

Managing Pasture Growth and Quality with Grazing

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Introduction

One of the keys to profitable livestock production is to minimize the costs of producing a marketable animal or animal product. Feed costs are commonly 70-80 percent of the cost of growing or maintaining an animal. Pastures provide feed at a cost of .01-.02 cents/lb of TDN while hay costs .04-.06 cents/lb TDN. Improved pasture management offers the single greatest opportunity to lower production costs, assuming that animal genetics, health, marketing procedures, and other areas of management have been addressed. A primary goal of livestock producers should be to utilize grazed forage for as many months of the year as possible while minimizing the need for stored feed.

In this article, controlled grazing refers to the degree of control or level of management applied to grazing animals through the use of such grazing systems as rotational stocking, continuous stocking, and strip grazing. The method or combination of methods used to achieve the appropriate level of control will vary with each livestock farm. Regardless of the grazing method(s) utilized, the goal is to provide the amount and quality of the forage required by the particular class of grazing animal, while maintaining or improving the vigor of the plants being grazed.

Except in situations where a high level of grazing management is already being practiced, any increase in the degree of grazing control will improve forage utilization as it is sold off the farm as livestock product. The effective and profitable utilization of grazed forage depends primarily on the degree to which the manager is able and/or willing to exercise control in determining when, where, and for how long animals graze.

Controlled grazing alone will not overcome low soil fertility and low soil pH. Apply fertilizer and lime based on soil test results to meet the needs of the plants being managed. Proper grazing management enhances the growth of well-fertilized, desirable pasture plants, but seeding new stands or overseeding to thicken existing sods accelerates the improvement.

Why Controlled Grazing?

Kentucky is blessed with soils and climate that favor the growth of a wide range of productive, high-quality grasses and legumes for grazing, hay, or silage. When grazed these plants need to be fully utilized without abusing their vigor and growth. They should not be grazed too closely or for too long. To achieve a balance between fully utilizing the plants while encouraging vigorous plant growth, the livestock manager must have a planned grazing system to control the way animals harvest available forage by grazing.

Without a controlled grazing system, managers cannot control the way their animals graze a pasture during the season. This lack of control can produce an extreme situation such as season-long continuous stocking where animals are left on the pasture until there is nothing left to graze or until they are removed at the end of the season. Pounds of livestock or their products per acre are low due to the undergrazing and overgrazing which occurs. Too many Kentucky pastures are grazed without adequate control, although this is changing as producers begin to realize the benefits of controlled grazing.

Benefits of Controlled Grazing

The "bottom line" benefit of controlled grazing is improved profit through more efficient utilization and harvest of forage by grazing animals. Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. There are several factors that contribute to greater profitability. The number of animals in the grazing system (stocking rate) can usually be increased by 30 to 50 percent. Gain per acre can also be increased by ensuring that high-quality, fresh, and unsoiled vegetative growth is available throughout the grazing system. Vigor of the pasture sod is improved. Handling and checking grazing animals is easier. More accurate estimates of the amount of forage available, greater uniformity in grazing of pastures, and the flexibility of harvesting and storing forage not needed for grazing are advantages. Extending the length of the grazing season while providing a more uniform quality and quantity of forage throughout the season are also important benefits. Improved grazing management offers one of the greatest opportunities for making livestock farming more profitable by lowering production costs.

Influence of Controlled Grazing on Pasture Plants

The primary, cool season, perennial pasture grasses used in Kentucky are orchardgrass, bluegrass, and tall fescue. When not grazed or harvested, each of these passes through successive stages of growth in the spring: 1) leafy vegetative; 2) boot with seed heads enclosed in leaf sheath; 3) heading when the

seed heads begin to show and, 4) bloom when pollination has occurred (Figure 2). Since fiber and lignin contents increase steadily beyond the vegetative stage, while percent protein and digestibility decrease, a major goal in grazing management is to maintain these grasses in the leafy, vegetative stage at all times. Once the spring season is past, these grasses do not go through this series of growth stages until the next spring. Therefore, the regrowth after each grazing period is leafy and high in quality.

