

Baled Silage: Frequently Asked Questions

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Introduction

Increasingly, producers have recognized the potential of baled silage to reduce the losses associated with harvesting and storing forage, as compared to conventional haying methods and provide an alternative method of silage production to conventional silos. Inevitably, a new technology has many questions associated with it. Hopefully, the answer to these questions, along with the information in the extension publication AGR-173, "Baling Forage Crops for Silage," will aid in the introduction of the baled silage technology.

Common Questions About Baled Silage

1) What will I need?

The requirements for baled silage are much the same as those for conventionally baled hay. However, there are some additions. The minimum requirements are a mower, possibly a rake, baler, tractor of sufficient horsepower to carry these bales safely, bale spear, and wrapper. Preferably the baler would be designed to bale wet forage. Usually, the variable chamber balers (belt balers) are capable of baling wet forage into a dense package. Most variable chamber balers also allow the control of bale size. New, specially designed fixed chamber balers are also capable of making dense bales. Some balers have some type of chop mechanism that aids in increasing bale density as well as reducing particle size for use in mixing rations. Bale spears are inexpensive ways of moving the bales. However, spears will make holes in the plastic if they are used after wrapping. Therefore, use the spears only in moving the bales to the wrapping/storage area and the feeding site. Many types of wrappers exist. Wrappers range in cost \$3,000-18,000 or more and differ considerably in labor and equipment requirements. Also, there are round bale wrappers, large rectangular bale wrappers, and even small square bale

wrappers. Some custom operators are wrapping silage and some counties have purchased wrappers that can be rented.

2) What should I use to mow?

Mower-conditioners are the most popular and easiest to use in bale silage. This is mainly due to faster wilting and evenly formed swaths. Raking can be avoided if a narrow swath is formed. Other mowers can also be used very successfully.

3) When do I cut?

The crop should be cut at the optimum maturity stage that provides good yields and the quality needed for your feeding situation. This generally means that legumes should be cut at one-quarter bloom and grasses at the late boot stage. Other crops such as oats, rye, triticale, and barley should be cut before the boot stage for the best results. These crops are hard to dry at this maturity but lose feed value quickly as they mature. Cutting at these earlier stages will produce good silage and excellent feed value per acre.

4) When should I bale?

Baling at the proper moisture content is important to success in producing baled silage. Forage containing less than 40% or much above 65% moisture should not be baled for silage in order to avoid excessive molding or spoilage. Producing bales with too much moisture reduces the feed quality of the forage, increases the chance of undesirable, butyric acid fermentation, and reduces the amount of dry matter stored per storage unit, greatly increasing storage costs. Moisture can be reduced to the 50-60% range to reduce bale weight for easier bale handling. Baling with inadequate moisture reduces fermentation and increases mold production, greatly increasing storage losses. Considering all factors, the optimum moisture for baled silage is probably in 50-60% range.

5) How should I make the bales?

A slow ground speed during baling helps make tight, dense bales that are less likely to spoil. Plastic twine is recommended, but net-wrap or untreated sisal twine can be used successfully. Sisal twine should be avoided since the oils applied during the manufacturing process often degrade the plastic film and can result in large storage losses.

The most popular bale size is 4 feet wide and 4 to 5 feet in diameter. These bales weigh 900-1300 lbs., depending on density and moisture concentration, and are best for handling and feeding. Larger bales, which use

relatively less film, can be made; however, handling difficulties may outweigh the advantages.

6) Should I apply additives?

Experimental work has shown that excellent baled silage can be made without the use of additives. This is true even when ensiling legume crops that have more difficulty reaching the pH range of stabilized fermentation. Therefore, inoculants can be added, but probably will not be necessary in baled silage.

7) How soon should I wrap the bales?

