

MANAGING PASTURES FOR YEAR-LONG FORAGE SUPPLY

Lesson 6

Introduction

Forages make up a large portion of ruminant animal diets. Nationwide 75 to 90% of all feed consumed by beef and sheep is forage. In addition, a survey of beef producers in Nebraska revealed that producers who grazed cattle longer during the year had lower costs of production compared to producers who fed more harvested forages. Thus, the longer we can keep animals out on pastures harvesting their own forage, the greater the opportunity to keep production costs down.

For planning purposes, break the grazing year up into four seasons. Unfortunately, in the north-central region, the four grazing seasons are not spring, summer, fall, and winter. The four grazing seasons in this region refer to spring (May and June), mid-summer (July and August), late summer (September), and fall (October until we can no longer graze). In addition to the four grazing seasons, we must also consider producing hay from our pastures for winter-feed.

In the north-central region, many perennial pastures consist primarily of cool-season grasses (bromegrass, bluegrass, quackgrass, etc.). These grasses produce most of their growth in spring, grow slowly during mid-summer, and if rainfall is adequate produce moderate amounts of forage in late summer and early fall. This uneven forage growth does not tend to meet forage needs of livestock throughout the growing season.

How do we manage pastures to supply forage for as long as possible during the year and produce adequate amounts of hay? **It takes planning.** To maximize the amount of time animals graze pastures, the most critical period is mid-summer. Supplemental pastures during summer can supply forage when forage is normally limiting. Furthermore, the use of supplemental pastures allows cool-season pastures to rest during mid-summer. This gives cool-season pastures time to regrow and accumulate (stockpile) forage for late summer or fall grazing. In addition, by resting cool-season grass pastures during mid-summer, those plants will be more vigorous and regrow more rapidly when grazing resumes. This lesson will focus on why management during the mid-summer period is so important for extending the grazing season. It will also provide management options for supplying adequate amounts of high quality forage during fall and for managing a productive hay program.

Management effects on plant growth

Normally in spring, pasture growth keeps up or keeps ahead of grazing animals. Under continuous grazing or high stocking rates, once summer comes and pastures get grazed down, they never seem to quite recover. This is for a reason. One must remember that half of the pasture is beneath the soil (the roots). When a plant is grazed, the plant tops (leaves) are removed. What we sometimes don't think about is that those leaves are feeding the whole plant (from the sun by photosynthesis). The plant compensates for top removal by sloughing off roots. Although it is a generalization, we need to think that what is going on above ground with our pasture plants is also going on below ground. When plant tops get shorter because we graze them, plant roots also get shorter. If plant tops are kept short, plant roots will also be short. A short root system can't explore very much of the soil for moisture or nutrients. When soil starts to dry, it does not take very long before the dry line in the soil is deeper than the plant roots. Even if fertilizer is applied, once nutrients are out of the relatively small rooting zone, the plant cannot get any more. Even when it rains, these plants are not as vigorous and cannot regrow as quickly. By letting pastures rest between grazings, plants can grow tops, which will help them grow more roots. This will then help them to explore more of the soil for water and nutrients, allowing the plants to grow more quickly after grazing. These are some of the reasons why rotational grazing helps pastures be more productive. However, even with rotational grazing, cool-season plant growth is slow during summer and pastures generally do not produce adequate supplies of forage. Often in July and August animals are grazing whatever they can find.

How do we manage to have enough high quality forage available from July through fall? To accomplish this, cool-season pastures need to be destocked after spring (less animals per acre because less forage per acre is being produced). How do we go about destocking? There are several ways to do this. One is to stock pastures lightly. Forage growth will get ahead of grazing animals in spring, but animals will be able to selectively graze and there will be more forage for later in the growing season. This is a viable option for some livestock operations. However, animal production per acre will be below its potential.

Some other approaches to destocking pastures in summer are: 1) for dairy producers, graze heifers behind lactating cows in spring (if not grazing cows, graze dry cows behind heifers), or 2) make hay on some pastureland (or alfalfa stands) in spring and then use those fields for grazing in summer. This results in more acres for grazing during summer (destocking). This system allows for both hay production and for extra pasture during slow growth periods. In beef systems you can over-winter calves, graze them the following spring, and move them to a feedlot or sell them as plant growth slows. This option has to be weighed against the cost of feeding animals over winter.

Perhaps the best way to destock pastures is to remove animals altogether. Using more than one type of forage crop for pastures may give the best chance of supplying adequate amounts of forage season long. The following will discuss several alternatives for additional crops and management strategies for pastures.

