

HAY

MAKING, STORING AND FEEDING

David Bade and Sim A. Reeves, Jr.*

In beef cattle operations, the most common source of stored feed is hay. If hay is harvested at the proper stage of plant growth and undamaged by weather, it can provide nutrients at the lowest possible cost, except for pasture or silage.

Feeding hay is also one of the best ways to increase year-round carrying capacity, as forage is harvested during periods of rapid, excess growth and then fed during stress periods. As a result, producers can feed cattle 365 days a year.

To make the best use of hay in your operation, you need to consider several factors: the quality of the hay, the cost of feeding and the factors influencing losses, including haymaking, storage and feeding systems.

Quality

The primary objective of any hay-feeding program is to provide plenty of high-quality hay to meet the animals' nutritional needs. Many factors affect the quality of hay: soil fertility, the stage of forage maturity when harvested, the moisture available during the growing season, harvesting conditions, and storage.

Because of those factors, most operations produce hay of varying qualities in different cuttings. To determine the quality of each cutting, have the hay analyzed by a laboratory. If you know the quality of each cutting, you not only can feed the highest quality hay to animals with the highest requirements, but you also can estimate the amount of supplement needed to meet animal requirements with each quality of hay.

Cost

The cost of feeding hay varies widely. Poor-quality hay is always more expensive to feed than high-quality hay. If you feed low-quality hay, you must also provide extra supplement to meet the animals' nutritional requirements. When you pay for both hay and the supplement required to maintain the animal, low-quality hay becomes very expensive. By feeding hay according to quality and animal needs, you can get more return from your hay production.

Losses of quality can occur during haymaking, storage and feeding.

*Professor and Extension Forage Specialist, and Professor and Extension Agronomist Emeritus, The Texas A&M University System



Table 1. Costs per day of supplementing hay for dry and wet cows.

| Crude Protein (%) | Dry Cow | | Wet Cow | |
|-------------------|--------------------------|----------------|-------------------------|----------------|
| | Cottonseed Meal (\$/day) | Cubes (\$/day) | Cottonseed Meal(\$/day) | Cubes (\$/day) |
| 4 - 5 | .30 | .60 | .45 | .80 |
| 6 - 7 | .10 | .20 | .20 | .30 |
| 8 - 9 | — | — | .10 | .20 |
| 10 - 11 | — | — | — | — |

Haymaking losses

Producers should harvest forage when it is in a high-quality stage. Timing is critical: If you do not time the harvest carefully, forage quality will plummet before storage.

The causes of losses include cutting hay past the optimum stage of maturity, rain leaching out soluble nutrients before baling, water respiring from plant tissues, and leaf shattering.

Late cutting: The biggest loss in forage quality is caused by delaying harvest after the optimum developmental stage, which varies by forage species. For example, the digestibility of alfalfa declines 0.5 percentage points per day after flowering. The digestibility of coastal bermudagrass drops 0.2 percentage points per day from 4 to 8 weeks of age.

Rain: Rain can leach out nutrients and increase dry matter loss from respiration, which is the process by which a plant uses oxygen. Nutrient losses depend on the amount, duration and timing of the rain in relation to cutting time.

Purdue University has conducted research on the amount of total digestible nutrients (TDN) and field dry matter lost from hay after a rain. The study found that 1 inch of rain reduced the TDN content of field-cured hay by 5 percentage points. Field dry matter losses from undried windrowed hay were 3.5 percent per inch of rain. In general, fewer nutrients are leached out during a quick 1-inch rain than during a slow, soaking 1-inch rain.

Rain-induced losses are much higher in drier hay than in hay that is fresh cut. Also, rain-soaked hay must often be reraked, which increases leaf losses. Although conditioning can reduce hay drying time, rain causes greater nutrient losses for hay that has been conditioned or crushed.

Respiration from plant tissues: Forage plants are living tissues that continue to respire when cut until the moisture content falls below 40 percent. If the drying conditions are poor (such as with high humidity, cloudy skies or low temperatures), the plant will use more of the readily digestible carbohydrates, sometimes up to 10 to 15 percent of the original dry matter.

Researchers at the Overton Agricultural Experiment Station studied the effects of drying on the crude protein content and TDN of coastal bermudagrass hay. They found that the crude protein content dropped from 11.1 percent at cutting to 8.9 percent after 2 days of drying. In that same period, TDN dropped from 51.6 percent to 42 percent.

