DAIRY NUTRI TECH®

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Silage Protection For Better Feed Quality

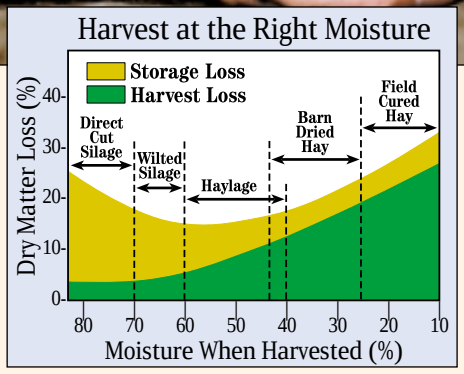
It's an all too common pattern in the dairy industry: Producers put time and money into the job of planting, growing, and chopping high-quality forage, only to be robbed by Nature taking her 5 to 30-plus percent losses during storage and feedout. Silage losses reduce dry matter, cut the nutrient quality, and hurt production. Although some losses will occur under the best management, take these steps to limit them:

- ***Harvest at the right moisture.*** Proper moisture level helps compact and transition silage into the appropriate anaerobic environment. It's good practice to test a regular sample using a Koster tester, electronic moisture tester or a microwave oven and accurate scale.
- ***Fill quickly, but pack sufficiently.*** This is the perpetual Catch-22 of bunker silos. As filling time increases, the percent of acid detergent insoluble nitrogen (ADIN) rises, leading to lower quality. Your goal in bunkers should be to fill and seal in less than 9 days–for every day it takes to fill, up to 25 days, you lose about 1 percent of total silage to ADIN protein binding. And be sure to factor in the extra day or three it inevitably requires to get the plastic on.

At the same time, bunkers must be packed slowly and meticulously in order to ensure a tight pack and anaerobic environment. Bunkers can generally only be packed successfully at a rate of 1,000 hour-pounds per ton (on an as-fed basis). That means a 3-ton tractor can only be depended on to pack 5 to 6 tons per hour without compromising silage quality.

- ***Seal.*** Improper sealing of bunkers can easily cost you 25 to 30 percent in quality losses. Spoilage of one foot on the sides of slab-piled silage and 6 to12 inches on uncovered tops is not uncommon. The hold-down tires also create their own problems in aesthetics, mosquito breeding sites, and disposal costs.
- ***Size to feed.*** Bunkers must be sized to facilitate incremental feedout across the face in order to maintain sufficient seal to prevent quality losses. But because concrete costs less laying flat than it does standing vertical, the natural tendency is to make bunkers too wide. The end result: Dairymen perpetually end up feeding spoiled silage.

Managing silage after you get it from the field is a challenge. Look inside this special four-page insert for ideas on new alternatives in storage that will improve both cost-effectiveness and quality.



Even the best forage producer will suffer some quality losses during storage and feedout. But limiting those losses, while maintaining cost effectiveness, is a key to feeding profit.

Think Your Bunkers Are Well Managed?

Keith Bolsen, Kansas State forage specialist, surveyed operations and estimated these are typical quality losses in bunker silos *annually.*

What's that worth? Wisconsin ag engineer Brian Holmes calculates that a 110-cow herd losing 25 percent rather than 13 percent gives up $7,833 per year. For a 440-cow herd, it's $31,344.

Losses	% of Bunkers
Under 12 percent	10%
12-20 percent	50%
Over 20 percent	40%

Total annual storage costs for a bagging system can run 14 to 18 percent less than bunkers, research shows.

Bagged Systems Offer a Viable Alternative to Concrete

Although the ever-present tower silo used to be the predominant means of ensiling on established dairies, many producers have reached a point that demands change. Old upright silos require overhaul. Climbing to change doors and service unloaders becomes more difficult. Excessive dry-matter losses spur a drive for lower cost/higher quality silage. Many expanding dairies simply can't build sufficient vertical storage, so bunkers are favored.

But the drive for efficiency in feed storage has led many dairy producers to turn to a relatively new option. Storing chopped silage and wet hay in large plastic bags is a relatively recent practice compared to the more traditional methods. Using a machine that stores and compacts silage in specially made plastic bags, the system ferments feed in long, horizontal, oxygen-deficient tubes until needed for feeding. Why are producers finding bags to be a better option?

Flexibility. Because virtually all of the system's investment is in mobile machinery and bags, not concrete or blue steel, a bag-based system is highly flexible. The equipment is easily moved if needed, bags can be gradually phased into an operation—especially with the help of a custom bagger. And because bags can be sealed easily, harvesting can be spread over a relatively long period if necessary, and feeding out leaves no exposed silage face to spoil.

