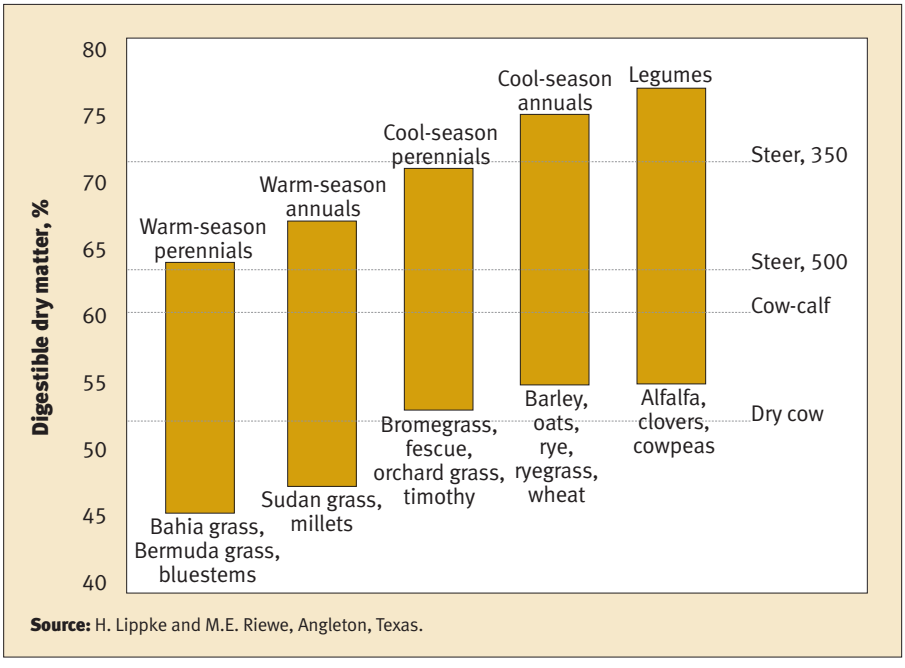
1. warm-season perennial grasses;
2. warm-season annual grasses;
3. cool-season perennial grasses;
4. cool-season annual grasses; and
5. cool- and warm-season legumes.

Fig. 1: Digestibility percent ranges for several forage classes



Source: H. Lippke and M.E. Riewe, Angleton, Texas.

Fig. 2: Digestibility percent ranges for several forage groups and requirements of different classes of livestock



Source: H. Lippke and M.E. Riewe, Angleton, Texas.

As percent digestible dry matter (DDM) increases, animal performance in terms of weight gain, milk production, weaning weight and conception rate increases. In general, cool-season grasses are higher in DDM than warm-season grasses, annuals are higher than perennials, and legumes are higher than grasses (see Fig. 2).

Within each forage class, plant maturity

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is the major influence on nutritive value. Nutritive value is highest in new growth and decreases with plant age. One reason is that leaves are more digestible than stems and the percent leaves in the available forage decreases as plants mature and become stemmier.

The second reason is that the digestibility of both leaves and stems decreases with maturity. Cell contents are 98% digestible and include carbohydrates, protein, triglycerides and glycolipids. Cell walls are mainly composed of cellulose, hemicellulose and lignin but are only 45%-75% digestible. About 70% of young plant cells are highly digestible cell contents and 30% partially digestible cell wall. As the plant matures, the cell wall thickens with age by adding more fiber and lignin to where the cell wall accounts for 80% of the cell and, therefore, is less digestible.

As forage plants mature, yield increases but protein and digestibility (nutritive value) decrease (see Figs. 3a, 3b). A compromise between yield and nutritive value is to cut Bermuda grass between three and four weeks for horses and dairy cattle and between five and six weeks for beef cattle. There is also a seasonal influence on digestibility of warm-season perennial grasses. Nutritive value is the highest in the spring and then decreases as temperature increases, reaching a low point in late July and August (see Fig. 4, page 199). Digestibility improves with cooler autumn temperatures.

