HARVESTING AND CURING HIGH-QUALITY HAY

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Fundamentally, the goal of hay production is to provide an inexpensive feedstuff that meets the nutritional needs (i.e., energy, protein, mineral, etc.) of the livestock. To meet this goal, hay should be harvested in a timely manner so that the balance between yield and quality is optimized. Unfortunately, changes in the weather can ruin even the best laid plans. As a result, hay production can be very risky. Of course, understanding the rules of the game can give the manager the advantage. This article presents the key factor that affects forage quality, a list of recommendations that can increase hay quality, and practices that can increase the drying rate of hay.

The Definition of High-Quality Hay

First, it is important to clarify what is "high-quality" hay, since this is a term that can mean different things to different people. For some segments of the industry, the esthetic value (e.g., color, texture, softness, smell, etc.) is the driving force behind the price. For the purposes of this discussion, however, the focus will be on the nutritional value of the hay. The definition of "high-quality", in a nutritional sense, is hay that is highly digestible (i.e., high in total digestible nutrients, or TDN) and capable of being consumed in sufficient quantities by the livestock (i.e., capable of sustaining high levels of dry matter intake, or DMI). There are many factors that can affect TDN and DMI. However, a critically important factor affecting TDN and DMI is harvest timing.

Timing is Everything

The maturity of the forage is a major factor affecting the yield and quality of a hay crop is the. Though forage species is also important, proper harvest timing of a low-quality forage will beat improver harvest timing in a high quality species. For example, bermudagrass hay that at the recommended harvest stage (4 week intervals) can result in hay that is higher in quality than alfalfa that is harvested in the late bloom stage.

Plant maturity is crucial because more fiber develops in the plant and the fibers become more rigid (lignified) as the plant gets older. As a result, the digestibility of the forage declines rapidly. Even though more total yield accumulates, there is a point where the amount of digestible dry matter harvested per acre (digestible yield) no longer increases. Figure 1 highlights this phenomenon in alfalfa, but all forage crops exhibit this same relationship.

Therefore it is critical to harvest the hay crop whenever the forage reaches the target maturity. Table 1 lists the maturity stages that should be targeted for some of the major hay crops. Delaying a harvest beyond the recommended maturity stage will result in forage that is less digestible and much less capable of being consumed at a high rate of intake. Harvesting slightly earlier than the recommended maturity is an option and may be advisable if the weather forecast predicts good drying conditions.

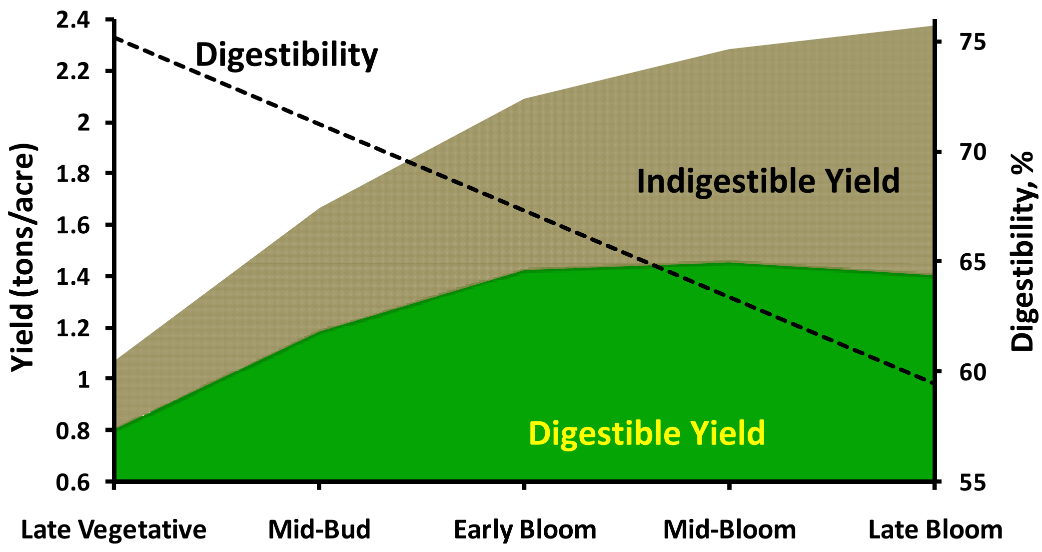

Figure 1. The effect of advancing maturity on the digestible and indigestible yield of alfalfa.

Table 1. Harvest recommendations for some of the major hay crops.

