

➤ Preparation & Harvesting

Controlling the cost of production on a farm is crucial to achieving and maintaining profitability in a continually challenging dairy market. Feed costs and milk prices constantly fluctuate, making long-term planning difficult. Producing the best quality silage possible can help producers take control of feed costs and reduce their reliance on purchased feeds. Producing better quality silage on a consistent basis can make a significant difference to the profitability of the farm. This is the first in a series of articles that will help producers make the best possible silage from a variety of forages.

SILAGE quality starts in the field

The harvesting stage and the dry matter (DM) content are two key factors in maximising feed value, quality of conservation and the palatability of silage.

SILAGE from grass

Typical target DM: 28-35%

The key to high-quality grass silage is to cut and wilt the crop to an appropriate DM. If the grass is ensiled too wet, it is susceptible to spoilage and effluent production. This will result in significant DM losses. If ensiled too dry, it makes packing and consolidation difficult, which increases the chances of mould and aerobic instability occurring. The result is losses through wastage and a reduction in the feed value of the grass silage.



SILAGE from whole maize/corn plants

Typical target DM: 32-38%

Corn is optimally harvested between 32-38% DM. Corn harvested for silage at greater than 35% DM may benefit from using a kernel processor or shredder processor at the time of harvest. Achieving optimal DM for corn silage is not always possible in all areas of the world due to specific climate issues. Often, it is necessary to harvest below 30% when frost has occurred or when it is becoming increasingly difficult to work with a forager because of field conditions.

SILAGE from alfalfa/lucerne

Typical target DM range (see table below)

Alfalfa	Harvest stage	DM level
Silos/bunker or bag	bud - 1/10 bloom	35-45%
Stave	bud - 1/10 bloom	40-55%
Harvestore	bud - 1/10 bloom	50-70%
Wrapped bales	bud - 1/10 bloom	40-60%

If the alfalfa is harvested and ensiled when it is too wet, there is the risk of prolonged fermentation, which can result in DM losses and a high acid load. If the alfalfa is ensiled too dry, it makes packing more difficult, and this can lead to mould growth and aerobically unstable silage.

For more information visit: qualitysilage.com

➤ Storage Options & Preparation

Successful silage production requires harvesting at the optimal forage maturity, preferably in good weather conditions. Be prepared to act quickly. Producers should ensure they have properly prepared the ensiling structure, have the right supplies on hand and have the equipment ready.

Storage design

There are a variety of storage techniques and structures for silage. Each operation must consider its individual needs, forage materials, weather conditions and herd size. First, producers must determine their storage requirements based on the amount of silage being produced and select a storage structure, or combination of structures, which best suit their needs. There are benefits and drawbacks to each storage technique that should be considered.

Structures	Pros	Cons
Bunker silo	<ul style="list-style-type: none">• Reduced spoilage across top of the structure• Easy to fill• Easier to feedout	<ul style="list-style-type: none">• Requires greater cost of investment compared to a drive-over pile
Pit or drive-over pile	<ul style="list-style-type: none">• Requires low investment• Offers greater feed inventory flexibility• Can be created in any stable floor	<ul style="list-style-type: none">• Greater surface space occupied• Lower compaction capacity
Bag silo	<ul style="list-style-type: none">• Storage for extra production• Flexibility for smaller forage quantity• Segregation of different forages or harvests	<ul style="list-style-type: none">• Lower density• Special equipment required• Damage to the plastic from rodents and equipment• Higher investment per ton ensiled
Tower silo	<ul style="list-style-type: none">• Less ground space/ton ensiled• Suitable for direct feeding in the barn• Good packing density and low oxygen permeability	<ul style="list-style-type: none">• Higher investment per ton ensiled• Higher risk of accidents due to gases at feedout• More annual maintenance
Wrapped bales	<ul style="list-style-type: none">• Flexibility to harvest regarding stage of maturity• More suitable for selling forage	<ul style="list-style-type: none">• Higher cost per ton of forage ensiled

Hygiene

Cleaning silage structures helps to reduce contamination from soil, moulds or effluent. Use a high-pressure washer to clean the area prior to filling. A clean surface is the best start for producing hygienic silage. For bunkers and piles directly on the ground without an asphalt or concrete base, keep the ground and walls straight and smooth. Ensure water can drain away from the silage mass to reduce the opportunity for losses.