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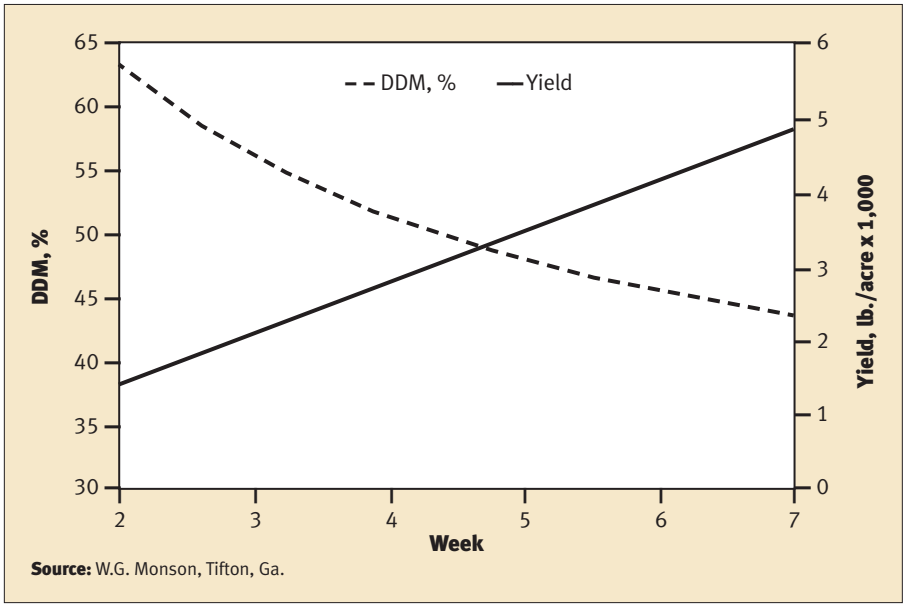
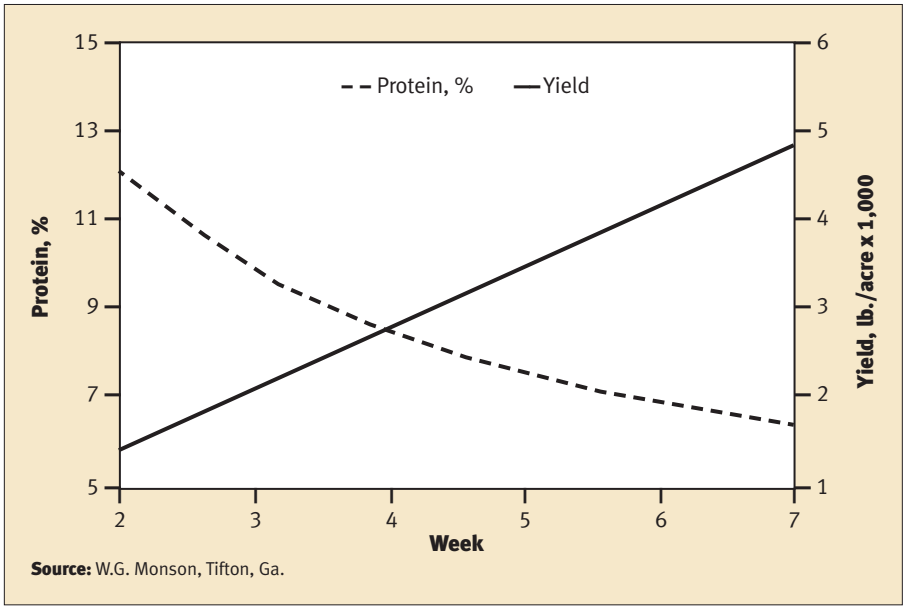
The challenge to the livestock producer is to maintain the pasture sward in a young growth stage that contains a high percentage of leaves, but has sufficient leaf area to intercept a high percentage of sunlight. A sward height of 5-8 in. is appropriate for most sod-type grasses such as Bermuda grass, Bahia grass and Dallis grass. The producer must have an understanding of the animal requirements and nutritive value of forages to manage pastures properly.

Fig. 3a: Effect of maturity on dry matter digestibility and yield of Bermuda grass



Source: W.G. Monson, Tifton, Ga.

Fig. 3b: Effect of maturity on protein percentage and yield of Bermuda grass



Source: W.G. Monson, Tifton, Ga.