Alternative forage management strategies and crops for summer

Alfalfa

Alfalfa can make an excellent complement to cool-season grass based grazing systems. Alfalfa is a high quality legume that grows more during mid-summer than cool-season grasses. Alfalfa already exists on many farms, and can support excellent liveweight gains or milk production. Over 3 years in Minnesota, alfalfa supported 667 lb. of lamb gain/acre/yr (Jordan and Marten, 1988).

Initial spring growth of alfalfa occurs when cool-season pastures are rapidly growing. As such, first cutting alfalfa can be taken for hay. Use alfalfa regrowth for summer grazing. When using alfalfa as pasture, rotational grazing is important. Graze alfalfa similar to the way you would hay it, with about 4 weeks rest between grazings. On dairies where forage intake is critical, moving animals to new forage should be done every milking or at least daily. In beef and sheep systems, less intensive systems can work well.

While animals are grazing alfalfa in summer, the cool-season grass pastures are growing slowly and are stockpiling forage for later use. This stockpiled cool-season grass is then available for grazing in late summer or fall.

Bloat can be a problem while grazing legumes and should not be ignored. Be aware and manage to minimize the risk of bloat. Do not move hungry animals to fresh, lush alfalfa. If animals are hungry, feed them hay before moving them to a new pasture. Also, do not move them first thing in the morning. Wait until after they have had their morning meal (and are not as hungry) before moving them. Do not move animals onto wet alfalfa (from dew or rain). Feed hay in alfalfa pastures, particularly when animals are first turned out on alfalfa. Supply animals with a bloat block or bloat guard. Perhaps the most critical point is to observe animals often, particularly when first putting them on alfalfa and when pastures are rotated. At the West Central Research and Outreach Center (WCROC) near Morris, MN sheep were grazed on pure stands of alfalfa for 122 days in 1997. One lamb was lost to bloat. So be aware, but don't be afraid.

Warm-season grasses

Warm-season forages produce the majority of growth during July and August in the north-central region. This makes them fit nicely with cool-season grass pastures. There are two types of warm-season pastures: 1) native warm-season grasses, and 2) warm-season annuals.

Native warm-season grasses

Native warm-season grasses are perennials. Thus, they can persist for many years with good management. Native warm-season grasses grow rapidly and produce lush, vegetative forage during

mid-summer. Keep animals off of the warm-season pastures in the spring while cool-season pastures are actively growing. While grazing warm-season pastures in mid-summer, animals can gain 2 lb./hd/day. While grazing warm-season pastures, cool-season pastures can be rested and forage stockpiled for late summer and fall use.

Native grasses can be challenging to establish and maintain. In addition, as we go north, the mid-summer period becomes shorter. Thus, the mid-summer forage slump when native grasses are most needed may not be as long. Good information on the economic benefits of native grasses in the north central region is lacking. However, native grass pastures offer an excellent complement to cool-season grass pastures.

Summer annuals

Summer annual grasses such as sudangrass or pearl millet can offer another option for mid-summer pastures. They also produce lush, vegetative growth during mid-summer, and are therefore a good complement to cool-season pastures. However, summer annuals can be expensive, as a result of annual seeding. Good management including rotational grazing and/or staggered planting dates are needed to make summer annuals economically viable. Under a multiple cut system at the Rosemount Research and Outreach Center in Rosemount, MN, sudangrass produced 5.7 tons/ac. dry matter (dm) of forage that averaged 12.7% crude protein (CP) and 61.0% in vitro digestible dry matter (IVDDM). In the same trial, pearl millet produced 5.8 tons/acre of dm that averaged 19.2% CP and 65.4% IVDDM. The sudangrasses (and all sorghum species) can cause prussic acid poisoning if grazed after a killing frost. Pearl millet will not cause prussic acid poisoning. As a general rule, pearl millet produces better on lighter soils and sudangrass better on heavier soils.

There are other summer annuals that can be used for forage as well. Both soybeans and cowpeas have shown promise as summer annuals for forage in the region. While the tonnage may not be as great (2.5 to 3.5 tons/ac.) as for sudangrass or pearl millet, animal performance can be better with these crops. Over three years, growing lambs gained 0.44 lb./day grazing cowpeas and soybeans as opposed to 0.33 lb./day for lambs grazing sudangrass (Sheaffer et al., 1992). Cowpeas and soybeans may be useful in systems where high intake and high individual animal performance are goals.

Summer N fertilization

Soil fertility on pastures is often overlooked as a management tool to increase summer forage production. To determine fertility needs, a lab should test soils, which can make fertility recommendations for your soil and climate.

