

PASTURE MANAGEMENT

Lesson 6

To be a successful beef cattle producer, one must first be a successful grass farmer. Differences between a well-managed and a poorly managed forage program often show up in animal performance, milk production, conception rates, and fewer days of feeding stored forage. All of these impact the profitability of the livestock operation. Therefore, this lesson focuses on some of the key concepts and ideas related to pasture and grazing management. Because pasture conditions, climate, producer management level, soil types and topography vary greatly, a detailed discussion on every aspect of pasture and grazing management is beyond the scope of this paper. There are numerous books, producer magazines, and university publications devoted to this topic that can be consulted for more detailed information. Some are referenced in this lesson.

Pasture Establishment/Renovation

A producer's needs, goals and land and capital resources all will affect the management priorities on a farm. Some ideas of management options for improving pastures are included in this lesson. Producers must evaluate farm needs and actively seek to make pastures more productive and profitable. There are several steps involved in establishing or renovating a pasture. These include (in chronological order):

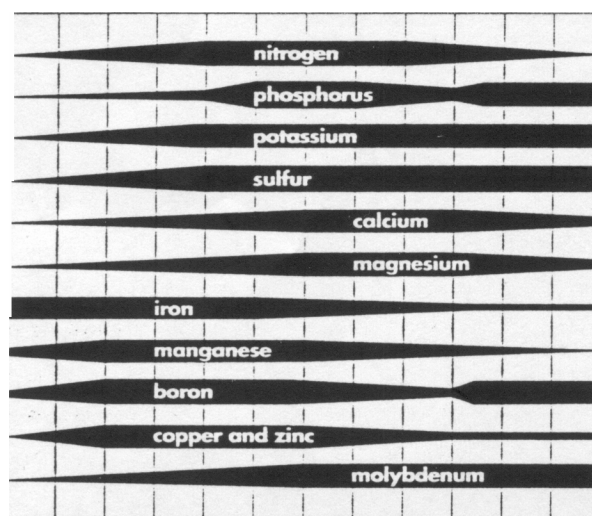
- 1) soil testing and correcting soil nutrient deficiencies;
- 2) selecting the desired mixture of plant species;
- 3) selecting a seeding method; and
- 4) using proper management to maintain a productive stand.

Correct Soil Nutrient Deficiencies

To correct soil nutrient deficiencies, a soil test should be taken to determine the nutrient status of the soil, followed by fertilization to correct deficiencies. Soil testing forms and containers can be obtained from a local extension office. The reverse side of the form shows proper sampling instructions. Soil test results will be returned with recommended amounts of lime and/or fertilizer to apply based on nutrient status of the soil and expected yield goal.

An important component of the soil test results is soil pH. If the soil pH is not in the appropriate range, nutrients may not be available for plant uptake (see Figure 1). Also, if legumes are a part of the forage program, lime may need to be added to correct a low pH. Clovers and birdsfoot trefoil grow best at a pH of 6.0 to 6.5, while alfalfa grows best at 6.5 to 7.0. Ideally, lime should be applied and incorporated at least 6 months prior to reseeding. Incorporation gets lime into the root zone to provide proper pH environment for bacteria that permit legumes to utilize nitrogen from the atmosphere. However, in situations where lime cannot be incorporated, such as pastures with many rocks or trees, or where erosion is a problem, lime may be topdressed. In this situation, the finest grade of lime obtainable should be applied. Lime will move downward approximately 1/2 inch per year in the soil and will therefore provide a benefit for future years.

Figure 1. Availability of nutrients at various pH levels



Nitrogen (N), phosphorus (P), potassium (K), and sometimes sulfur (S) and boron (B) are the main nutrients considered in a pasture fertilization program. Tables 1 through 4 below, taken from the publication *Fertilizer Recommendations for Agronomic Crops in Minnesota* (University of Minnesota publication BU-6240-E), show the phosphate and potash recommendations for grasses and grass/legume mixtures. These nutrients are generally supplied as a commercial fertilizer mix. In situations where commercial fertilizer is not appropriate, composted manure spread on the pasture can be a beneficial nutrient source. Some producers have also found success in improving poor fertility soils by wintering their cow herds on the pasture that needs to be improved. Cows will excrete approximately 90% of the minerals they consume. By frequently moving bale feeders around the field, the cattle will more evenly distribute their manure and, consequently, the nutrients from the manure that is excreted. In addition, providing a commercial mineral mix to the cows will result in additional minerals being deposited on the pastures.