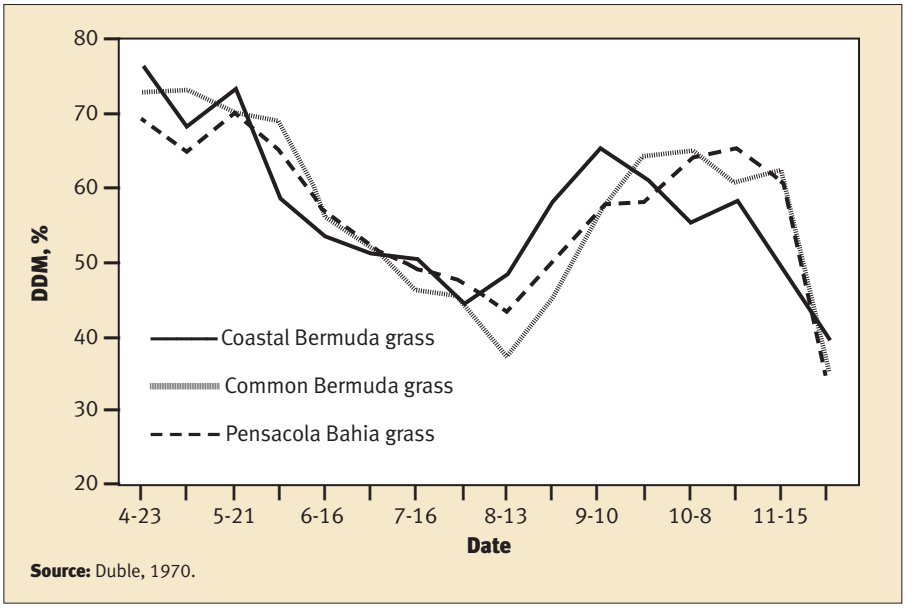
Animal requirements

The general types of beef operations include cow-calf, raising replacement heifers and stocker/backgrounding operations. One, two or all three of these operations may occur on pasture on the same farm or ranch. The segment of the beef cattle enterprise with the largest amount of variation in nutritional needs required during the year is cow-calf production. During the 12-month cycle of production, a beef cow goes from low nutritional demands when not producing milk to high nutritional demands after calving and to several stages of moderate nutritional requirements (see Fig. 5, page 199).

Energy (TDN, total digestible nutrients) and protein priorities of a cow after calving are: cow survival, maintenance and producing milk for the calf, and rebreeding.

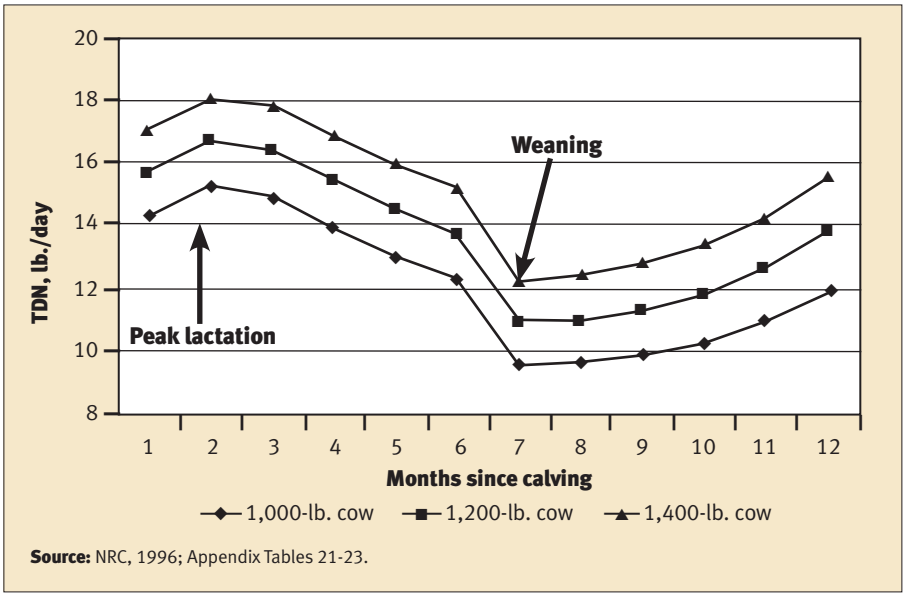
Knowing these priorities, our management should be to make high-quality forages available to cows early in lactation if we are to maximize milk production and rebreeding. Approximately two months after calving, a cow will reach her peak lactation, or maximum level of milk production.

Fig. 4: Influence of season on digestibility of continuously grazed sod grass at Overton, Texas, sampled at two-week intervals



Source: Duble, 1970.

Fig. 5: Total digestible nutrients (TDN) of three cow sizes for the year



Source: NRC, 1996; Appendix Tables 21-23.

Nonlactating, mature beef cows require low levels of nutrition to maintain body condition. Excess energy is converted to fat, which can be used later when nutritive value of the forage diet is less than the cow requires.

Fall-calving cows will have calves weaned in May-June, allowing the cows most of the summer to regain the body condition lost during lactation. Optimum weaning time for late winter- and spring-born calves is no later than September to allow the cows to regain some body weight before winter.

