How Much Can You Invest In Round Bale Hay Storage?

"How much will storage and feeding loss be reduced if I switch from one hay storage system to another?" "How much can I profitably invest if I make the change?"

These questions are frequently asked by livestock producers. Estimates for a reasonable investment when storing and feeding 150 tons per year of alfalfa in 5-foot diameter round bales are provided below in Table 1.

Round Bale Storage Methods

As soon as hay is placed in storage, dry matter begins to disappear as microorganisms consume sugars, carbohydrates and other hay constituents. Alan Rotz and I measured dry matter loss in round alfalfa hay bales (cuts 1-3) which had been stored through the winter. Dry matter loss averaged 6 percent in bales stored inside, 9.6 percent in stretch wrap bales stored outside and more than 16 percent in net and twine wrapped bales stored outside. All bales were harvested at 15 to 18 percent moisture and stored on pallets. The effect of ground contact on outside storage varies widely and has been shown to increase storage loss from 10 to 50 percent over elevated storage.

The values in Table 1 reflect an increased dry matter loss of 18 percent (34.7 vs. 29.5 percentage units) for direct ground contact over the same wrap and on elevated or improved storage bases.

Feeding loss is related to storage method. In feeding trials in Missouri and Tennessee, wasted hay was nearly equa to dry matter loss during storage. An additional loss of 16 percent at feeding time for twine and net wrapped bales stored outside may seem high, but remember that 20 percent of the bale volume is in the outer 2 inches of a 5-foot bale. If cattle are fed whole bales and can refuse the weathered portion, 16 percent or more feeding loss will not be uncommon. Even in stretch wrap bales that have only the ends exposed, 8 percent of the bale volume is in the weathered, outer 2 inches of the bale ends.

The 6 percent storage loss in bales stored inside is probably unavoidable. The higher losses with the other storage systems can be considered discretionary loss; producers can cut those losses if they choose to do so by improving storage conditions. But cutting loss involves an investment in time and materials and the benefits of various options can be difficult to identify.

The values in Table 1 are based on dry matter loss measured under Michigan conditions, estimated feeding loss and the cost of harvesting extra hay to cover excess storage and feeding losses. Losses for options not tested are estimated based on similarity to tested storage methods and research trials from other states.

TABLE 1. Estimated break-even investment for alternative storage options for large round hay bales (150 tons/year) at two price levels compared to bales being stored outside, on the ground, and exposed.

Storage method	Storage* and feeding loss, %	Useful life yrs	Break-even Investment** Hay @ $65/ton	Hay @ $90/ton
Inside	11.7	20	$9.50/sq.ft. $169/ton	$12.50/sq.ft. $224/ton
Tarp	14.9		$13.95/ton $24.80/ton	$18.80/ton $33.35/ton
		4	$43.60/ton	$58.65/ton
Slip-on cover	22.5	1	$3.30/bale $7.00/ton	$4.70/ton $9.95/ton
		2	$5.85/bale $12.40/ton	$8.30/bale $17.65/ton
Stretch wrap	22.5	IO-machine 1 -wrap	$2,250/machine +$2.80/bale	$2,250/machine +$4.20/bale
			or	
			$4,250/machine +$1.80/bale	$4,250/machine +$3.20/bale
Outside-exposed improved***	29.5	10	$16.65/ton	$24.25/ton
Outside-exposed on ground	34.7	—	-o-	-o-

*Feeding loss equals storage dry matter loss. Storage loss based in part on Harrigan and Rotz 1992 Feedling loss estimated from research trials in several states.
**Labor @ $7.50 per hour, real interest @ 6 percent, fuel @ $1 per gallon, building taxes and insurance @ 2 percent of purchase price.
***Improved drainage, 4 inches of crushed stone @ $0.20 per square foot.

Investment in Round Bale Hay Storage

The investment guidelines in Table 1 should be interpreted with caution. They are appropriate when feeding whole bales free of choice if weathered hay can be refused and if the current storage method is outside-exposed-on ground. The values are not accurate if the bales are chopped and fed in a bunk or total mixed ration. The guidelines are based on expected but specific assumptions regarding storage and feeding losses, labor requirements and equipment ownership and operating costs.

The break-even investment is the most a producer can invest in an improved hay storage option and hope to recover the cost through greater hay recovery. For example, if beef-quality hay valued at $65/ton is stored, the producer can invest as much as $9.50/square foot ($169/ton) for a storage structure and expect to recover the cost over the 20-year life of the investment.

If the building purchase price is greater than $9.50/square foot, the building will not be a wise economic decision. If higher valued dairy-quality hay is stored,

the break-even investment increases to $12.50/square foot ($224/ton). At current prices, a producer should be able to build a storage structure for about $5/square foot; a profitable, long-term investment with a 6 to 10 year payback.

The values in Table 1 were calculated under the assumption that no additional equipment is needed to handle and stack 950-pound bales three high. But if an investment is made that is well below the break-even level, the value of recovered hay may also support an additional equipment purchase.

For instance, if a building is purchased for $5/square foot when storing hay valued at $65/ton, the anticipated reduction in storage and feeding loss will also support an $8,000 investment in a loader or bale grapple to improve hay handling. If the hay stored is valued at $90/ton the break-even machinery investment will increase to $13,500.

— Tim Harrigan, Agricultural Engineering, Michigan State

Creeping legume is a Low-Maintenance Forage

Thanks to his Morocco connection, Paul Beuselinck may have developed the best forage ever to creep across a pasture.

Creep? you ask.

This birdsfoot trefoil has rhizomes — creeping stems. On the bottom of the stems are hairy roots that have gripped poor Moroccan soil for hundreds of years while enduring the severest grazing pressure from sheep, camels and cattle.

Now the creeping birdsfoot trefoil has been brought to the United States and crossed with popular Midwest varieties by Beuselinck, a U.S. Department of Agriculture geneticist at the University of Missouri-Columbia.

"This birdsfoot trefoil is better than alfalfa for grazing and sustaining quality pastures," Beuselinck said. "Alfalfa needs good soil, fertility, good management and is usually used to produce hay. This creeping birdsfoot trefoil needs virtually no maintenance. Birdsfoot trefoil thrives on wet, problem soils with low fertility unsuitable for alfalfa.

"Besides, with alfalfa there is always the potential that it can cause cattle to bloat. Birdsfoot trefoil does not because it contains preventative compounds," he said.

Birdsfoot trefoil has been around the Midwest for nearly 50 years. Farmers like its nutritional value, but they don't like the extra effort required to manage for reseeding in pastures as plants die out from diseases.

With rhizomes, a bare area is soon filled in by another plant creeping, spreading, growing and providing high-protein nutrition for cattle and sheep.

Beuselinck has crossed the Moroccan version of birdsfoot trefoil with popular Midwest varieties like Dawn, Norcen and Dewey.

"All of the crosses have been successful," Beuselinck said. "We see plantings of these crosses that are lush, thriving and vigorously producing rhizomes. Survival through our last Missouri winter was excellent.

"I want to test the best selections of these crosses three more years in the lab and in the field for seed production, quality, performance under grazing and disease resistance. I'm pretty confident that birdsfoot trefoil with rhizomes is going to be a good, persistent, high-quality forage for Midwest farmers."

— MU Extension Information

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