The bottom leaves of the grasses, especially the tall-growing orchardgrass and tall fescue, die due to shading and diseases as the plants grow tall. Such tall growth also shades clover plants, making it difficult for them to compete or even survive. As leaves mature they decrease in quality and growth rate slows. Removal of these leaves by the grazing animal stimulates new tillers and increases the vigor of the plants if conditions are favorable for regrowth. Legumes, such as red clover, ladino clover, and alfalfa, also go from leafy to stemmy growth stages with the same lowering of quality as the grasses. Except for calcium, the mineral content in these forages decreases from the leafy to the stemmy growth stages.

Nonstructural carbohydrates and other energy reserves are produced when plants are growing. The excess nonstructural carbohydrates are stored in roots, rhizomes, stolons, and tillers. They provide energy and nutrients while plants are being grazed and as they make regrowth. Reserves provide energy for persistence during drought, periods of low or high temperatures, and for growth when conditions improve. Levels of nonstructural carbohydrates are reduced as they are utilized for rapid plant growth, particularly after the plants are grazed so short that little leaf area remains. As leaf area increases, nonstructural carbohydrate reserves also increase due to the positive balance between photosynthesis and respiration.

When leaf area on plants is low, such as after close grazing or hay making, there is not enough energy (sugars) being produced by photosynthesis to provide for both leaf and root development. To "stay alive" the plant uses all available energy for producing new leaves until there is excess for root development. If the leaf area, and indirectly the stored energy, is always low due to continuous overgrazing, the root system is small, weak, and shallow. The deprived root system cannot provide adequate water and nutrients which contributes to a weakening of the entire plant.

Maximum growth of forage plants generally occurs when there are enough leaves present to intercept 90 percent of the sunlight, with less than 10 percent falling on the soil surface below the plants. Additional leaves do not increase production due to shading and loss of efficiency of the older lower leaves. This is the optimum time to begin grazing.

Utilizing these principles, the goal of efficient grazing management, with the plant in mind, is to practice grazing management which results in plant persistence plus high yields and quality while maintaining adequate leaf area and levels of nonstructural carbohydrates for stored energy. This means removing a major portion of the leaves by grazing at a time when plant reserves are adequate, then allowing the plant enough time to produce leaf area sufficient to replace the reserves utilized in the process of making regrowth.

Perennial Forage Species for Grazing

Orchardgrass and tall fescue are tall growing, perennial, cool season grasses. Bluegrass is also a perennial, cool season grass which is shorter and has finer stems and leaves. Very close continuous grazing suppresses new growth of these grasses, but bluegrass is less affected than the two taller growing grasses. In addition to stored energy at the base of its tillers, bluegrass also has relatively high levels of nonstructural carbohydrates stored in its rhizomes which serve as sources of energy when it is grazed closely. Each of these cool season grasses, especially bluegrass, slows down dramatically in growth during the hot summer months.

The primary storage of nonstructural carbohydrates in orchardgrass is in the base of its tillers. Since it is also a tall grass compared to bluegrass, a large percentage of its tillers and their high levels of stored energy are susceptible to being removed by close grazing. Unlike bluegrass, orchardgrass has no rhizomes and tall fescue has only very short rhizomes for storage of energy.

Tall fescue is better able to withstand close, continuous grazing than orchardgrass. In addition to the nonstructural carbohydrate reserves in the base of its tillers, tall fescue has reserve energy stored in its short rhizomes. Tall fescue also has more leaves closer (semi-prostrate) to the ground. Based on these characteristics, bluegrass can be grazed down to 1 inch, tall fescue to 2-3 inches, and orchardgrass to 3-4 inches without causing injury to the plants. However, each species benefits from recovery periods following grazing to allow accumulation of leaf area and nonstructural carbohydrate energy reserves. The cool season species benefit from longer rest periods and from not being grazed as closely during periods of stress such as drought or high temperatures.