Stocker programs place weaned calves on pasture to gain an additional 200 pounds (lb.)-300 lb. before going to the feedlot. The smaller the calf, the higher the nutrient value of the diet must be. Only cool-season pastures of smallgrains, ryegrass and clover have sufficient nutritive value for 350- to 500-lb. calves to produce average daily gains (ADGs) of up to 2-3 lb. per day for a five- to six-month grazing season. Tifton 85 Bermuda grass can produce average daily gains of about 1.5 lb. on fall-born calves during the summer.

More than 90% of the nitrogen (N), phosphorus (P), potash and most other nutrients that are in the forage consumed by livestock passes through the animal and enters the soil in the urine and feces. This recycling of nutrients from the forage, through the animal and to the soil where they can be taken up by the plant roots to enhance forage growth must be maximized to reduce fertilizer needs. Livestock must be grazing on pasture as much of the year as possible.

Legumes, like clovers, vetch and alfalfa, have the ability to use nitrogen from the air if the legume plant roots are infected by the appropriate *Rhizobium* bacteria. This "free nitrogen" comes at a cost of adding lime and other nutrients to grow the legume. However, if the legumes are only grazed so that the nutrients are recycled, maintenance fertilization after the establishment year should be low.

Matching animal requirements to forage production and nutritive value

Fig. 2, page 197, shows the nutrient requirements of several physiological stages of beef cattle across ranges of DM digestibility of forage classes. We will begin with a cow-calf operation using only warm-season perennial grasses. It can be Bermuda grass, Bahia grass, or some other warm-season perennial grass.

Peak forage production normally occurs in May and June, with the best nutritive value in spring (see Fig. 6, page 200). Because the beef cow's highest nutrient needs occur after calving, when she is at maximum lactation and needing to rebreed, preferred calving time is February-March (about two months before peak nutritive value). Weaning calves in early fall will allow the cow to gain some weight before first frost and match her period of low nutritional needs with the winter feeding period.

A minimum of two pastures is required, with the designated hay pasture being from 25% to 50% of the total pasture acreage. In March-April, cows and their calves have access to both pastures. About May 1, the hay meadow should be fertilized according to a soil test, and all the cows should be placed on the other pasture.

From late April to early July, one to two hay cuttings are taken from the hay meadow with normal rainfall. It is important to harvest hay by early July when the nutritive value of the grass is still high (see Fig. 4). Another advantage is that a pound of nitrogen applied in late April will produce more pounds of forage than if applied during the summer when temperatures are higher and rainfall is lower.

Cows and calves can graze both pastures after the last hay harvest until mid-September when forage growth rate is low. About mid-September the calves could

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be weaned and the hay meadow fertilized with 60-70 lb. nitrogen per acre to produce a fall hay cutting that is to be stockpiled and grazed in late fall when hay feeding is normally initiated.

Sufficient hay should have been made from the one to two hay cuttings to carry the dry cows through the winter. A general guideline for northeast Texas is to have three large round bales [5 × 6 foot (ft.)] per cow. The main disadvantage of this system is that calves are weaned and sold in early fall when calf prices are usually at their lowest. However, the cost per pound of calf gain should be low because cow wintering costs are low since she is not nursing a calf during most of the winter feeding period.

A more advanced forage system is where part of the warm-season perennial grass acreage is overseeded with an annual ryegrass-clover mixture (see Fig. 7, page 204). This system requires a minimum of three pastures. A hay meadow (about 40% of open pasture), a pasture to be overseeded with ryegrass-clover (about 40% of open pasture), and a third pasture used for feeding hay and calving (about 20% of open pasture).

A pound of nitrogen applied in late April will produce more pounds of forage than if applied during the summer when temperatures are higher and rainfall is lower.

The hay meadow should never be overseeded with annual ryegrass since ryegrass grows through May and delays growth of the warm-season perennial grass. This results in the loss of the early hay cutting when warm-season grass growth and nutritive value are the highest. With about 40% of the pastureland used as a hay meadow, one hay cutting about June 1 with a yield of two and half large round bales per acre should be sufficient. If drought eliminates or reduces the first hay cutting, a second hay cutting can be taken in early July.

Ryegrass-clover grazing can usually begin sometime in February in east Texas. Cool-season forages have higher nutritive value than warm-season forages, so the most digestible forage for the year in this system occurs from February through April. Cows should calve in December-January so their peak nutrient needs (after calving) match that of the ryegrass-clover growing period in March and April. These calves can be weaned in July or August before calf prices reach their normal low and allow the dry cow a longer grazing period before the first frost to gain weight and improve body condition score (BCS). An additional benefit of this system is a shorter winter-feeding period, which reduces the amount of hay needed. Calving in winter during harsh weather may increase calf death losses. Another disadvantage of this system is the dependence on fall rainfall to grow a standing hay crop and establish the ryegrass-clover.

