



Forage Management

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Round Bale Storage

Not every one uses round bales but they are getting more common every year. The change to using round bales is easily understood if you have spent much time putting up square bales. When comparing the cost of putting up hay as square bales versus round bales the round bales usually win. The machinery time to cut and rake the hay is the same between the two systems. When using a round baler making 500 lb. bales and a manual string wrapper, the time required to bale an acre of hay was the same as with a square baler. The savings came in getting the hay to storage and again in feeding the hay. Moving round bales from the field took one-half the machinery time and one-tenth the labor of moving square bales dropped on the ground to the barn. The round baler will look even better if you use a larger round baler with hydraulic wrapper. The square baler will look better if you have kicker wagons or run the bales directly to the wagon.

The problem with round bales comes from the losses incurred if you don't store and feed them properly. If round bales are stored in a barn they have no more storage loss than the same hay put up in square bales. However, many of our round bales are stored out of doors. Outdoor storage losses occur mainly due to rain and melting snow penetrating the top of the bale and water wicking up into the bottom of the bale from the soil. Most of the losses occur in the winter when the bales don't dry out between storms, allowing the water to soak deeper and deeper into the bales. Several other factors influence the outdoor storage losses in large round bales:

1. Higher amounts of storage loss occur in wet years than in dry years.
2. More loss occurs in legume and stemmy grass

3. Bales stored for a short time have less loss than those left out all year.

For estimating the value of improving your round bale storage management use the values in Table 1 to estimate the economic return of alternative storage methods. The values in Table 1 are a summary of four research projects. These results show that the largest return from outside storage management came from top covers and not from placing the bales on pallets. Keep in mind that at all locations the bales were stored on well drained soils. In wet years storing on wet soils for even a few months can result in a 10 to 25% loss from the bottom of a round bale. On wet soils it is worth the investment to make a raised storage area covered with 4 to 6 inches of clean gravel to prevent loss of hay from the bottom of bales.

Here is an example of estimating the value of improved hay storage. If you have a herd of 25 cows, averaging 1100 pounds in weight, and feed hay at 2 percent of their body weight (a dry cow's maintenance requirement) for 180 days you will need about 50 tons of hay dry matter ($\{25 \times 1100 \times 0.02 \times 180\} / 2000 = 49.5$) or 55 tons of air dry hay ($49.5 / 0.90 = 55$). If the hay is stored in a barn you will have a 5% storage loss and will need to harvest and store 58 tons of hay during the summer ($55 / \{1 - .05\} = 55 / .95 = 57.9$). If you were to store the bales outdoors on the ground without any covers you could expect a 33% storage loss. In this case you would need to harvest and store 82 tons of hay ($55 / \{1 - .33\} = 55 / .67 = 82.1$). This is an additional 24 tons of hay or 24 acres of hay if you are harvesting a typical 1 ton per acre per cut yield. On the average it costs about \$25 per acre to mow,

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Table 1. Effect of storage method on storage losses from large round hay bales.

Storage Method	Dry Matter Loss	
	Range	Average
Barn	3-8%	5%
Additional losses with outside storage		
Covered on pallet	5-10%	8%
Uncovered on pallet	28-39%	34%
Uncovered on Gravel	4-46%	22%
Uncovered on Ground	7-61%	33%

rake, and bale hay. Your costs may be more or less than this so it would be good to use your own cost or the local custom rate. This amounts to \$600 per year in additional haying cost for the 25 head of cattle.

If we carry this example a little further we can see that the savings in haying cost for our 25 head of cattle more than offsets the cost of a barn. It takes about 20 square feet of barn to cover 1 ton of 500 pound round bales stacked 3 high. It costs between \$3.50 and \$7.00 per square foot of barn depending on the materials used and the cost of labor and site preparation. For our example lets say we buy all new materials, hire a bulldozer to level the site and install surface drainage, and do the work ourselves for a cost of \$4.00 per square foot. If we expense the barn over 10 years the barn cost is \$8.00 per ton ($\{20 \times 4\} / 10 = 8$). The barn cost for 55 tons of hay will be about \$440/year ($55 \times 8 = 440$). When the additional haying cost is \$600 per year if the hay is stored outdoors without cover, the net return to building a pole barn would be \$160/year. When plastic is well managed and used for more than one year it can result in a lower material cost than a barn storage. Depending on the availability of materials you may be able to build a less expensive barn than the one priced here. In either case you need to study

your options based on your local costs.

The total cost of storing your hay needs to include a reasonable charge for:

1. materials required for the barn or for plastic
2. labor and machinery required for wrapping, hauling, and stacking
3. labor and machinery required to move the bales to storage
4. labor and machinery to take bales out of storage
5. cost to dispose of waste plastic and
6. taxes on machinery and buildings.

The cost of improved storage is inexpensive compared to the cost of making hay. Building a pole barn for storage is one of the most convenient but may be an expensive alternative. Plastics provide an inexpensive, flexible storage alternative but they pose a potential environmental hazard if not managed properly. It is very important to clean up and dispose of the used plastic in an approved manner to keep your farm clean, to prevent the waste plastic from blowing onto the neighbor's land and to keep your cattle safe. Where available, recycling the plastic is the preferred method of disposal. The increased labor required with plastic covers increases their total cost and makes the barn alternative more attractive.

Table 2. Material cost of alternative round bale storage systems.

Storage Method	Cost/Bale	Useful life of method (years)			
		1	2	3	10
Cost/ton dry matter/year					
Barn					8.00
Bonnet		6.12	12.25	6.12	4.08
Row cover		3.96	7.92	3.96	2.64
Bag		12.38	24.75	12.38	8.25
Wrapped silage		1.75	4.38		