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Hay harvest decisions and management

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Most forage crops managed for hay or silage in the upper Midwest U.S. are composed of perennial grasses and/or legumes. Their growth during a typical growing season often allows for multiple harvests. Forage species and varieties have a great influence on the number of harvests and the nutritive quality of the harvested crop. Additionally, the stage of maturity when harvested, fertilization management, harvest practices and weather will also influence, yield, nutritive quality and persistence of these forage stands.

The primary and secondary objective of the producer for the harvested crop or forage stand tend to guide the decisions for a particular harvest schedule. Objectives may include harvested yield, nutritive quality of the forage, or vigor and persistence of the perennial stand. Achieving high levels of all three objectives is unlikely with a single chosen harvest schedule. Producers can generally achieve two of the three with a chosen harvest schedule, but not all three, thus usually must make some compromises when harvesting. In general, more frequent harvests produce forage of higher nutritive quality at an acceptable yield level, but at a sacrifice in stand vigor or longevity. Conversely, less frequent harvest will produce acceptable yields and a greater degree of stand persistence and plant vigor, but forage of a lower nutritive value.

Harvesting established alfalfa and alfalfa-dominant mixed legume grass stands

Maximum dry-matter yield from alfalfa and most forages is often obtained by harvesting the first cutting of the season at nearly full bloom and harvesting subsequent cuttings at 40-45-day intervals until late-August or early-September; often referred to as a '3 summer-cut system'. This management produces forage that is relatively lower in nutritive quality. Such forage is suitable for livestock on maintenance rations, producers slow weight gain livestock enterprises, and can be used in low-performance feeding programs. To add additional harvested yield, producers practicing a '3 summer-cut system' will often harvest a 4th cutting in late fall (mid- to late-October).

In contrast, high-performance livestock feeding programs require a higher nutritive value forage. The optimal compromise for higher forage quality and dry-matter yield of alfalfa is to harvest the first cutting at the late-bud to first-flower stage and to make subsequent cuttings at 32- to 35-day intervals until late-August or early-September; often referred to as a '4 summer-cut system'. Producers practicing a '4 summer-cut system' will sometimes harvest a 5th cutting in late fall, also typically a high nutritive quality forage.

This latter '4 summer-cut system' has led to greater stand reductions and shortened stand longevity than those managed under a '3 summer-cut system'. The negative impact on stand vigor and longevity are usually made worse when a late autumn cut is added to either the '4 summer-cut system' as a 5th, or to a '3 summer-cut system' as a 4th cut.

Alfalfa and alfalfa-dominant mixed legume/grass stands mature more quickly and lose nutritive quality more quickly during the first growth cycle of the spring, than during summer growth cycles, thus, producers desiring high-quality alfalfa hay at first cutting must manage the first seasonal cutting more closely to meet their forage quality goals.

To complicate this management even more, each spring growing season is a little different and may be a week or more different from one year to the next in the rate of crop development. Producers managing for high quality are encouraged to use one of the 'heads up' method for predicting the quality of the standing crop in the field. These are referred to as the Predictive Equations for Alfalfa Quality (PEAQ) or the 'scissors clipping' method. Both methods provide an in-field estimate of preharvest quality of standing alfalfa. They are indicators of quality, but they are not intended to be used as the basis for ration balancing and do not account for harvest or storage losses.

The scissors clip method involves taking hand clippings at harvest height in several places within a field, twice per week leading up to first harvest. Samples should be no more than 1 pound fresh weight, and delivered to a forage testing laboratory for analysis using Near Infrared Reflectance Spectroscopy (NIRS) for fresh tissue.

The Predictive Equations for Alfalfa Quality (PEAQ) method predicts relative feed value (RFV) and fiber content by

identifying the maturity of the most mature stem in a 2-square-foot area, and the height of the tallest stem in the area. These two characteristics are applied to a chart, or to a more 'user-friendly' PEAQ stick, to estimate the Relative Feed Value (RFV) or Relative Forage Quality (RFQ) of the standing crop.