Unnecessary delay between baling and wrapping lowers the quality of the bale because of microbial activity and excessive heating that occur while the bale is exposed to oxygen. Too much time between the baling and wrapping process may also cause the bale to sag. A sagging bale is difficult to wrap, uses more plastic film and wastes time. Ideally, wrapping should be carried out as soon as possible after baling. Our research indicates that delays of a few hours in wrapping do not affect silage quality appreciably. Do not leave bales overnight because the delay will allow undesirable microbial activity and will allow bales to settle.

8) Where should I wrap?

Wrapping at the storage site minimizes handling of wrapped bales, and reduces the potential for damaging plastic. Mishandling wrapped bales risks damage and spoilage of all or part of the bale. However, bale squeeze attachments are readily available for transporting and stacking silage bales. Individually wrapped bales can be stacked on their sides or ends. It has been suggested that stacking bales on their flat ends reduces the potential for UV degradation of the plastic since the ends have more layers of film. Small holes in the bale's plastic can be patched using a repair tape that has been treated with a UV inhibitor. UV deterioration of other types of tape, such as duct tape, makes them unacceptable for repairing holes.

To avoid degradation of both the silage and the plastic, store the bales on a well-drained sod and away from trees that might harbor rodents. Spray the perimeter of the stack to kill weeds that can harbor rodents and insects that attract birds and lead to plastic damage.

9) What kind of wrap should be used?

The plastic wrap used in baled silage is a polyethylene plastic film that is pre-stretched 50 to 70% by the wrapper as it is applied to the bale. The plastic must be able to withstand the local environmental conditions

such as UV radiation and changes in ambient air temperature. Tear strength and tack or "stickiness" may also vary among brands of wrap. Most farm supply stores either carry or can obtain stretch-wrap plastic for baled silage. Check with the supplier and/or local producers to see which brands promote proper fermentation in your area.

Plastic film may be white, black or clear. White plastic is most common in this region since that film color reflects sunlight better and reduces radiation heating of the plastic. In more northern climates, such heating might be desirable to improve the environment for fermentation or help prevent freezing of the silage that makes feeding more difficult.

10) What type of wrapper is best?

Four major types of wrappers are available and all four can be used to produce good silage. The main wrapper types are 1) platform, 2) swinging arm, 3) in-line, and 4) bale spear. Platform wrappers simultaneously rotate and revolve the bale on a platform to feed plastic from a stationary roll. Swinging arm wrappers have rollers that open to enclose and pick up the bale before wrapping. The plastic roll swings around the bale on an arm. More recently, integral baler-wrapper designs have become available that wrap the bale just after it is formed. In-line wrappers place bales end-to-end in a row while dispensing plastic from rollers that travel around the bale. The bale-spear wrappers have a hydraulic motor to rotate a bale on a spear while the operator moves the plastic along the bale length. Wrappers that make bale rows use less plastic per bale since the ends within the row are placed against other bales and are not covered with plastic.

Trailer-type wrappers place less weight on the tractor than three-point-hitch wrappers and may allow use of a smaller tractor since horsepower requirement for wrapping. Some three-point-hitch wrappers that are moved empty and lowered to the ground before the next bale is placed on can also be operated using smaller tractors. Some wrappers have loader arms to elevate the bale onto the platform and eliminate the need for a loader attachment to load the bales.

10) How much plastic needs to be applied?

Stretch-wrap plastic is usually one mil (0.001 in) thick and comes in rolls of 5,000 or 6,000 ft. The plastic is typically pre-stretched 50 to 70% on the wrapper's film dispensing unit to get the correct tension on the bale surface. Always ensure that the tension of the wrap (tacky side toward bale) is such that film is stretched uniformly on the bales. Four layers should be applied to each bale. The preferred method is the 2+2 system whereby two layers of wrap are applied during one rotation of the bale, by a 50%

overlapping of successive layers. Four layers are applied during two full rotations of the bale. The plastic used in baled silage does not create an airtight seal. Low density polyethylene plastic such as that used in silage films is four times more permeable to carbon dioxide gas than it is to oxygen gas, allowing the bales to vent excess carbon dioxide gas as fermentation begins.