Each cutting or field of forage harvested under different conditions can be stored in its own bag, indexed by quality in order to easily change ingredients to maximize forage quality in the ration.

Cost-effectiveness. When compared with new construction, a bag-based system shows a lower initial investment than concrete-based ones. And when compared to existing structures, if you look at all annual costs, including ownership costs and cost of spoilage, bags are the most cost-effective option, according to recent Wisconsin research.

Lower storage losses. Because ensiling and sealing are more dependable than other horizontal storage, bagging produces a higher quality silage. Storage losses are comparable with tower silos and much lower than bunker silos.

Safer. Bagging silage reduces the conventional safety hazards of silage management. Their low height virtually eliminates the No. 1 cause of silo-related deaths: falling from elevation. And although bags aren't immune from silage gas, according to New York research, even dangerous levels of gas are more likely to be vented quickly in the open air where bags are stored.

Typical Capital Investment *To ensile 4,389 wet tons*

BUNKER

- 8 above ground bunkers with shared walls
- 20' x 320' apron; 42,400 sq. ft.excavation/fill @ 32¢ + 30,400 sq. ft. apron@ $1.80
- Subtotal $121,428 + packing tractor $7,875 +loader $6,300 = **Total $135,603**

BAGS

- 32 - 8' x 150' bags stored 3' apart
- 155' x 352' stone storage pad @ 50¢ + PTO powered bagger $17,400
- Subtotal $44,680 + bagging tractor $3,375 + loader $6,300 = **Total $54,355**

Assumes packing and bagging tractors devote 10 percent of total lifetime use to silage work; loader, 20 percent.
Source: B Holmes, University of Wisconsin, 1996.

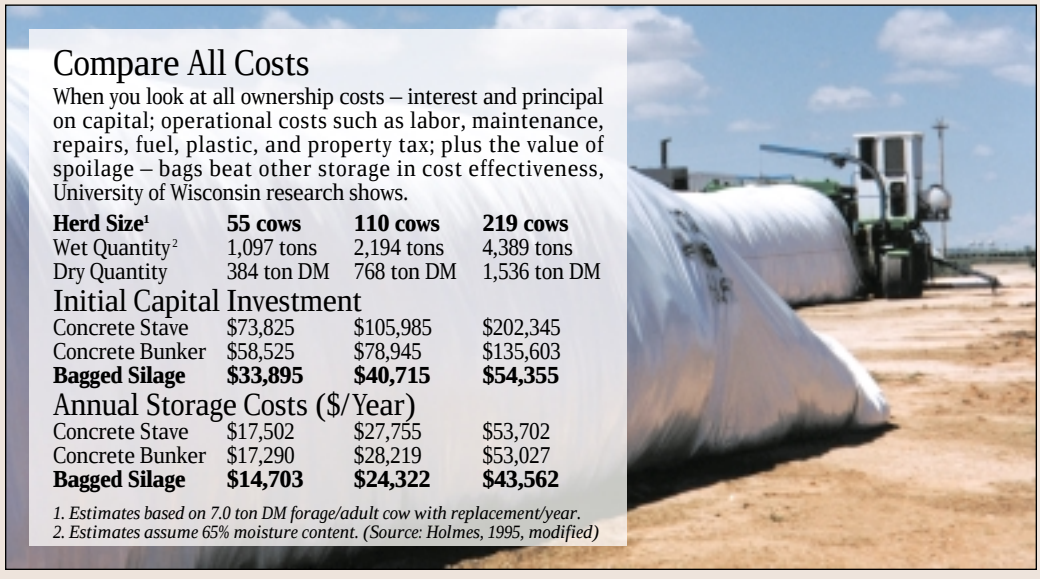
A high-quality plastic bag seals out sunlight and oxygen, maintaining fermentation and limiting dry matter losses.

Compare All Costs

When you look at all ownership costs – interest and principal on capital; operational costs such as labor, maintenance, repairs, fuel, plastic, and property tax; plus the value of spoilage – bags beat other storage in cost effectiveness, University of Wisconsin research shows.

