

Baled Silage: Frequently Asked Questions

Dr. Dennis Hancock, Forage Extension Specialist

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 enclosed Extension publication "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 round baled hay. However, there are some additions. The minimum requirements are a mower, rake, baler, tractor of sufficient horsepower to make and carry these bales safely, bale handling equipment, and wrapper. 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, but are not able to change bale size. Many balers have some type of chopping 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 \$3000-18,000 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, thus offering alternatives to the large capital investment of purchasing a wrapper.

2) *What should I use to mow?*

Mower-conditioners are the most popular and easiest to use for baled 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% moisture 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. Baling with inadequate moisture reduces fermentation and increases mold production, greatly increasing storage losses. Considering all factors, the optimum range for baled silage is probably in the 50-65% range.



5) *How should I make the bales?*

A slow ground speed during baling helps make tight, dense bales which are less likely to spoil. Plastic twine is recommended, but net-wrap or nontreated sisal twine can be used successfully. Sisal twine should be avoided since the oils and rodenticides applied during its manufacturing 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. or more, 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 with or without the use of additives. This is true even when ensiling legume crops which 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 the baling and wrapping processes may lower the quality of the bale because of microbial activity and excessive heating that may 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 wrap and wastes time. Ideally, wrapping should be carried out as soon as possible after baling. However, instantaneous wrapping may not be economically feasible or efficient. Bales should always be wrapped within 12 hours of baling.



8) *Where should I wrap?*

Wrapping at the storage site ensures that handling of the bales, and likely damage to the individually wrapped bales, is kept to a minimum. Mishandling wrapped bales risks damage and spoilage of part or all of the bale. However, there is a wide range of special equipment available for transporting and stacking silage bales. Individually wrapped bales can be laid or stacked on their sides or ends. It is thought that stacking the bales on their flat ends may reduce potential damage to the plastic. 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 tapes, 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. Spray the perimeter of the stack to kill weeds which harbor rodents and insects that might damage the plastic.

9) *What kind of wrap should be used?*

The plastic wrap used in baled silage is a polyethylene plastic film that is pre-stretched 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 temperatures. Tear strength and the amount of 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 and are economically viable in your area. The use of white plastic wrap, to aid in preventing excessive heating, is recommended.

10) *How much plastic needs to be applied?*

Stretch-wrap plastic usually is one mil (0.001 in) thick and comes in 20 or 30 in. rolls which are 5,000 or 6,000 ft in length. The plastic is typically pre-stretched 50 to 55% 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 it is stretched uniformly on the bales. At least four layers should be applied to each bale if an individual (spinning platform) bale wrapper is used. If an inline wrapper is used, apply six layers of wrap to each bale with additional wrapping were bales butt-up against one another. The plastic used in baled silage does not create an airtight seal. Fortunately, this low density polyethylene plastic is four times more permeable to carbon dioxide gas than it is to oxygen gas, allowing the bales to vent excess carbon dioxide as fermentation begins.

11) *How many bales can be wrapped per hour?*

Depending on the type of wrapper used, experienced workers can wrap 25-30 bales, or more, per hour. This is about 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. However, plastic use will also be dependent on the wrapper type.

12) *How much does it cost?*

Since each roll is approximately \$60-90 (1999 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 specific 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 a fungal colony's access (though limited) to oxygen, and rarely penetrates more than a few inches into the bale. The animal will usually eat around or even discard this portion. Even if ingested, this type of mold will not 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. Such severe cases only occur when there was an excessive amount of topsoil in the bale, there was an extremely excessive amount of moisture, or the plastic hadn't sufficiently prevented oxygen entry.

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 (depending of baler type and setting), 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. Yet, the amount of DM harvested will be approximately the same, and, therefore, 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 and refusals. Some studies have shown that a considerable amount of forage was lost when large round silage bales were fed to cattle without placing the bales in a ring feeder. Use of a ring feeder, especially if the bale is elevated, can reduce losses such that only refused forage will remain. 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 integrated 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 Georgia for collection and disposal of used baled silage plastic, beyond landfill disposal. Used plastic, in the future, may be baled and collected for recycling. Such efforts have been successful in those areas that have enough plastic to warrant its collection and recycling. Check with your local government on applicable statutes in your area for disposal or recycling.