11) How many bales can be wrapped per hour?

In most systems, experienced workers can wrap 25-30 bales, or more, per hour. This is approximately the same number of bales covered by a 20 in. x 6,000 ft. or 30 in. x 5,000 ft. roll of stretch-wrap plastic.

12) How much does it cost?

Since each roll is approximately \$90 (1998 prices) and will cover 25-30 bales, the average cost per bale is \$3-4. Because the cost of the wrapper varies and the type of wrapper determines the amount of labor and plastic that will be required, the total cost of baled silage per ton of dry matter (DM) is highly dependent on the type of wrapper used. The more expensive wrappers are usually less labor intensive and can use less plastic than the less expensive models. Producers should use a wrapper that will minimize the capital investment, the amount of plastic used, and labor costs for their system. The cost of baled silage, therefore, will vary from \$9-11 per ton of DM. This is much less expensive than conventional silage methods and is very competitive with the cost of conventional hay, when the losses associated with making and storing hay are taken into account.

13) What if I feed a molded bale?

Despite the best efforts of the producer to limit the amount of mold growth in silage bales, many bales will develop some white mold. This usually occurs on the flat ends of the bale and around previously undetected pinholes in the plastic. This type of mold is usually just surface mold, caused by entry of sufficient oxygen to support some fungal growth, and rarely penetrates more than an inch into the bale. The animal will usually eat around or even discard this portion. Even if ingested, this type of mold will not significantly harm the animal. Severely spoiled, putrid bales can, however, contain harmful bacteria such as *Listeria* and botulism organisms and molds, and should not be fed.

14) Is baled silage higher in quality?

The feed value of the baled silage will be no better than the quality of the forage at the beginning, and can be worse if the bale was too wet and/or spoilage has

occurred. As with conventionally prepared hay, quality is a function of forage maturity at harvest, handling during harvest, and storage. The adage "garbage in - garbage out" is very true concerning baled silage quality. Relative to hay, however, the forage going in is higher in quality due to decreased harvest losses, and the resulting silage will not exhibit the same degree of losses during storage. Therefore, baled silage will be higher in quality than a comparable hay.

15) How many bales will I need?

In order to justify the costs associated with storing forage, one should wrap as many bales as possible in a season. However, because of the possibility of less DM per bale in baled silage, one might be putting up more bales (up to 20% more) of the same size to feed the same number of animals, relative to the number of hay bales required. From an acreage standpoint, the number of acres put up as stored forage will probably be approximately the same.

16) What kind of feeding system do I need?

With the costs associated with each wrapped bale, or any other type of stored forage, it is essential to control feeding losses. Some studies have shown up to a 50% loss of the forage when large round silage bales were fed to cattle without placing the bales in a ring feeder. Use of a ring feeder can reduce this loss to 10-20%. Losses can be reduced to below 10% using an elevated hay wagon. When feeding whole silage bales to any species, it is best to feed a sufficient number of animals that will eat the entire bale within about two days. Silage bales may also be intercut into rations if cut before grinding and mixing the ration.

17) What can I feed it to?

Traditionally, baled silage has been fed to beef and dairy cattle. However, there is no reason, physiological or otherwise, that it cannot be fed to sheep, goats, or even horses. Feeding molded silage bales to horses, as in hay, should be avoided. When prepared properly, baled silage can represent up to one third of a horse's ration, on a dry matter basis. To ensure the most efficient use of the quality in a silage bale, it is important to match the bale's quality to the animals' economic productivity.

18) What should I do with the used plastic?

Because the plastic can be used for baled silage only once, plastic disposal is a potential environmental problem. Every effort should be made to prevent this. Currently, there are no standard policies in Kentucky for collection and disposal of used baled silage plastic, beyond landfill disposal. Used plastic, in the future, may be baled