Herd Size[1]	**55 cows**	**110 cows**	**219 cows**
Wet Quantity[2]	1,097 tons	2,194 tons	4,389 tons
Dry Quantity	384 ton DM	768 ton DM	1,536 ton DM
Initial Capital Investment			
Concrete Stave	$73,825	$105,985	$202,345
Concrete Bunker	$58,525	$78,945	$135,603
Bagged Silage	**$33,895**	**$40,715**	**$54,355**
Annual Storage Costs ($/Year)			
Concrete Stave	$17,502	$27,755	$53,702
Concrete Bunker	$17,290	$28,219	$53,027
Bagged Silage	**$14,703**	**$24,322**	**$43,562**

1. Estimates based on 7.0 ton DM forage/adult cow with replacement/year.
2. Estimates assume 65% moisture content. (Source: Holmes, 1995, modified)



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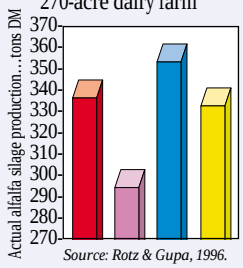
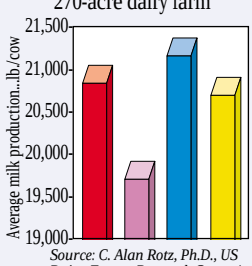
Compare the Results

Effects of silage system on feed production for 100-cow, 270-acre dairy farm



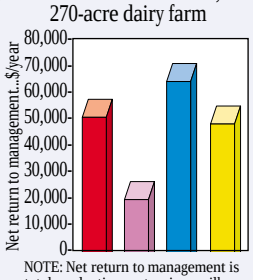
Source: Rotz & Gupa, 1996.

Effects of silage system on animal production for 100-cow, 270-acre dairy farm



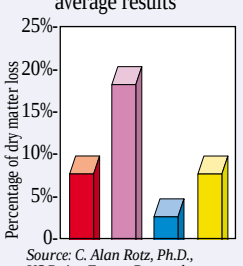
Source: C. Alan Rotz, Ph.D., US Dairy Forage Research Center/ Michigan State University

Effects of silage system on net return for 100-cow, 270-acre dairy farm



NOTE: Net return to management is total production costs minus milk, animal and feed income.
Source: Rotz & Gupa, 1996.

Total dry matter loss occurring on 25-year average results

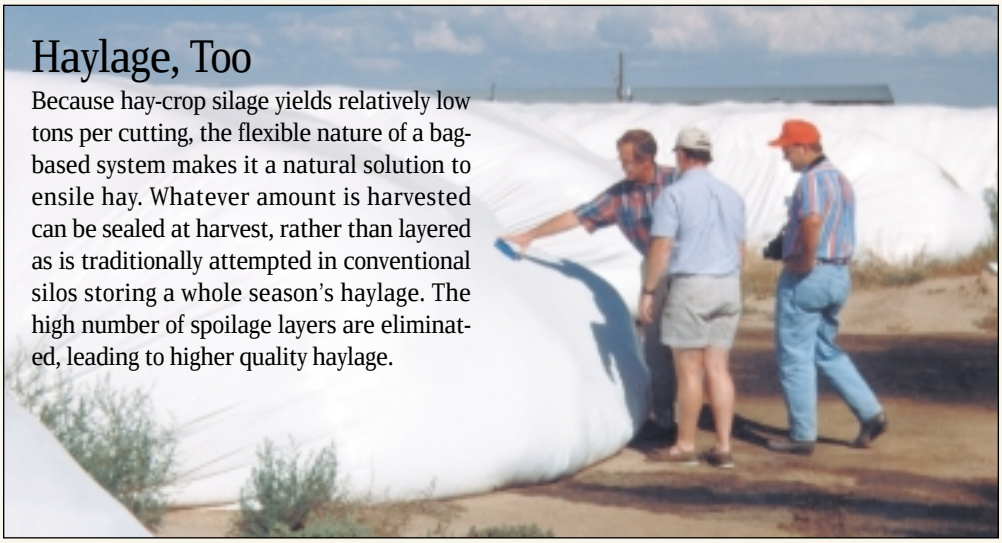


Source: C. Alan Rotz, Ph.D., US Dairy Forage Research Center/ Michigan State University

Concrete Stave Silo | Uncovered Bunker Silo | Silage Bags (chopped) | Wrapped Silage Bales

Because ensiling and sealing is more dependable than other horizontal storage, bagging has been shown to produce a higher quality silage.

Haylage, Too



Because hay-crop silage yields relatively low tons per cutting, the flexible nature of a bag-based system makes it a natural solution to ensile hay. Whatever amount is harvested can be sealed at harvest, rather than layered as is traditionally attempted in conventional silos storing a whole season's haylage. The high number of spoilage layers are eliminated, leading to higher quality haylage.