Tables 1 through 4: Phosphate and potash fertilizer recommendation tables for grasses and grass/legumes

Table 1. Phosphate fertilizer recommendations for grass hay and grass pastures.

		Phosphorus (P) Soil Test (ppm)				
Yield	Bray:	0-5	6-10	11-15	16-20	21+
Goal	Olson:	0-3	4-7	8-11	12-15	16+
ton/acre		-----P ₂ O ₅ to apply (lb./acre)-----				
2		40	20	10	0	0

Table 2. Potash fertilizer recommendations for grass hay and grass pastures.

		Potassium (K) Soil Test (ppm)				
Goal		0-40	41-80	81-120	121-150	161+
ton/acre		-----K ₂ O to apply (lb./acre)-----				
2		70	50	25	0	0

Table 3. Phosphate fertilizer recommendations for red clover, alsike clover, birdsfoot trefoil, & grass legume mixtures.

		Phosphorus (P) Soil Test (ppm)				
Yield	Bray:	0-5	6-10	11-15	16-20	21+
Goal	Olson:	0-3	4-7	8-11	12-15	16+
ton/acre		-----P ₂ O ₅ to apply (lb./acre)-----				
2		35	25	15	0	0
3		55	40	25	10	0
4		70	50	30	10	0
5		90	65	40	15	0

Table 4. Potash fertilizer recommendations for red clover, alsike clover, birdsfoot trefoil, & grass legume mixtures.

		Phosphorus (P) Soil Test (ppm)				
Goal		0-40	41-80	81-120	121-160	161+
ton/acre		-----K ₂ O to apply (lb./acre)-----				
2		95	65	40	15	0
3		140	100	60	20	0
4		185	135	80	25	0
5		230	165	100	35	0

Select Desired Species to Plant

One of the most often asked questions about pasture management is “What grasses or legumes should I plant and at what seeding rate?” The referenced article, entitled *Selecting Legumes and Grasses for Hay and Pasture*, provides a detailed discussion of the various characteristics of common grasses and legumes grown in pastures, as well as recommended seeding rates. Legumes offer many advantages when included in a pasture mix. Some advantages include N contribution from legumes to the grasses, increased production during summer months, and increased forage quality.

Which legumes to include in the pasture mix depends on soil pH (see previous section), management, and producer preference. Simple grass/legume mixtures (brome/alfalfa, orchardgrass/red clover, etc.) that are well adapted to the site can be very effective and are relatively easy to manage. Theoretically, there can be advantages to more complex species mixes. If growing conditions, disease, insects, etc. take a species out of a simple mix, there may not be a species present to come in and fill its place. Although grazing management will be discussed later, it should be mentioned that no matter what combination of species is chosen, if the forage is continuously grazed to the ground, the end result will be a situation where the predominant species will be bluegrass and weeds, and production will be greatly reduced. Most forages need at least six weeks of growth after germination to survive the winter, so when fall seeding, allow enough time before the first killing frost for the forage to grow.

Select Seeding Method

Seeding method will be influenced by plant species, seedbed, availability of equipment and site conditions. Whether establishing a new pasture or renovating, it is usually better to avoid tilling the soil, and instead work with the existing stand. Turning the soil can lead to erosion, loss of soil organic matter, and also creates a favorable environment for weeds. However, certain situations warrant the use of tillage. If tillage must be done, the objective of the tillage operations should be to prepare a smooth, firm, clod-free seedbed to provide for optimum seed placement and good seed-to-soil contact. Moldboard or chisel plowing should be done in the fall so that the freeze-thaw cycle will help break down soil clods. Cultipacker seeders, which broadcast the seed on the soil surface and then press it into the soil with rollers, have shown excellent results where a complete tillage program is used.

Pastures can be renovated by interseeding desirable species into the existing stand using a no-till drill. The existing sod must first be suppressed in order to eliminate competition with the new seeding. This can be accomplished by heavily grazing the grass, preferably the fall before seeding. Suppression can also be accomplished by using a chemical control method. One quart/acre of glyphosate (Roundup, Jury, etc.) should provide adequate suppression to get the interseeded species started. Apply glyphosate when grasses reach about 4 inches tall in the spring, then interseed.