Ensiling structures should be examined for wear and tear. The fermentation process creates acid, which can damage the quality of concrete and other surfaces. Depending on the structure, seals should be checked and repaired as necessary. A clean sheet of plastic can be placed along the walls and floor to further seal and protect the structure from acid. As the structure is filled, be sure to maintain cleanliness. Do not roll dirty equipment wheels onto clean forage.

Plan ahead to make sure materials are obtained in plenty of time. Be sure to think about: forage inoculants; covering materials (preferably oxygen barrier systems); additional or replacement weights (such as tyres and gravel bags).

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Management & Bunker Designs

Quality silage requires well designed bunkers/piles

A prerequisite for quality silage is a well-designed and hygienic bunker. The quality of forage fed to stock can influence the success of a whole year of animal production and merits at least a few hours of preparation.

The size of the bunker/pile should be dimensioned such that a minimum depth of 15-20cm of silage from the entire width of the open face is used per day. This will help limit mould growth (a wide silage bunker can be divided into two narrow ones, using a partition).



A clean, empty bunker.

The ground of the bunker must slope slightly towards the front to allow water and any effluent leaching from the silage to run off. Effluent running from a bunker can be quite acidic so it is always best practice to collect it in drainage tanks.

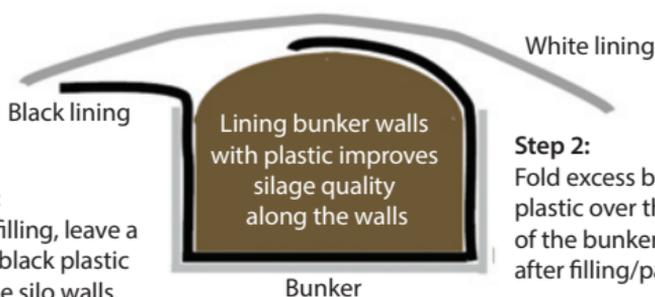
Asphalt flooring is a good choice for all bunkers or pile silo floors. The material is unaffected by silage acids. In addition, the lack of seams in an asphalt floor eliminates the risk of water seeping through a seam and undermining the floor.

The walls of a silo should be constructed out of concrete and lining the inside of bunker walls with plastic prior to filling prevents water from seeping in at the edges and protects the sidewalls from damage. The results of this additional effort are the silage quality and dry matter (DM) along the wall will be the same as that throughout the silo.

This procedure can be accomplished by placing a small amount of old silage on the bottom of the plastic at floor level. Stretch the plastic to the top of the wall and then extend it an additional 1-2m. Sealing is completed after filling by extending the wall plastic back out onto the top of the pile prior to covering with the top plastic.

Step 3:

Cover bunker with additional white plastic.



Step 1:

When filling, leave a flap of black plastic over the silo walls.

Step 2:

Fold excess black plastic over the top of the bunker pile after filling/packing.

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Helping producers make the best possible silage from a variety of forages

➤ Packing & Filling a Bunker

Correctly filling and packing a bunker or silo is critical to achieving quality forage. It is vital the silage is packed and rolled into the bunker or silo to remove as much of the air as possible from the forage. Time and effort spent at this stage will reap rewards at feedout time.

The minimum recommended packing density for corn silage and grass is 47lbs/ft³, or 750kg/m³, on a fresh weight basis at 30% dry matter (DM) or 65lbs/ft³, or 240kg/m³, on a dry-weight basis.

Bunker silos and drive-over piles should be filled using the progressive wedge technique to minimise the surface exposed to air and to maximise packing efficiency (Fig.1). Forage should be rolled in layers of six inches, or 15cm, or less to ensure consolidation. Slopes of any bunker should not be greater than a 4-to-1 ratio (length to height) both for safety and to allow effective packing and filling.

Packing vehicle weight and the thickness of the layer of silage being packed are two of the main variables influencing silage density and how well consolidated the silage is. A general rule is to roll the bunker with as much weight as is possible and ensure the layer thickness is not above the recommended levels.