Tips to Better Manage a Bag-based System

- ***Use a quality bag.*** Storage life is a function of bag quality: Low-quality bags allow more oxygen to infiltrate, interfering with fermentation. High-quality bags resist damage caused by sunlight and oxygen infiltration over long periods of time.
- ***Apply a fermentation inoculant.*** This is particularly important to hay crops, in which sugar and starch levels are lower than corn. Research shows that even the best managed silage can benefit from an effective inoculant that rapidly reduces pH and prevents heat.
- ***Manage the site.*** At least a third of total bags should be sited on well-drained ground you can easily access and unload without problems during wet weather. All bags should be placed on flat, non-saturated ground, on a low-cost pad of gravel, packed sand or crushed lime.
- ***Store bags on a clean site*** free of vegetation and trash, away from livestock areas.
- ***Observation is important*** in the bag storage area. The placement of bag pad will determine how often you need to check on bags. Repairs are easily made with repair tape. It is critical the feed remain oxygen free.
- ***When unloading the silage*** from the bags, use a front end loader or skid steer. The small feed-out face on the bag is easier to manage.
- ***Sampling forage*** from the bag is very easy. Samples can be tested from various spots in the bags prior to feeding. This allows easy changes in the TMR as necessary. You know at any time exactly the quality you are feeding.
- ***Another advantage*** of using the bag system is that it can be introduced to your present system by a custom operator or rental, prior to purchase. Expansions to larger herds are very easy with this system, as it offers a great deal of flexibility.

Consider Safety

Major causes of accidents in tower silos were falls, unloader entanglement and silo gas. Side collapse was the primary cause of accidents in trenches.

Fatal Accidents

Tower Silos	25
Bunker/Trench	5
Bagged Silage	0

Source: "Fatal Accidents in Work with Silage in Wisconsin 1987-1996." Based on accidents reported in the local Wisconsin press, ASPS, 1996.

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Ag-Bag® Systems Offer The Storage Solution

Since 1978, Ag-Bag International, Ltd. has pioneered bagging as an efficient—*and cost-effective*—alternative to bunkers, piles, pits, silos, bales and stacks. Ag-Bag's system stores silage, haylage and high-moisture grain in oxygen-limited, durable plastic bags of up to 500 feet in length and up to 12 feet in diameter. Anaerobic packing is ensured by using machines manufactured specifically for the purpose of filling the bags. Full width feed deflectors, laser cut stripper bars, and full 1-inch teeth ensure even compaction. As the bag is filled, the bagger moves forward. Self-aligning steel cables with MICO disk braking guarantee the best feed compaction on the market.

With Ag-Bag storage, you get less waste and better feed at lower cost. That means more production and more profits. You can store at variable moisture levels, which means a much wider range of acceptable weather conditions for harvest. It also means earlier harvest and reduced weather risks...in some areas even an extra cutting.

The exterior white layer of Ag-Bag's unique 3-ply construction repels solar heat and keeps contents cooler. The black inner lining keeps out sunlight and preserves valuable nutrients. With UV inhibitors to resist sun damage, each Ag-Bag Tri-Dura® bag is built to last two years under rugged weather conditions.

Ag-Bag puts unlimited, low-cost storage capacity where you need it. Feed can be removed from the bags, which eliminates spoilage created by poor face management in other storage systems.

Ag-Bag International manufactures a complete system offering the finest quality equipment and silage bags to produce the most cost-effective and highest quality silage and grain. We also produce a complete line of equipment for the round and square bale silage markets. Ag-Bag systems are sold through dealers and distributors worldwide.

Let Us Help You Put Up The Best Quality Feed For A Lower Cost.

G6000 Ag-Bagger®

- 8', 9' or 10' diameter bags
- PTO-driven
- 65 to 85 HP required
- Easily handles 3,000 to 5,000 tons per year.

G6700 Ag-Bagger®

- 8' or 9' diameter bags
- PTO-driven • 100 HP required
- 3,000 to 6,000 tons per year.

M7000 Ag-Bagger®

- 9' or 10' diameter bags
- Self-propelled by 120-HP John Deere diesel.
- Also available PTO-driven, 90 to 150 HP required (Model G7000).
- 6,000 to 20,000 tons per year.

M10,000 Ag-Bagger®

- 12' diameter bags
- Self-propelled via 425-HP John Deere PowerTech.
- Handles 8,000 to 100,000 tons annually.

Ag-Bag now has the option of using cable machines or the new HFC series of cableless machines. Call for more information.

Ag-Bag Tri-Dura® Bags

- Specifically developed for this technology
- All needed diameters, 100' to 500' long.
- Recyclable.

Bale storage systems

- Ag-Bag Flex-A-Tuber® for high-moisture round bales, oxygen limiting.
- Ag-Bag Square Bale Bagger® for a variety of square bale sizes. Shrinks to limit oxygen.

Ag-Bag Plus® Inoculant

- The only one made for bagging.
- Soluble or dry
- 5 lactic-acid producing strains and 2 enzymes.

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