How to make cheaper round baled silage

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Technological (equipment) advances and the operator's skill and management techniques can all substantially reduce the cost of making and storing (sealing) round baled silage. Although round baled silage is known to be more expensive than chopped bulk silage, many farmers still prefer to make baled silage for many reasons but is not the purpose of this article.

However, this article does suggest someways to reduce the cost of baled silage. These suggestions are:

- Increased bale size
- Savings in plastic use
- Combination and integrated baler/wrappers and,
- Increased bale density due to the use of chopping balers, operator skills and management techniques. Be aware that the effectiveness and extent in cost reduction of these suggestions will vary according to whether the job is done by the farmer or by a contractor and the operator's skills.

Increased bale size

Purely increasing bale size by increasing its diameter and/or length can result in substantially increased bale weight. Increasing bale diameter of a 1.2 m x 1.2 m bale by 150 mm (6″) or 300 mm (1′) can increase bale weight by about 25% and 55% respectively. Increasing its length by 30 cm (1′) can increase bale weight by about 24%. The use of a chopping baler can also reduce baled silage costs.

Starting with a standard sized bale of 1.2 m x 1.2 m (4' x 4') round bale of silage at 50% DM, it may weigh about 540 kg wet weight, ie. 270 kg DM. Assume this bale costs about $40.00/bale to mow, ted once, rake, bale with netwrap and 4 layers of cling wrap. Table 1 shows the effect of increasing bale diameter and length and/or chopping, on bale weight and subsequently on conservation cost (¢/kg DM) of round baled silage, assuming bale density is maintained as size increases.

Table 1. Effect of bale size and chopping on harvesting cost (cents/kg DM)

Bale Size	Unchopped Bales			Chopped Bales (+12%)		
L x D metre (feet)	Price ($)	Weight[1] (kg DM)	Cost (¢/kg DM)	Price ($)	Weight[1] (kg DM)	Cost (¢/kg DM)
1.2 x 1.2 (4' x 4')	40.00	270	**14.82**	43.80	302	**14.50**
1.2 x 1.37) (4' x 4'6″)	42.00	330	**12.72**	45.80	370	**12.37**
1.2 x 1.5 (4' x 5')	44.00	387	**11.37**	47.80	433	**11.04**

Note 1: The above weights will vary considerably according to the operator's ability, forage type, DM content and the capability and settings of the baler.
Note 2: Charging rates for the standard bale size, increased bale size and the chopping option will vary slightly from the above assumed figures.

The largest savings come from increased bale diameter and chopping, depending on the charging rate, will reduce cost slightly for each bale size.

Obviously contractors may, and often do, charge more for baling larger diameter bales although they do save time in the number of stops for tying off and dumping of the bales. For the farmers baling their own crop, savings come in less string/net and less plastic per tonne of dry matter, less baling time to due to less stops, lower cost and reduced time and fuel in transporting the bales to/from the storage and at feed out.

However, can your front-end loader, wrapper, feed out cart, etc. handle the extra weight? Some wrappers will have difficulty lifting these bales onto the wrapper.

When carting these much heavier bales to the storage area, the transporting machinery (tractor axles, front-end loader frame, spiles, bale handlers, etc.) must be able to handle the extra weight. Many front-end loader frames, etc. have developed cracks and twists with extremely heavy bales causing substantially more stress on the metal works when tractors hit ditches, rough tracks and bumps.

Many of the combined baler/wrappers only produce bales of 1.2 m x 1.2 m dimensions so no saving here on increased bale size, although some produce denser, therefore slightly heavier bales than most normal balers. However, some of these machines have now been designed to produce larger diameter bales.

Plastic savings

A Continuous In-line wrapping machine will save about 30%- 40% plastic on round bales and about 25% on large rectangular bales as the ends are not wrapped, apart from the start and end of each line. Larger diameter bales will also require substantially less plastic per unit although the pre-stretcher may need to be re-positioned so that its centre and that of the bale are at the same level to ensure the correct wrapping.

A new stretchwrap film designed to stretch axially somewhat may reduce the number of layers currently used from six to four, or at the very least, prevent to splitting of the film at the juncture of different diameter sized bales.

Film on film wrapping replaces netwrap resulting in tighter bales and less air trapped (100 L) inside bales at wrapping leading to slightly heavier (15-20 kg DM) and better quality bales.

