Forage News

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Preserving The Value of Hay Through Proper Storage

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Hay made from the most productive warm-season grasses (e.g. bermudagrass) and fertilized properly can still result in suboptimal forage if it is not properly stored. It is important to remember that one of the main purposes of haymaking is to produce a cost-effective and nutritional feed for livestock and reduce any cost of supplementation. The cost of making bad hay will not be different than making good hay. They average cost of making hay can reach up $92.54/ton of hay produced (**Figure 1**) and it could increase if hay is not stored properly.

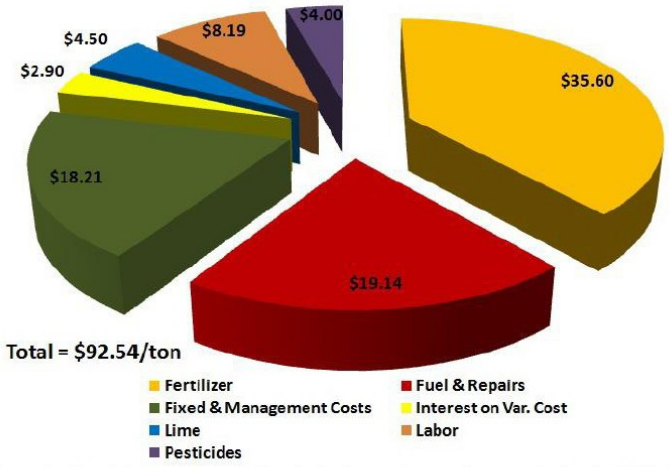

Figure 1. Breakdown of projected costs for bermudagrass hay production in 2010. Cost could fluctuate based on fuel, chemical, and fertilizer prices. **Source:** Mississippi State University Budget Generator.

Most storage losses are related to moisture content at time of bailing. Optimum moisture for bailing can range from 15% to 20% depending on the type of forage of species and the type and size of bale being made. Baling at moisture levels lower than 15% will result in greater harvesting losses because leaf losses increases as moisture content decreases. On the other hand, storing hay at moisture levels greater than 20% can result in molding and heating, which translate into hay discoloration and greater dry matter and nutrient losses (**Figure 2**).

All bales made at moisture content above 15% will undergo some increase in temperature in the first two to three weeks post-bailing. This change in temperature is known as "sweating" or "going through sweat" and this is due to the final stage of plant and microbial respiration. This increase in temperature can cause spontaneous combustion if bales are stored too tight or in close environments. When storing hay in a barn or outdoors, do not stack more than 5 tiers high before the hay has gone through the sweating process. After the sweat when temperatures lower, more tiers can be added to the stack without fire danger. Fire danger usually increase when bales reaches temperatures above 150 ºF. Heating bales must be moved to prevent the stack or barn from burning. Check the bale moisture content by using a hay moisture probe to determine the potential for greater respiration. To measure the bale temperature use a thermometer that can be pushed at least 12 inches into the bales and check the temperature of at least 20 different bales and monitor each daily until the sweat period is over.

Moisture is the most aggressive and destructive enemy once the hay is stored. Larger bales have more volume per unit of surface area exposed to the elements. As bale size and density increases, proper baling moisture is more critical to prevent heating and deterioration in quality. All storage sites regardless of the type of storage should be well drained. The idea is to stop move-

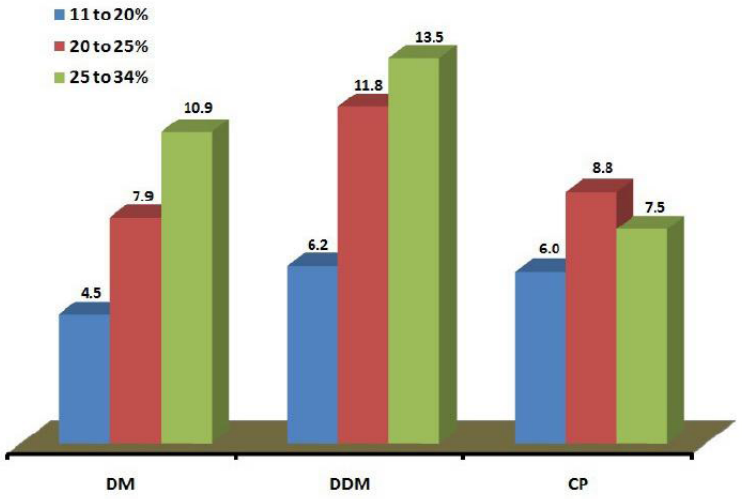

Figure 2. Percent dry matter and quality losses from the initial forage hay stored at different moisture levels (DM = Dry Matter; DDM = Dry Matter Digestibility; CP = Crude Protein). **Source:** Wilckle et al., 1999.

ment of soil moisture into the stored bales. Selecting the most appropriate type of storage depends on the end-use for the forage, the specific livestock feeding situation and the needs of the producer. Bales should not be left to lie in the field after baling for extended period of time (more than 4 weeks).

Table 1. Effect of storage method on percent dry matter (DM) loss from large round hay bales.

	Storage Period (months)	
Storage Method	**0 to 9[1]**	**12 to 18**
	---------- % DM loss ----------	
Ground		
Covered	5 to 10	10 to 15
Exposed	5 to 20	20 to 35+
Elevated (pallets/tires)		
Covered	2 to 4	5 to 10
Exposed	3 to 15	12 to 35
Enclosed barn	>2	2 to 5
Under roof (open building)	2 to 5	3 to 10

[1]If hay is used before spring warm-up.
Source: Huhnke, 2003.

In Mississippi, round bales is a common method of handing and storing dry forages. Proper storage facilities to preserve hay quality and value are critical. Storing bales outside on the ground without covers is the cheapest method of storage, but has the greatest potential for weathering loses, especially under extended storage periods (**Table 1**). Large round bales without cover should be stored end-to-end in single rows in a north-south orientation with space between the bales to facilitate good air circulation and drying. If the hay is stored outdoors then it should always be kept off the ground (e.g. on ties, pallets, gravel) which are covered with tarps or plastic. Storage losses can be reduced by two-thirds with indoor storage. The barn roof must be in good shape to keep rain off the hay. Long-term hay storage will require the hay to be greater than 82% DM (less than 18% moisture). If moisture content at baling is too high, the entire bale stack can become a block of mold spores unfit for livestock consumption and a potential fire hazard.

The availability and cost of labor and machinery and the location of storage and feeding facilities play an important role in determining the best storage option. Not all classes of livestock have the same forage quality requirements. Consider covering high quality forages that is to be fed to livestock with high nutrient requirements (lactating or milking cows). It would be nice if we could just say that one option is better than the rest, but each individual livestock operation should analyze which hay storage is a better option and make a decision based on cost and labor. Temporary storage options can be effective and include low-cost frame structures with fabric covers, reusable tarps or bale sleeves.