Light grazing pressure results in orchardgrass and tall fescue dominating bluegrass and the clovers due primarily to shading by the two tall growing grasses. In tall fescue-orchardgrass pasture mixtures, tall fescue can be expected to overcome the orchardgrass. This is partly because tall fescue is adapted to a wider range of soil moisture, temperature, and soil fertility than orchardgrass. Another factor is that animals often overgraze the more palatable orchardgrass. Tall fescue also is better able to withstand close grazing due to its semi-prostrate tillers and leaves. In controlled grazing systems with adequate,

but not extreme, grazing pressure, bluegrass can often be maintained with orchardgrass and even tall fescue if soils and climate are favorable for bluegrass.

When properly managed, alfalfa and alfalfa-orchardgrass mixtures provide high-quality, high-yielding forage throughout the grazing season. Its large tap root enables alfalfa to obtain water during dry periods when more shallow rooted plants slow down in growth or dry up. Alfalfa needs a rest period following grazing. Alfalfa varieties developed specifically for grazing are often able to withstand closer grazing and require less recovery period than the traditional hay varieties. To ensure persistence and high yields, alfalfa should be grazed to 3-4 inches within five days, then given approximately 21 days for recovery growth before being grazed again. Regrowth initiates from buds in the crown and from leaf nodes on the stem after the terminal bud (flower) is removed by grazing.

Ladino and white Dutch clover are the same (*Trifolium repens*) except for size. Ladino is a giant type while white Dutch is much smaller. These perennial legumes have shallow root systems which make them susceptible to drought injury. They spread by stolons which are actually stems laying on the soil surface producing roots and leaves at each node. Since the stem (stolon) is on the soil surface rather than upright, grazing animals remove only leaves. This is a primary reason for the high quality of these plants and their ability to withstand close grazing.

Red clover is a perennial legume that generally persists for only one and half to three years in Kentucky due to crown and root diseases (common seed – 1 to 1 ½ yrs, improved varieties 2 to 3 years). It has excellent seedling vigor and develops a strong taproot. Red clover can tolerate close grazing even on a continuous basis. Regrowth is initiated from buds in the crown. It is an excellent companion legume with orchardgrass and tall fescue because it grows tall enough to compete with them. It adds to the quality and productivity of pasture and is also well suited for grazing and for hay or silage.

Getting Started with Controlled Grazing

By utilizing an effective grazing system, the manager gains control of the grazing animal and therefore gains control of how the forage plants are treated. Such a system needs to be simple and flexible. Each farm is different, as is each season and each manager, among many other factors. The principles of managing plants for grazing discussed thus far are based on plant science. The daily and seasonal decisions, such as where fences should be placed, when grazing livestock should be moved, which pasture should be grazed first, and size and number of pastures in the grazing systems, are usually based on good judgment and experience. Thus, grazing management is very much an art that is best learned by "doing."

The degree of control exercised will vary with the situation. Simply dividing a pasture boundary with one fence to provide two areas or paddocks instead of one large pasture increases the degree of control. Additional paddocks and greater control can be established by continuing to subdivide the pasture boundary. Some producers may want to gain very close control, to the extent of moving grazing animals every 12 hours. Generally, when the number of paddocks is more than 4-6, the goal is high-quality forage for high-performance livestock, such as dairy cows or stocker cattle. One practical technique is to use a single strand of temporary wire to limit the grazing animals to the area that can be grazed in the allotted time. Move the wire forward to provide fresh grazing. No back fence is required if the entire paddock is grazed in less than seven days or before significant regrowth occurs.

The first requirement for controlled grazing is a boundary fence that will effectively hold grazing animals on the farm or in the pasture area. Temporary or only minimal interior fencing is required to hold the animals in the subdivisions or paddocks. It is very likely that the fencing system will change as the manager gains experience. Do not be afraid to make mistakes because there is no single "perfect" system for any given situation. Lessons learned from the first experience with controlled grazing can be easily incorporated into the grazing system.