Nitrogen fertilizer will increase plant growth. In many instances N is applied to pastures in spring. If the pastures are harvested for hay, this is a way to increase hay production and may be a viable option. However, under grazing systems, forage is often in abundant supply in spring, so additional growth at this time may not be efficiently used by grazing animals. This can result in poor return from money invested in fertilizer. It may make more sense in a grazing operation to apply fertilizer in June. This way

the additional forage production will occur in mid-summer, when additional forage is needed. The carrying capacity of the cool-season grasses is greater in mid-summer when N is applied later in the growing season.

How much fertilization can be profitably applied to pastures can be difficult to determine. Growing more grass does not make fertilization profitable. Remember, for every dollar spent on fertility (or any input), more than one dollar must be made in return. Therefore, fertilizing to grow more forage in the spring and letting that forage get too mature and lower in quality is not profitable. Nitrogen should only be applied to grass if additional forage is needed. Because most pastures are under-used in spring and over-used in summer, one application of 50-80 lb. N/ac. in mid-June to mid-July may be the most profitable in many pasture systems. Table 1 gives nitrogen application recommendations for different grazing management systems and environmental conditions.

One thing to consider with N fertilization is that N can be applied to pastures in several forms. Supplying N to pastures by growing legumes or with animal manure can be an excellent option. Legumes can provide 80-100 lb. N/acre to grasses in a pasture. In addition, over 80% of the legume N grazed by livestock are returned to the pasture through manure and urine.

Table 1. Nitrogen recommendations for grass pastures in Minnesota

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

Forage Legumes in Grass Pastures

Legumes benefit grass pastures by providing N to the grasses, by improving the distribution of forage growth through the grazing season, by increasing animal intake, and by improving animal performance. Alfalfa and clovers can make pastures more productive. Planting 10 lb./ac. of alfalfa in bromegrass pastures at the WCROC increased forage production 2.3 tons/ac./yr. To effectively use and maintain legumes in pasture systems, good pasture management is critical. Special attention to soil fertility and grazing management is needed to maintain legumes in pastures.

Forage legumes offer a number of advantages for pastures. However, there are several challenges for using legumes in pastures. Legumes can have poor persistence (particularly under continuous grazing) and low tolerance to poorly drained soils and low soil fertility. In addition, many legumes can cause bloat. As such, grass/legume mixed pastures are easier to manage than legume monocultures, and therefore may be desirable for pastures.

Stockpiled cool-season grass

Stockpiling forages is done by removing animals from a pasture at some time during the growing season and letting forage accumulate for later use. Most people consider this an option for fall forage. However, cool-season grasses can be stockpiled for grazing during mid-summer. Pastures designated for mid-summer grazing would be grazed lightly or not be grazed in the spring. Thus, forage would be stockpiled in those pastures for mid-summer grazing. When stockpiled pastures are grazed during mid-summer, spring grazed pastures would be rested. Animal performance may be lower in this type of system because pastures would be mature before they were grazed.

Strategies for fall forage

Stockpiled cool-season grass pasture

Stockpiling cool-season grass pastures can supply forage for fall grazing. The brome grass that dominates many pastures in the north-central region generally produce most of their seedheads by mid-June. Therefore, if stockpiling is initiated after mid-June, the majority of the forage available will be leaves. Leaves are more readily eaten and are higher quality than stems. However, the quality of cool-season grasses declines quickly as they go dormant. Thus, the quality of stockpiled forage tends to be relatively low. Therefore, fall stockpiled forage in this region is probably best suited to dry pregnant cows and ewes as opposed to growing or lactating animals.

A trial was conducted at the WCROC to evaluate the effect of stockpile initiation date and N fertilization on stockpiled yield. The earlier in the season stockpiling was initiated the greater the yield. However when pastures were stockpiled before July 1, more of the forage was stem material. In addition, the earlier a pasture is stockpiled the less use you can graze it during the growing season.

Nitrogen fertilization greatly increased the production of stockpiled forage in that trial. Applying 50 lb. N/ac. increased forage yield from 1190 lb./ac. to 1830 lb./ac. An additional 50 lb. N for a total of 100 lb. N increased yields only slightly. Preliminary data from this study indicate that in the region, initiating stockpiling in early to mid-July and applying 50 lb. N/ac. will optimize the amount of leaf material available for grazing during fall.

Making cool-season pastures available for stockpiling in mid-summer can be a challenge. On most farms, all available acres are needed for summer grazing. To make stockpiling work on a consistent basis, consider some of the summer forage alternatives discussed previously.