With the use of either scissors clipping or PEAQ, an additional calculation must be made for anticipated harvest and storage losses that will occur. As a general guide, 10 to 15% harvest and storage losses are anticipated. So, for each bi-weekly sample, about 10 to 20 RFV or RFQ units should be deducted from that of the standing crop to predict the nutritive quality of forage in storage. More details about this process and PEAQ can be accessed on the World Wide Web at <http://peaq.outreach.uiuc.edu>, or at ISU Field Agronomist, Brian Lang's May 22, 2009 Crop Note at <http://www.extension.iastate.edu/winneshiek/info/crops.htm>

Fall harvest considerations

The goal of most producers with perennial forage crops is to help keep the forage plants 'perennial'. During the fall weeks, perennial forage legumes and grasses respond to shortening days and cooling average daily temperatures and progress through their gradual "cold hardening" process. The genetics of the variety determines how cold tolerant the plant crown and taproot can be during the winter months. Most successfully winterhardened alfalfa plants can withstand soil temperatures in the crown area to about 0 to 4 degrees F without crown tissue damage. At lower soil and crown temperatures, varieties and individual plants will vary in the degree of cold damage they may experience.

To acquire their potential for winter survival, alfalfa plants should get 5 to 6 weeks of uninterrupted growth to accumulate root carbohydrates and proteins before going dormant for the winter. A 'killing freeze' is about 23-24F for several hours. So it is important to manage fall harvests to give the plants the best chance for strong winter survival.

For Iowa weather conditions, the 'average killing freeze' usually comes in mid-October, so the both the '3 summer-cut' and '4 summer-cut' systems with the final summer cutting falling in the late-August / early-September period will provide for the needed 5 to 6 weeks of 'fall rest' for winterhardening. Other factors affecting winter survival are age of the stand, plant health status, variety characteristics, soil-fertility level, soil drainage, and 'insulation' of the plant crowns during the winter.

Harvest decisions and management of seeding year stands

The majority of new hay and pasture fields are spring-planted, with a small grain companion crop such as oats. The oat, barley or spring wheat or spring triticale companion crop can either be harvested as grain and straw, with associated extended shading and competition, or harvested as hay or silage to reduce its competitiveness for the underseeded forage seedlings. Forage seedlings established with a companion crop and harvested for grain and straw often are harvested again in late summer as a 'stubble cutting'. This late-summer harvest should be taken by late-August or early-September to provide for the 5 to 6 weeks of 'fall rest' for winterhardening. It is generally recommended not to take a late fall harvest on new seedings, rather leave the forage in the field to provide more uniform winter insulation for the new crowns.

Spring-seeded hay crops and pastures without a companion crop (herbicide assisted) or when the companion crop is harvested early as hay or silage, can often be first harvested at late-bud to bloom stage for pure alfalfa, or at about the boot to milk stage of development, about 60-70 days after emergence, for cereal companion crops, and again a 2nd or 3rd time for either type of new seeding, at 35-40 day intervals thereafter until late-August or early-September. Again, It is generally recommended not to take a late fall harvest on new seedings, rather, leave the forage in the field to provide more uniform winter insulation for the new crowns.

Harvest guidelines for other legumes and forage grasses

Red clover and red clover-dominant mixed legume/grass stands are often harvested along the same management guidelines as for alfalfa, except that the first harvest is often delayed until early to mid-June and only 2 or 3 summer cuts are taken instead of 3 or 4. Fall harvest decisions are similar for clover stands as for alfalfa stands.

Perennial forage grasses produce more of their seasonal production in the first cut of the season when seedstems are contributing to the yield. Later summer harvests are nearly all vegetative and leafy growth, thus produce less yield per cut in later cuttings. Grass stems are quite fibrous, so stem-dominant 1st cut grass hay (and annual cereal grain hay) is of lower nutritive quality. Harvesting the 1st cut of grasses and cereal hays at 'boot' stage or at pre-heading will produce hay of a greater nutritive value, but at a significantly reduced seasonal yield (approximately 20-35 % less seasonal yield per acre). Warm-season perennial, and warm-season annual grass follow the same trends and are managed similarly.