Guidelines for Establishing Controlled Grazing

Because of the need to start somewhere, general guidelines are useful. Each farm situation is different. Cool season pasture plants generally need about 15 days of rest after being grazed in spring, and 25-30 days of rest during the hotter summer months. Grazing animals should be moved through pastures quickly in the spring, or graze the spring growth continuously without division fences or by giving animals access to all paddocks. Once forage growth begins to exceed livestock demands, limit the area to be grazed to provide forage for no more than 5-7 days grazing, and the excess forage should be harvested as hay or silage. As growth slows during the summer, longer rest periods are necessary and more acreage is required. Additional summer grazing can come from pastures harvested for hay in the spring, from forage species included in the system specifically for summer production, or from hay fields outside the rotational system.

Bermudagrass, big bluestem, eastern gamagrass, and switchgrass are perennial warm season grasses that make significant growth during the summer months when the cool season perennial grasses slow down in growth. The management of some of these grasses is discussed in greater detail in the section on extending the grazing season.

Another general rule of thumb is to place enough grazing pressure on the forage in each paddock to utilize it within 5-7 days. If grazed longer, plant regrowth begins to be grazed in preference to the existing growth. Generally, the shorter the grazing period, the more uniformly the forage is grazed, with minimal spot grazing.

Any subdivision of pastures provides improved grazing control. However, to meet the guidelines of 15-30 days of rest after grazing for no more than 6 days, at least 6 paddocks are required. The more paddocks, the greater the grazing control and the more flexibility the system has to offer. Livestock distribution is improved, forage waste is reduced, the plants are provided longer periods to make regrowth after being grazed, and the plants are maintained in a leafy, vegetative state for longer periods of time.

However, as paddock numbers for a given pasture acreage increase, grazing pressure increases, raising the potential very quickly for overgrazing and weakening the plants. To prevent overgrazing, higher levels of management skills are required, along with more frequent monitoring. Always plan to have an alternative source of feed, especially during July and August when drought and/or high temperatures slow plant growth. The alternative feed may include "escape pastures" composed of warm season perennial or annual grasses or cool season forages that were harvested for hay earlier in the season, hay, poultry litter, or silage. Controlled grazing offers the opportunity to "inventory" the available forage. The manager can look ahead to the ungrazed paddocks, estimate how long it will take to graze each of them, and plan accordingly.

There are two basic approaches to planning a grazing system that provides forage throughout the grazing season, including the summer months when slower plant growth is combined with the increasing forage requirements of growing livestock:

1. Plan a system of paddocks in which the grazing animals will be able to utilize all the spring growth. As summer approaches, add fenced fields that were harvested for hay or silage to provide the needed additional grazing.
2. Include enough acreage in the system to provide grazing during the month with least production and harvesting of hay from those paddocks not needed for grazing at other times.

While the differences in these approaches are subtle and may not appear to be great, the actual layout of the systems can be quite different and significant. For example, if much of the land available for pasture is too steep or rocky to harvest for hay, spring grazing should be planned so the paddocks in these areas are heavily grazed. Later in the season, paddocks that were harvested for hay can be grazed. If all the pasture land can be harvested, there are

advantages to including all that land in the grazing system so that different paddocks can be harvested for hay as necessary.

All paddocks do not need to be the same size or shape. Square paddocks are ideal. Long, narrow paddocks that are 4-5 times longer than their width should be avoided. Livestock often will not graze them uniformly plus long traffic lanes often encourage soil erosion. Place fences to separate areas with different plant species. Use fences to hold grazing animals on areas such as steep hills where they would not naturally prefer to graze. Minimize fencing up and down slopes where travel patterns encourage soil erosion. Place gates in corners nearest the direction of normal livestock travel to and from the paddocks.