Leaf shattering: As hay dries, the leaves become brittle and shatter when they are mechanically manipulated, such as during baling or hauling. Legume hays are especially prone to leaf shattering. Raking losses range from 5 to 15 percent; baling losses can contribute another 1 to 15 percent, depending on the type of equipment used and the operator's efficiency.

To reduce haymaking losses, producers should:

- Cut hay at the proper stage of maturity.
- Cure the hay as fast as possible.
- Minimize excess manipulation of the hay.
- Bale the hay promptly when it is dry.
- Store it according to bale type.

Storage losses

The percentage of moisture in hay at storage directly affects its nutrient and dry matter losses. The higher the moisture content at storage, the greater the losses.

High moisture conditions allow hay to heat up, which causes losses. The degree of heating that develops during storage depends on the moisture of the hay and its density, size and shape in storage. Tight round bales suffer fewer losses than do loose ones.

The main factor in controlling nutrient loss or retention in storage is exposure to moisture. Research has shown that a firm round bale stored outside for 1 year loses 22 percent of its dry matter. When stored outside for 2 years, the same bale loses 25 percent dry matter — meaning that it has only 75 percent of its original weight remaining for feeding. The most nutrient losses occur on the outer portion of the bale.

In the Overton study, large round bales of coastal bermudagrass hay were stored for 112 days. During

that period, the protein content dropped by almost 2 percent in the middle of the bale and by 14 percent on the outside. The digestible dry matter decreased 11 percent in the middle and 32 percent on the outer surface.

A round bale's greatest loss occurs at the bottom of the bale where it touches the soil. Purdue University conducted a study of round bales that were stored inside, outside on the ground or outside on crushed rocks:

- The bale stored inside retained 92 percent of its original weight.
- The bale stored outside on crushed rock retained 85 percent of its original weight.
- The bale stored outside on the ground retained only 76 percent of its original weight.

The results indicate that producers should store bales in well-drained areas where moisture does not accumulate and water will run off.

Feeding losses

The amount of hay lost during feeding depends on the feeding system and on the amount allocated per animal per feeding time. An efficient feeding system should keep losses to a practical minimum. Feeding losses are caused mostly by trampling, leaf shatter, chemical and physical deterioration, fecal contamination, over consumption and refusal.

To some extent, you can control these losses by proper management. Management decisions include feeding method, intervals between feedings, amount of hay fed at one time, weather conditions and the number of animals fed.

The largest hay losses occur when large hay stacks are fed without animal restrictions. The lowest hay losses result from hand feeding livestock the amount they will consume at one time. However, the labor expense for the big hay stack is lower, and hand feeding requires extensive labor. The most economical feeding system is somewhere in between.

When feeding large round bales, you must use some restriction barrier to limit animal access. Barriers include electric wires, feeding racks, panels, wagons, gates and many other items. Feeding racks are now available in various sizes and shapes.

Research conducted at Overton showed that feeding large round bales free choice resulted in a 24 percent hay loss. Feeding identical bales in a feed rack cut the loss to 4 percent. (Standard small bales sustain a 6 percent loss when fed free choice and a 3 percent loss when some type of restricted access is used.) This 24 percent loss from free-choice feeding justifies the use of a feeding rack to conserve feed and money.

During the feeding season, hay may be fed in one or more areas. Both systems have advantages and disadvantages. The main disadvantage of feeding in one area is the heavy traffic on sod during wet weather. This can result in soil compaction and deep ruts throughout the field leading to this area. Feeding in one area destroys the sod excessively and usually involves muddy conditions. In this situation, a producer should feed on concrete or gravel to reduce hay losses and eliminate some of the muddy conditions.

Feeding in different spots in the field each time can actually improve soil fertility, but it requires more time and is less convenient.

Either system will work, depending on each producer's particular situation. Under either feeding system where the sod is killed, these areas should be reseeded as soon as possible. Scatter the excess hay and manure in surrounding areas.

Summary

Hay can provide nutrients at a low cost and can increase year-round carrying capacity if the cattle producer pays close attention to the quality of the hay and mitigates as much as possible the factors influencing losses, such as during haymaking, storage and feeding.

Texas A&M AgriLife Extension Service

AgriLifeExtension.tamu.edu

More Extension publications can be found at *AgriLifeBookstore.org*

Educational programs of the Texas A&M AgriLife Extension Service are open to all people without regard to race, color, sex, disability, religion, age, or national origin.

The Texas A&M University System, U.S. Department of Agriculture, and the County Commissioners Courts of Texas Cooperating.