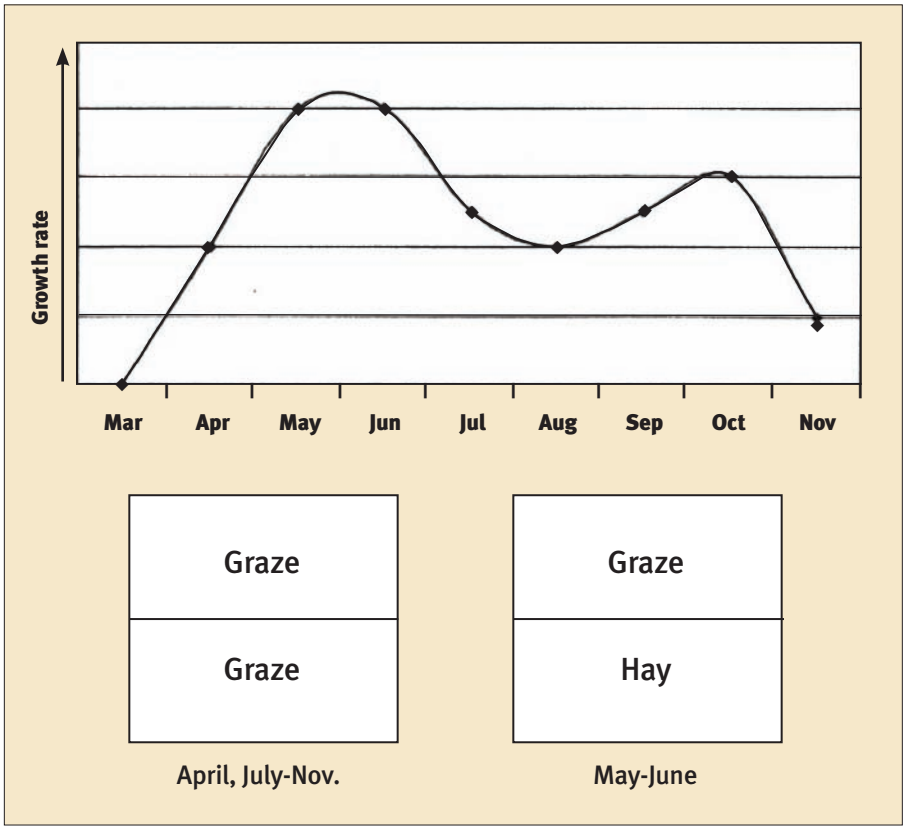
Cows calve during the winter on the calving pasture. When ryegrass-clover reaches a height of about 6-8 in., cows with calves can be moved from the calving pasture to the ryegrass-clover pasture. If winter pasture is limited, cow-calf pairs can limit-graze the ryegrass and clover two hours per day or four hours every other day.

Cows should be able to graze the ryegrass-clover full-time, beginning in mid-March during the peak ryegrass-clover growing period. When the ryegrass-clover matures in May, it may take some time for the warm-season perennial grass to come back, especially if rainfall is limited in April and May and the stocking rate is reduced for good seed production for volunteer reseeding of the ryegrass and clover.

Cows can be moved back to the calving pasture, which accumulated grass while the cows were on ryegrass-clover pasture. Following the last hay harvest, cattle can also have access to the hay meadow.

The success of this system is dependent on fall rainfall to grow a fall standing hay crop and establish ryegrass and clover. It is important to have a hay barn of some type to store excess hay in case of dry falls. If kept dry, hay will last for more than 8-10 years. Having hay stored under a roof will reduce the risk of a dry fall on this pasture system. Rotational grazing can still be practiced by subdividing the hay meadow and ryegrass-clover pastures.

Fig. 6: Utilizing a warm-season perennial grass (Bermuda grass, Bahia grass, etc.) with a two-pasture system



Summary

Two pasture systems have been presented as models for your beef cattle operation. No two beef cattle operations are exactly alike.

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They vary in soil, climate, size, producer goals and amount of time available to manage the operation. Each producer must develop a pasture system that best fits his or her situation. Important factors in developing a good forage system are desire, knowledge of livestock nutrient requirements and forage management, and patience. AJ

Editor's Note: *Gerald Evers is a Texas AgriLife Research forage management scientist based at the Texas AgriLife Research and Extension Center at Overton.*

Fig. 7: A three-pasture forage system consisting of a hay meadow, pasture for overseeding with ryegrass and clover, and a winter feeding/calving pasture (2-3 acres/cow)