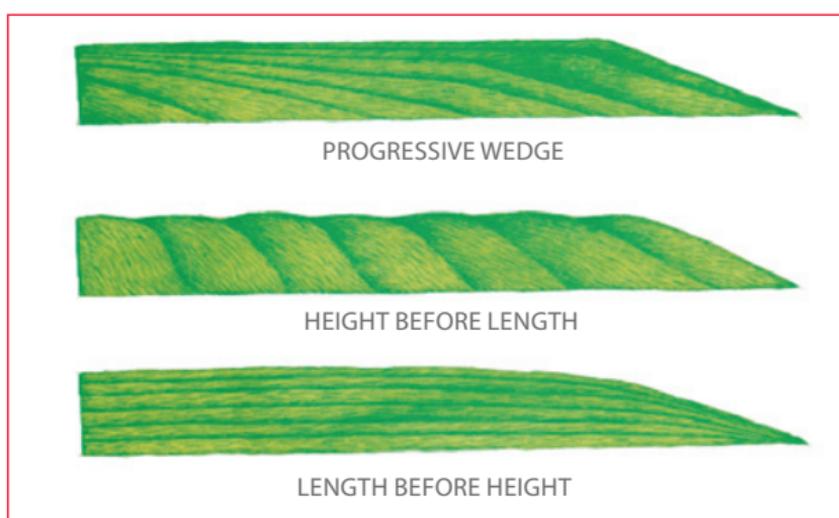


Fig. 1. The progressive wedge method is the best way to fill a bunker silo. There is less silage respiration with the progressive method than when bunkers are filled length before height or height before length.

Safety first

Safety should also be a significant consideration when packing and rolling as it is all too easy to ignore basic rules when trying to harvest and ensile the crop as quickly as possible. Following a few basic guidelines will ensure the safety of all working around the bunker:

- Ensure all personnel wear safety vests while working around silage and moving equipment.
- Access to, or near, a bunker/silo during filling should be limited to essential personnel only.
- Do not fill the bunker/silo higher than unloading equipment can safely reach.
- Do not fill higher than the top of the bunker wall.
- Packing tractor operators should always form a progressive wedge of forage, which provides a safe slope for packing when filling bunker/silos and drive-over.
- Never form a slope of more than 25% or 1 in 4. Steep slopes in bunkers and drive-over piles can easily cause tractors to roll.

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➤ Covering & Sealing Bunkers & Silos

Dry matter (DM) losses in bunkers, silos and piles are significantly reduced by covering effectively with suitable plastic sheeting weighted down with tyres or gravel-filled bags. Covering improves the quality of the fermentation by reducing air ingress into the silo. This, in turn, ensures the nutrient quality of the silage is maintained for feed-out. The improvement in yield and quality translates into improved digestibility of nutrients and better intakes.

The silage must be covered immediately after the structure has been filled. Otherwise, oxygen will penetrate back into the silage, which will impair the fermentation, thus reducing the silage quality. It is always recommended to use an oxygen barrier plastic system.

These systems use plastics which offer a complete barrier to oxygen ingress, which regular plastic sheeting does not. If it is not feasible to use such a system, use a plastic that is at least 5mm thick. Cover the entire bunker and pay particular attention to the slope at the front of the bunker, or around the drive-over piles, as these areas are particularly prone to spoilage.



An oxygen barrier system.

Oxygen barrier systems are typically weighed down using specialised top covers and sandbags and do not require the use of tyres.

When using regular plastic covers, some of which also offer UV protection, tyre-to-tyre placement is a popular way to keep the plastic in place. There has been a move to use truck sidewall tyres as these are heavier. Wrapped bales are also used to weigh down the plastic, but this is not recommended due to safety issues when removing silage from the bunker/silo.

Plastic covers should be inspected regularly. Check the top surface for tears or animal damage and repairs can be made with tape. Ensure edges and seams are weighed down to ensure the plastic is not dislodged in windy conditions.

Tyre-to-tyre placement with a regular plastic cover.



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➤ Feedout Management

Managing the way silage is removed from the bunker can have a dramatic impact on the stability and quality of the silage. There are some simple guidelines that will ensure the silage is at optimum quality.

- Silage should be cut from the face, rather than torn off. Using a defacer is recommended. Tearing increases the intake of air into the silage, promoting the development of aerobic micro-organisms that can contribute to spoilage losses.
- Keep the leading edge of plastic sufficiently weighted down to prevent air infiltration beneath the plastic.
- Discard spoiled silage away from the storage structure. Placing waste close to the useable silage may result in perpetual inoculation of the open front of the silage face or clamp.
- If the silage is heating, protect the open front with a thick net. This will keep the silage in the shade while allowing air to circulate. This technique also protects the silage from birds.
- If possible remove a minimum of 15-20cm of silage from the entire width of the open face used per day. This will help ensure the silage feed is as fresh as possible.



Using a defacer ensures the silage face remains safe and limits air ingress.

Tearing increases the intake of air into the silage, promoting the development of aerobic micro-organisms.



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