Brassicas

Brassica crops include turnips, rape, typhon, kale, etc. The primary advantage of these crops is that they remain green and lush in the fall after most forage crops go dormant. Thus, they can produce good animal gains on pasture at a time when other forage crops are relatively low quality. However, animal performance when grazing brassicas has been highly variable. In the literature, gains with growing lambs

have varied from 0.04 lb./hd/day to 0.74 lb./hd/day. However, average daily gains have generally been higher for lambs grazing brassica crops than for lambs grazing stockpiled tall fescue or orchardgrass. In 1997, at the WCROC, lambs were finished grazing forage turnips, alfalfa, or in the feedlot on an alfalfa, corn, soybean meal diets. Lambs gained 0.60 lb./day in the feedlot, 0.56 lb./day grazing alfalfa, and 0.51 lb./day grazing turnips. Most of the decreased lamb performance while grazing turnips occurred in the first few weeks of grazing. These lambs had not been exposed to turnips prior to the trial and took 2 to 3 weeks to begin readily eating the turnips.

The reason for the inconsistency in animal performance while grazing brassica crops is not well understood. Several management strategies can be used to try to minimize the variation in animal performance while grazing brassica crops: 1) allow the animals to become adjusted to the brassicas gradually, and 2) supply dry hay to animals grazing brassica crops.

Alfalfa regrowth

Alfalfa was discussed previously as a summer grazing option. However, alfalfa can be an excellent option for high quality forage in early fall. As mentioned in the “brassica” section, finishing lambs performed very well grazing alfalfa regrowth in the fall. Research is being initiated on the effect of grazing alfalfa in the early fall (when it is not normally recommended to harvest alfalfa for hay). Preliminary observations imply that moderate fall grazing does not stress plants as much as cutting for hay. Therefore the risk of winter injury may be less when grazed in fall than when cut for hay. If this is true it may open up some opportunities for grazing late-season alfalfa regrowth.

Corn Residues

The corn husks and leaves left in the field after corn harvest can make excellent forage in fall. Forage quality of corn residues is generally not high enough to meet the nutritional needs of lactating or growing animals, but can adequately maintain dry pregnant cows and ewes. Strip grazing will make for more efficient use of corn residues.

With any fall grazing strategy in Minnesota, one risk is that snow may make fall forage inaccessible. You may have enough alfalfa aftermath, stockpiled cool-season grasses, corn stalks, and turnips available for grazing until April; however, a thick blanket of snow can ruin plans for fall pasturing. The key is to be flexible. Obviously, it is unrealistic to expect to graze through the winter every year in the north-central region. However, there are many opportunities to keep animals out on pasture through October and November.

Managing a successful hay program

Similarly to planning for grazing, the key to a successful hay program is planning. Did you produce enough hay last year? Was the quality what you wanted? How and where will you grow enough hay to get through next winter? To start the planning process, list the acreage in each field you use for hay production. Then, estimate last years production as tons of hay per acre. The kind and variety of forage and the fertilization of each field during the past year is also important. Estimate the amount of stored forage you will use this winter. Finally, make a list of practices or changes you can make to help you achieve your production goals for next year. This section will discuss some management ideas for a successful hay program. Before we start there are two points to consider: 1) it costs little more to produce good hay than poor hay, and 2) forage plants are generally higher in quality when young than when mature (corn silage excluded).

The basics of growing ample amounts of high quality hay are to harvest at the proper stage of maturity and follow a good fertility program. The proper stage of maturity usually means when an acceptable compromise between yield and quality is reached. It is generally recognized that harvesting alfalfa between bud and early bloom and grasses at the boot stage are good benchmarks for getting both high quality and good yields from a hay field. However, depending on what species of animal(s) you are feeding, as well as their stage of production, proper harvest stage may change to meet your goals.

If you have a pretty good idea about the stage of maturity at which you want to harvest your forage, the next step is to grow the amount of forage you need. To target production, start with a soil test. If you have not soil tested your hay fields in the last 2 years, it is time to do so. Otherwise you don't know if low fertility or low pH may be limiting forage growth. Follow the soil test recommendations by applying the needed nutrients. A primary reason for lower than desired hay yields is low soil fertility. However, when applying fertilizer keep in mind the golden rule of forage production, "for every dollar you put into a fertilizer program you must make more than a dollar back". If your yield goal is 2 tons of hay per acre, there is no need to fertilize for 5 tons of hay. Keep fertilizer and production records to help determine if extra inputs are profitable!

Our most common hay crop is alfalfa, and that is rightly so. It is a high quality, productive crop that is the backbone of many forage systems. A good fertility and harvest management program are essential to profitable alfalfa production. The management of alfalfa for hay is well documented in publications like the *Alfalfa Management Guide* available from seed companies or your local extension office. Therefore, the following section will focus on grass and grass/legume pastures for hay.