There is currently an eight-week grazing restriction when glyphosate is applied to pasture. However, this eight-week period gives the new seedlings a chance to establish. Once grazing begins, rotationally graze to give the new plants their best opportunity to establish. In addition, one quart/acre of glyphosate in most instances will suppress, but not kill, brome grass, orchardgrass, or reed canarygrass. Thus in most instances, these grasses will regrow and be a part of the stand along with what was interseeded. However, one quart/acre of glyphosate will often kill bluegrass. If a bluegrass pasture is desired, the use of glyphosate is not recommended. When drilling, make sure to plant no deeper than 1/4 to 1/2 inch. A deeper seeding depth may sometimes be needed during dry periods for the seedling roots to be in moist soil. A good rule is to plant the seed three to four times as deep as the diameter of the seed. After interseeding, grass regrowth and weeds should be controlled by grazing or clipping to the height of the interseeded species to reduce competition.

Dormant, or frost seeding, is another option for seeding that can be used for most forage species, especially in a field that is not accessible to machinery or is full of rocks. Frost seeding is done in late fall or early spring and uses the freeze-thaw cycle to incorporate the seed into the soil. Red clover usually has the best chance for success with frost seeding. Other legumes and grasses can be planted using frost seeding, however, germination and establishment are often poor.

Utilize Proper Grazing Management to Maintain a Productive Stand

The objective of a grazing program should be to match animal nutritional needs with forage availability. In other words, maximum forage production and quality should coincide with the herd's maximum nutritional needs, such as during the calving and breeding season.

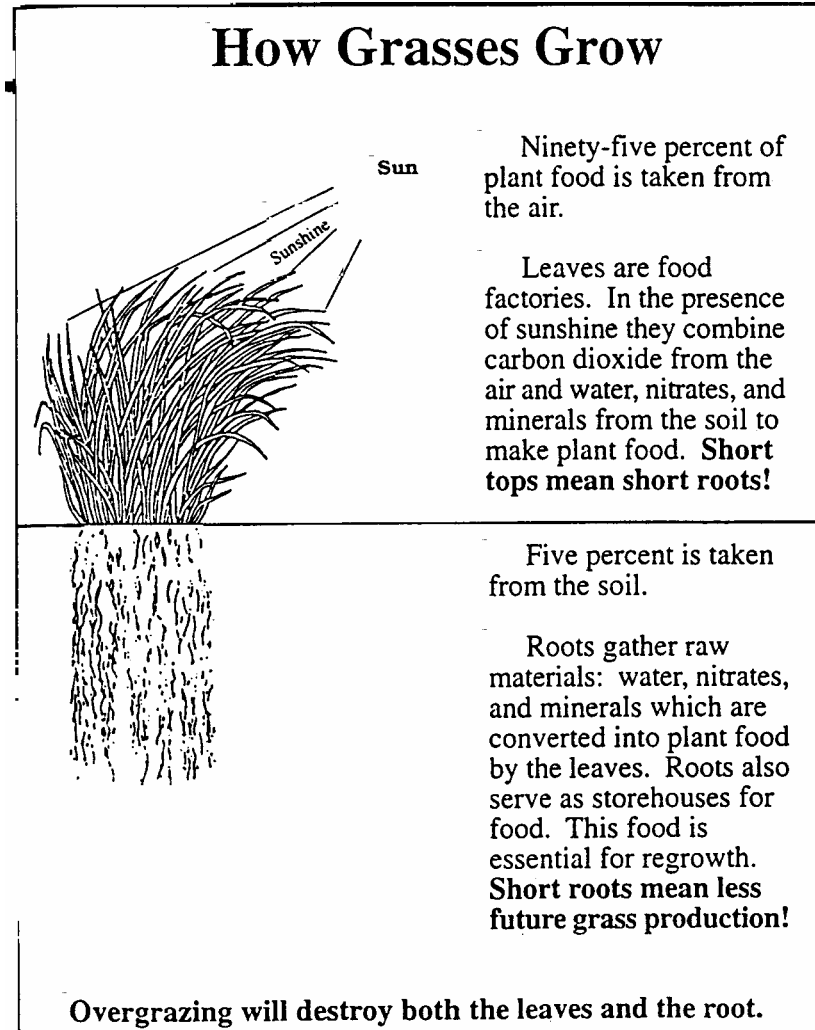
There are basically two types of grazing systems - continuous and rotational. In a continuous grazing system, there are no subdivisions of pastures. This type of grazing requires less management skill and lower set-up costs (water systems and fence), but results in less beef produced per acre. Legumes will generally not persist under continuous grazing. Stocking rates in a continuous grazing system should be chosen to assure adequate forage availability during low production periods of the year.