Hay Crop	Harvest Recommendations		
	First Harvest	Subsequent Cutting	Special Considerations
Alfalfa*	Late bud stage	Early bloom (usually after every 28-32 days).	In the spring after establishment, allow the first cutting to reach mid-bloom.
Annual Ryegrass	Boot stage	when regrowth reaches 10-12 in. (if applicable)	Harvest if forage growth ceases because of hot or dry weather.
Bermudagrass	12 - 16 inches	3.5 - 5 week intervals	If the variety rarely gets taller than 14 - 15 inches, take the first harvest at 12 inches.
Orchardgrass	Boot -early head	4 - 6 week intervals	Harvest if forage growth ceases because of hot or dry weather.
Red or Ladino Clover	Early Bloom	Early Bloom	When grown with a grass, cut at the correct stage for the grass.
Small Grains	Boot-early head	N/A	If the boot-early head stage is missed, take the first harvest at the dough stage.
Tall Fescue	Boot -early head	4 - 6 week intervals	Harvest if forage growth ceases because of hot or dry weather.
Winter Annual Legume	Early Bloom	N/A	When grown with a grass, cut at the correct stage for the grass.

* These recommendations aid the longevity of the alfalfa stand in the South and may not be appropriate for other areas in the U.S., especially when extremely high quality is desired.

Getting Hay to Cure as Quickly as Possible

The risk of rain damage to the hay crop is substantial. One rain shower of about 1 inch on tall fescue hay during curing can cause yield losses of greater than 5%, reduce TDN by 5-6%, and reduce DMI by 8-9%. In the more arid areas of the U.S., the risk of rain damage is lower because of the rarity of rainfall and abundant sunlight and low humidity levels that allow for a fairly rapid drying rate for hay crops (often less than two days).

In many areas of the Humid East, however, it may take more than five days to dry a hay crop to the moisture level that is safe for hay storage (15-16% for large round or big square bales; 17-18% for small square bales). Unfortunately, the chances are fairly high in this region that a significant rain event will occur during any given five-day stretch. To make matters worse, the high humidity and the condensation of dew that regularly occurs in this region can actually cause the moisture of the partially-cured hay to increase overnight. Consequently, it is critically important to dry hay as quickly as possible. The five following recommendations can help ensure hay drying is as quick as possible:

1) Take full advantage of good drying conditions. If the weather forecast projects good drying conditions in the 7-day forecast, the chances are fairly high that the weather will change and rain could occur on days 4, 5, 6, or 7. If the decision is made to harvest, begin cutting the crop early in the day (immediately before or soon after the dew is off) so that days known to provide good drying conditions can be fully utilized. By waiting to the end of the day to cut, the drying time is pushed back by a full day or more. This exposes the curing hay to more risk of weather-damage.

2) Use a conditioner on the mowing implement. A conditioning-mower will greatly aid crop drying. Studies have shown that the drying rate of a hay crop is 15-25% better when a conditioner is used. There are two basic types of conditioners: an impeller (also known as flail) and a roller-crimper (Figure 2). The impeller conditioner uses v-shaped flails that whip around on a rotating drum, hit the forage, crack some of the stems, and scratch off some of the waxy layer (cuticle) on the outside of the leaves and stems, allowing the forage to dry quicker. The intermeshing rubber rolls of a roller-crimper conditioner crush the stems and leaves of the forage crop, exposing the inside of the stem (pith), and the mid-vein of the leaves to drier air, speeding the release of moisture from the crop.

Figure 2. The two conditioner styles: impeller or flail-type (L) and roller-crimper (R).

3) Use the right conditioner for the crop being harvested. Impeller conditioners are generally better for fine-stemmed, grass hay crops (e.g., bermudagrass, tall fescue, etc.) where roller-crimper conditioners are better for thick stemmed species (e.g., pearl millet, sorghum x sudangrass hybrids, etc.) and legumes (e.g., alfalfa). It is best to avoid the use of an impeller condition on alfalfa to prevent leaf losses (~7%) during the harvesting process. Leaf loss using the roller-crimper conditioner is minimal.

4) Spread the harvested swath out wide. The hay producer's best friend is sunshine. When sunlight is intercepted by the drying plant material, the energy of the light heats the plant and speeds drying. Therefore, it is important to use every square inch of the field to intercept the sunlight. For alfalfa and other legumes, however, wheel traffic over top of the swath may increase leaf losses. In this case, it may be best to lay the forage in a narrow swath at first, and then use a tedder to spread the forage out.

5) Use the tedder wisely. A hay tedder inverts, stirs, and spreads out the hay crop. The proper use of a hay tedder can substantially increase the drying rate of a hay crop (by 15-30%). Further, the device is a relatively economical tool for the hay producer. It is usually best to use a hay tedder on the morning after the crop was cut. (On some occasions, it may be necessary to run the hay tedder within 3-4 hours of the mowing operation. However, this should only be necessary if large clumps of forage occurred during the hay mowing operation or the forage was placed in a narrow swath.) One should use caution, however, when using the hay tedder. Running the tedder after the dew has completely dried or when the forage is too dry can lead to excessive leaf shatter and losses. It is usually best to complete all tedding operations before late morning.