The importance of shade for grazing animals is strongly debated in Kentucky. Milk cows on very hot summer days need shade if they are going to be out in the paddocks in the middle of the day. However, under such conditions, the cows will go to the barn to find shade. Other livestock are more comfortable in shade on hot summer days, but there is no clear evidence that production is affected. A disadvantage of shade is the concentration of manure and the killing of pasture sod in areas of congregation. Compared to many areas of the country, Kentucky has relatively mild summers.

Managing Controlled Grazing

Managing a grazing system offers daily challenges and opportunities to utilize the pasture plants as high-quality feed for grazing animals without weakening the plants. However, there is plenty of flexibility in the degree of intensity. If the manager needs to be away for an extended period, animals can be given access to additional paddocks so they have plenty of forage. Or, it is easy to leave simple directions for moving livestock as necessary.

An experienced manager is able to estimate the number of grazing days a paddock will provide by observing the height and density of its plant growth. When in doubt, it is nearly always better to leave a liberal amount of forage rather than allow it to be grazed too closely. Techniques such as creep grazing of calves in a cow-calf operation can be easily incorporated into the system. Placing structures at gate openings so calves can walk through to graze fresh growth in the next paddock is a common way to creep graze. Raising the fence to allow calves, but not cows, to walk under it is a simple way to creep graze.

Another way to provide the best quality forage to those animals that can most efficiently convert it to a saleable product is "first-last grazing." For example, stocker cattle are allowed to selectively graze the highest quality plants (first grazers). They are rotated to the next paddock and dry dairy cows or beef cows (last grazers) follow and finish grazing the forage partially removed by the first grazers.

Ideally, by continuous grazing or rapid rotation through paddocks in spring and by harvesting those paddocks not needed for grazing for hay or silage, grass seedheads will be kept to a minimum. In practice, there are usually some paddocks in which the timing of grazing is such that the meristematic growing points that move up the stalk to form the seedhead are not removed. In most instances, it is not productive to clip these paddocks simply to remove the relatively sparse seedheads. Livestock will nip most of them off during the next grazing period. If weeds are present and not grazed, clip them to prevent seed production.

In those instances where grazing pressure is inadequate and results in mature, low quality forage, clipping will stimulate new, high-quality growth. Overall, clipping is expensive and should be minimized by properly managed controlled grazing.

A key to managing controlled grazing is to gain the ability to anticipate available forage in other paddocks in the system. In spring or following a drought when all the paddocks are starting growth at the same time, it is necessary to start grazing before the optimum amount of growth is present. If grazing is postponed until the forage in all paddocks is 6-8 inches tall, the plants in several paddocks in the grazing sequence will decrease in quality before they are grazed. Those paddocks grazed first will provide forage for only a short time before the animals need to be moved.

Water and Controlled Grazing

The availability and accessibility of clean, fresh drinking water for grazing animals is a serious consideration and may limit the design and management of controlled grazing systems. A supply of water does not always need to be present in each pasture, but it certainly needs to be available within walking distance of 500-600 feet for milking dairy cows and 800-1,200 feet for other livestock. There are many options available, such as solar pumps, ram pumps, cattle operated pumps, spring development, drilled wells, gravity-flow systems, and windmills. Do not allow the lack of existing water to be a complete barrier to the development of controlled grazing systems until all practical possibilities for supplying water have been explored.

Extend the Grazing Season with Controlled Grazing

One of the benefits of controlled grazing is the opportunity to take advantage of the particular contributions various forages can make toward extending the grazing season. A single, continuously grazed pasture offers little opportunity to do this. For example, with six paddocks, there is the opportunity for

several of the paddocks to be seeded to forage species such as alfalfa-orchardgrass, bermudagrass, annual warm season grasses, or a native warm season grass.