In a rotational grazing system, animals are rotated to different pastures, or paddocks. Rotational grazing can increase the productivity of pastures over continuous grazing. This can lead to more pounds of beef per acre. Rotational grazing gives plants a rest period to grow plant tops (leaves). Plant tops capture the sun's energy and allows plants to be less susceptible to short term drought, able to get more nutrients from the soil, less prone to winter injury, more competitive with weeds, and regrow more quickly after grazing. Thus, the real advantage to rotational grazing is healthier, faster growing, and more productive pastures.

There are different viewpoints about when to rotate cattle from one paddock to another. Some producers will move cattle to a pasture when the forage is a predetermined height, for example 10 inches, and let them graze it down to a certain height, such as 4 inches. Others rotate when the forage in the next paddock is ready to be grazed, which means getting the cattle on that paddock while the forage is in a lush, vegetative state so that it does not get overly mature and low in quality. During periods of rapid grass growth, cattle are rotated frequently between paddocks to keep up with rapid forage growth.

If there is too much forage growth in a paddock before it can be grazed, it can be taken for hay. Then during the summer slump when forage production is low, rotations are less frequent. Rotational grazing requires a higher degree of management and labor and increased costs for fencing and water supplies. However, there is an increase in both forage and animal production, and desirable species of forage persist for a longer period. Diagram 1 below shows why it is essential that adequate leaf area be left after grazing a pasture to permit photosynthesis to regenerate energy reserves in roots.

DIAGRAM 1.



Source: [Pasture Management Guide for Northern Missouri](#)

Fertility Management in Grazed Pastures

Pastures should be soil tested every two to three years to determine their nutrient status and fertilized according to soil test results (see Tables 1 through 4) to maintain productivity. If legumes are a major component of pastures, then soil pH, and P and K levels should be the main focus of the fertilization program because P and K are essential for legume persistence. However, if grasses are the main component of a stand, research has shown that yields can be significantly improved by fertilizing with nitrogen. Table 5 gives the University of Minnesota nitrogen recommendations for grass pastures under different situations. When split applications are recommended, application of the N should be made when the grass can best utilize it, such as when it is actively growing. An application in early spring, and another application in early August, depending on moisture conditions, are common application times.

University of Minnesota N recommendation for grass hay/pasture

Table 5. Nitrogen recommendations for grass production in various pasture management situations.

Management Situation	N to apply lb./acre
Rotational grazing and adequate rainfall	150*
Continuous grazing and adequate rainfall	100*
Grazing and moderate rainfall	50
Sandy soils, steep slopes, low rainfall areas	30
Organic soils	50

*Use split applications.

Research at the University of Missouri compared grass pastures with supplemental N to pastures of a grass/legume mixture. The project was conducted using a 12-paddock rotational grazing system. The researchers found that the grass/legume pasture had a lower cost per grazing day than the grass+N pastures, even with the additional fertility needed for the legumes. In addition, because a grass/legume mixture will usually result in higher gains, the cost per pound of gain would also be lower on a grass/legume mixture.

Uniform manure distribution is a key factor in maintaining soil fertility in a grazing system, and is affected by stocking rate, size of pasture, distance the animals travel to water, and availability of shade, as well as other factors. Manure is more evenly distributed at higher stocking densities. As cattle travel farther to water, manure tends to be deposited around the water source. Research at Wyoming and Missouri found that ideally paddocks should be arranged so that the farthest spot in a paddock is within 1/4 mile of the water source. This will result in more uniform grazing because forage that was more than 800 feet from the water source was not grazed as heavily on the first grazing. Therefore, it became overly mature on subsequent grazings and passed up by cattle for more vegetative forage. University of Missouri research found that soil test levels for P and K were up to five times greater within 50 feet of a lone shade tree compared to elsewhere in a pasture. Therefore, either providing uniform shade within a pasture or fencing a lone shade tree out of a pasture should result in more uniform manure distribution.