If other nutrients are not limiting plant growth, applying nitrogen to grass pastures will grow more forage. Yield response from additional nitrogen depends on many factors, including current soil fertility, soil type, rainfall, etc. Often forage yield can double with as little as 50 lb. of N/ac. However, if forage gets overly mature after N fertilization, you have only grown more poor quality hay. This will probably not be a profitable use of your fertilizer dollar. We rarely have a shortage of poor quality hay, but we can almost always use more high quality hay.

One way to get the additional N to pastures is by the inclusion of legumes. Legumes add N to pastures, increase productivity and intake potential of grass pastures, grow more during the summer than grasses, and are high in protein without N fertility. Legumes, however, have higher fertility requirements than grasses and low flooding tolerance.

One way to get the best of both legumes and grasses in a hay pasture is to plant them together. Management of mixed pastures takes skill. However, unless alfalfa is grown for a cash hay market, there are some advantages to including a grass with alfalfa. A grass/legume mix harvested at the proper stage of maturity can produce high quality hay. At the WCROC, excess spring growth from an alfalfa/orchardgrass pasture (about 50% alfalfa and 50% orchardgrass) produced 157 RFV hay. In a three-year pasture renovation experiment also conducted at the WCROC, interseeding alfalfa into bromegrass pastures increased forage production an average of 2.3 ton/ac./yr. Over the three years of the study, the areas interseeded to alfalfa produced 7 ton/ac more forage than smooth bromegrass alone. Including machinery, labor, seed, and herbicide, the additional forage cost \$8.07/ton to produce. That is only about 10% of what it would cost to buy that additional forage as hay. Keeping good records of acreage, production, and cost can provide valuable information when considering interseeding legumes into grass pastures in the future. Advantages of a grass/legume mix for hay production over alfalfa alone include reduced drying time and lodging, decreased winter injury, reduced weed encroachment and soil erosion, and longer stand life. However, legume persistence has been a problem in both pastures and hay fields. Good harvest management, including not harvesting in the fall and a good fertility program can make for a successful grass/legume hay field.

The real benefit from a good hay management program is reducing your feed cost. Therefore, keep in mind when making hay that you are using that hay to feed animals. Higher quality hay can help meet the nutritional needs of animals with less supplementation (less cost). Have your hay tested and feed higher quality hay to animals with higher nutritional needs and lower quality hay to animals with lower nutritional needs. Knowing and understanding the nutrient requirements of animals for the stage of production they are in will help avoid over- or under-feeding.

There are several management steps to consider as you plan a hay program. These include: 1) target the yield and quality needed from your hay fields, 2) soil test and apply nutrients as needed to meet your yield goals, and consider using legumes as a source of N and high quality forage, 3) harvest at the proper stage of maturity, and 4) forage test to better allocate your hay supply. There are many things to consider when evaluating a forage program. Review your system and visit with your local extension educator if you have any questions.

In this article there have been several options discussed on how to maximize the time animals spend grazing during the year, as well as planning hay production to meet your goals. There is not a single best system for all farms. Consider some of the options suggested, consider when you have forage shortages and excesses, and see what kind of forage management program you can put together. By diversifying your pasture system, you can reduce the impact of seasonal weather and growth fluctuations and give yourself the best opportunity to have abundant amounts of high quality forage available throughout the year.

The following questions are geared toward helping you develop a pasture management system for your operation!

- 1) How will you manage your farm to efficiently utilize early spring growth?
- 2) How will you manage to supply adequate forage availability during summer?
- 3) How will you manage to supply adequate forage availability during fall?
- 4) In the winter, how will you manage to meet nutritional needs of cattle at the lowest possible cost?
- 5) If pasture renovation or reseeded is in your plans, identify potential species for forage production. (remember to take into consideration soil type, drainage, etc.)

Jordan, R.M. and G.C. Marten. 1988. Influence of legume species on grazing lamb performance and forage quality characteristics. P.24-28. Proc. 60th Sheep and Lamb Feeders Day, Morris MN. (to obtain a copy contact the West Central Research and Outreach Center at 320-589-1711)

Sheaffer, C.C., G.C. Marten, R.M. Jordan, and E.A. Ristau. 1992. Sheep performance during grazing of annual forages in a double cropping system. J. Prod. Agric. 5:33-37.

This lesson prepared by:

Kirby Hettver, Stevens County
Extension Educator – Livestock Systems
208 Atlantic Ave. Colonial Square
Morris, MN 56267-1321
(320) 589-7423
khettver@extension.umn.edu

Greg Cuomo
West Central Research and Outreach Center
State Hwy 329, Box 471
Morris, MN 56267
(320) 589-1711
cuomogj@cda.mrs.umn.edu