Combination and integrated baler/wrappers

Most manufacturers now produce combined baler/wrappers (wrappers behind the baler) which save time as a new bale is being formed while the last one is being wrapped. A few manufacturers have developed integrated baler/wrappers (baling chamber is also used for wrapping) but must stop baling while wrapping, but is a lighter machine thus saving on fuel. Both these machines types require only one operator to both bale and wrap the bales versus two in a baler + wrapper operation although labour is required to transport the bales later.

Another advantage of these machines is that the bale is wrapped (sealed airtight) immediately after baling, therefore less exposure time to air entering the exposed bale, leading to a slightly reduced losses. In a normal baler + wrapper operation, this particular advantage may be negligible if the wrapping occurs up to about one hour later, but how often does the wrapping occur many hours later?

However, their down sides are the cost of the machine (although cheaper than a baler plus wrapper) and their increased weight, posing a problem on hills and wet ground conditions. Another disadvantage is that these wrapped bales must now be transported to the storage site, making them vulnerable to damage or possibly a disruption of the seal between the plastic layers while being moved.

Chopper balers
Research in the UK and Ireland has reported increased bale weights of 8% – 12% (with 12 –14 knives, higher with 20 knives) when forage is chopped as it enters the bale chamber. However, the extent of the increased weight can be greatly influenced by the operator's skills, the number of knives in operation, chamber pressure and sharpness of the knives!

Extra tractor power is required to operate these machines and using less knives (most machines allow every second knife to be dropped out of operation) allows faster baling and requires less horsepower but produce lighter bales. The raking and baling direction may also influence how much forage is actually chopped versus passing through between the blades, unchopped.

Let's not forget the extra thousands of dollars cost of the chopper option which has to be covered by increased baling charges (contractor) or a longer payback period for the farmer owner. The savings come in less string/net, plastic, transport costs, etc. The material, being chopped thereby exposing more plant sugars to the bacteria, would also ensile slightly quicker with slightly less nutrient losses.

Operator skills and management techniques
Baling slower in most situations allows the baler to produce denser (heavier) bales, with less air trapped within the material and savings as mentioned above. Baling slower (6.4 kph vs 8.8 kph) in three Irish experiments, using a fixed chamber baler, resulted in increased bale weights of 2.8% – 5%.

Equipment operators can also reduce/increase bale costs. They should be well trained to become skilled at recognising when and how to alter equipment settings as conditions change. Such examples may be:

- to know when and how much to alter bale belt tension/chamber pressure
- how to set and operate the baler to produce heavy and even shaped bales
- when and how to correctly sharpen chopper baler knives
- to recognise when the plastic film is not being applied with the correct overlap or number of layers
- to recognise when and how to maintain the pre-stretcher eg, cleaning off the build-up of "tackifier"
- the rake operator sets the rake to avoid soil contamination and leaves well formed, very even windrows to allow better more efficient baling
- how to handling wrapped bales correctly
- how to correctly apply silage specific tape to repair damage

By comparison, harvesting with a loader wagon or precision chop machine also varies widely in cost depending on the charge rate, equipment throughput, down time, distance of travel, amount of plastic required, crop yield, etc. Figures often quoted are between 4 – 9 ¢/kg DM. However, there are many other factors involved outside

straight cost (¢/kg DM) such as having paddocks cut and returned without missing a rotation compared to stack silage which keeps farmers making the “more expensive” silage.

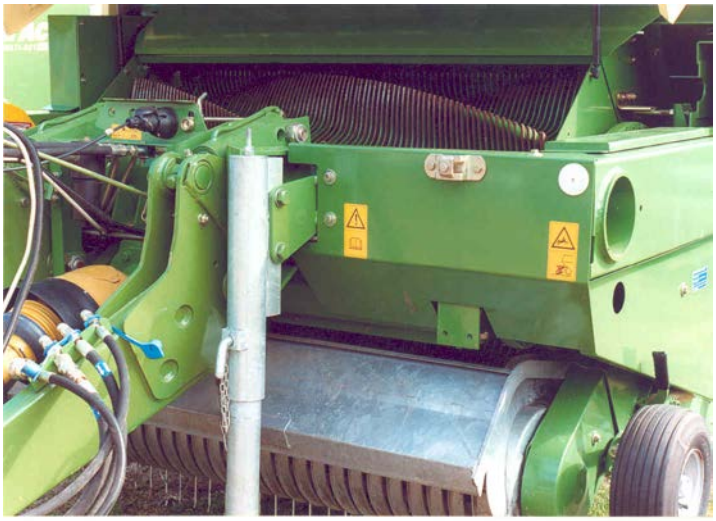

Figure 1: Cutting mechanism in round baler