Weed Management

Proper grazing management generally leads to healthy pasture plants which compete better with weeds. By rotating pastures and leaving some plant residue after grazing, grasses will generally outcompete weeds. Maintaining proper soil pH and fertility helps control many weed species by keeping desirable plants growing vigorously. If weeds do become a problem, they can be clipped before they develop seeds. Allowing cattle to graze on wet soils damages pastures and allows weeds to grow.

Another option would be to use chemicals to control the weeds. Consult with the local extension office or obtain a copy of *Cultural and Chemical Weed Control in Field Crops* (University of Minnesota publication BU-3157-F) for herbicides currently approved for use on grass pastures. Be sure to follow the label instructions for use of herbicides and also to observe haying and grazing restrictions. If chemical control will be used, correct identification of weed species and proper timing of chemical

application are essential for effective control. For example, during the fall, weeds are moving sugars from their leaves to their roots to store energy for winter. This movement, or translocation, from leaves to roots also favors movement of herbicides to the roots and makes weed kill more likely.

Stockpiling Forage

Many producers are looking to cut costs of feeding stored feed early in the fall and winter. While corn stalk grazing is an excellent option for dry cows in the fall, many producers do not have access to stalk ground. Another way to extend the grazing season and cut down on the quantity of stored feed that must be fed is to stockpile, or accumulate, forage for later use. The stockpiled forage can then be grazed either in the fall after a killing frost or the following spring before pasture greenup. Stockpiled forage quality is usually most suitable for dry cows. In addition, snow cover is a common concern when stockpiling. Therefore, grasses more suited to stockpiling are those that remain upright, such as brome grass, quackgrass or tall fescue.

Recent research from the West Central Experiment Station in Morris found that early July was the optimum time to initiate stockpiling of brome grass to get the highest leaf yield and the optimum total yield. Other dates evaluated in the study were June 1 and 15, July 15, and August 1 and 15. This research also found that 50 lb. N/acre resulted in significantly higher yields than no N fertilization. Applying 100 lb. N/acre did not increase yields over the 50 lb. N/acre application. University of Wisconsin researchers found that initiating stockpiling on August 1 resulted in yields of 1 to 1.5 tons/acre. Starting on August 1 also allows for the pasture to be grazed or hayed for an additional month.

The quality of stockpiled forage is dependent on a number of factors, including weather, N fertilization, and how early or late stockpiling is initiated. Later initiation results in higher quality (but lower yielding) forage because the forage is less mature. University of Wisconsin research reported that stockpiled quackgrass and brome grass analyzed over winter was seldom below 18% crude protein.

Producers who decide to stockpile should strip graze the pasture, allowing about 3 to 4 days worth of forage at a time. This will increase utilization of the available forage by preventing excessive trampling. Fence posts will need to be put into the ground before the ground freezes. Other practices used by some producers include drilling a hole into the frozen ground and inserting a fiberglass post, or filling a bucket with soil, inserting a post and then letting the soil freeze. In order to have enough forage to use for stockpiling in the fall, pastures must be deferred during late summer (a time when forage on pasture is often sparse). Therefore, careful planning and stocking of pastures is needed to make stockpiling a viable option.

Many states offer annual grazing workshops or conferences that cover aspects of grazing in much greater detail. Contact your local extension office for the dates and sites of these workshops.

Additional References and Reading

- Selecting Legumes and Grasses for Hay and Pasture - 1996 MN Beef Cow/Calf Report C-127
- Pastures for Profit: A Guide to Rotational Grazing
- 1998 Minnesota Beef Cow/Calf Report
- Plants Poisonous to Livestock
- Cultural and Chemical Weed Control in Field Crops
- Birdsfoot Trefoil for Grazing and Harvested Forage (NCR Extension Publ. 474)
- Variety Trials of Selected Farm Crops

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