Utilizing stockpiled tall fescue for winter grazing is a practical way to extend the grazing season and lower winter feed costs. Remove livestock from the tall fescue paddocks August 1-15. Apply 60-80 lb of nitrogen per acre plus lime, P_2O_5 , and K_2O as needed. Allow the fall growth of tall fescue to accumulate. After the forage in other paddocks has been grazed in late fall - early winter, turn the livestock into the stockpiled tall fescue paddocks to graze the accumulated growth; ideally, this will be in late November to early December. Strip grazing to limit the forage offered to the amount that can be grazed in seven days or less will significantly increase the number of grazing days. Since tall fescue is dormant and makes no regrowth at this time of year, it is not necessary to have a back-fence. The increase in grazing days is realized primarily from reduced trampling and soiling of the forage. At the same time, fresh forage is made available as each new strip becomes available. With adequate late summer and fall rainfall, one acre of a strong tall fescue sod managed in this manner will provide sufficient grazing for a beef cow for four months.

The use of warm season perennial grasses, such as bermudagrass or native warm grasses, in grazing systems can provide significant summer forage. Having the grass available for grazing in July and August relieves grazing pressure on the cool season grass pastures. This summer growth also provides a greater opportunity for growth of fall forage and to set aside and stockpile tall fescue for winter grazing.

Big bluestem, eastern gamagrass, and switchgrass need to be rested for about 4 to 5 weeks after being grazed. A stubble height of 8-10 inches should be left when grazing these species. Bermudagrass has strong rhizomes and stolons which allow it to be grazed closer and more frequently than most pasture grasses. However, bermudagrass does respond to rotational stocking which results in grazing the plants from 6-10 inches tall down to 1-2 inches followed by a 2-4 week rest period.

Sudangrass and sorghum-sudangrass are summer annual grasses that provide large amounts of high quality grazing during summer. These plants can contain toxic levels of prussic acid during their early stages of vegetative growth. Once the plants are an average of 30 inches tall they are safe to graze. Each paddock should be grazed down to 6-8 inches within 3-5 days to avoid trampling losses, provide uniform utilization, and minimize grazing of regrowth high in prussic acid. Graze again when plants are an average of 30 inches tall. The leaves of these plants can contain dangerously high levels of prussic acid immediately after being killed by frost. Do not graze such plants until the frosted leaves have dried (generally 2 weeks after a killing frost). Then beware of new leaves that may sprout following the frost. Interestingly, these same grazing

recommendations apply when johnsongrass occurs in pastures, since it is in the sorghum family of grasses.

Pearl millet is another summer annual grass that provides valuable summer grazing. Prussic acid is not a concern with pearl millet. Grazing can begin whenever forage is needed but preferably not before plants are at least 18 inches tall. Since most of the regrowth from pearl millet occurs from nodes on the stem, leave a stubble height of 6-8 inches. Graze the plants down within 3-5 days to minimize trampling losses and graze again when the plants reach a height of 18 inches or earlier if needed.

Another group of plants valuable for extending the grazing season are the small grains. Any of these winter annuals can be grazed during late fall, winter, and early spring, but rye is most commonly used. Varieties of rye adapted to Kentucky conditions make considerable growth in late fall-early winter as well as in late winter - early spring.

Wheat also provides excellent grazing, particularly if growth is needed in late spring. Since wheat matures later than rye, it can be grazed later in spring. Triticale, a cross between wheat and rye, matures later than rye but earlier than wheat. The small grains can be grazed continuously during periods of rapid growth. Once they are grazed down to 1-3 inches, they benefit from a rest period until they reach a height of 6-8 inches. If wheat or triticale is being grown for grain, grazing should stop by March 1 or earlier as a general rule, to avoid removal of the growing point or developing seedhead.

Summary

The development of grazing systems to provide the appropriate degree of control of grazing animals and the plants they graze is a management tool that successful livestock producers will continue to make greater use of in the future. Reducing production costs is a key to profitability in the livestock industry and feed is a major cost. Efficient marketing of forage through livestock which harvest it directly by grazing is a key way to reduce production costs. By controlling the grazing animal, the manager will profit from enhanced livestock performance and continued forage plant productivity.