Helping farmers produce consistently better maize silage

Cut to Clamp

A **Volac** initiative

Growing maize for silage?

Read our handy Cut to Clamp guide to help you get the most from this valuable forage.

Planning

The high energy and starch content of forage maize make it a highly valuable silage. But it's also one of your riskiest forages in terms of preserving it.

With its two opponents knocking on the door of: (1) aerobic spoilage (heating) caused by yeasts and moulds in the presence of air; and (2) risks to fermentation, especially when making greener, moister maize silage – it only takes one slip of management to significantly reduce its feed quality, or the tonnes of dry matter (DM) in your clamp.

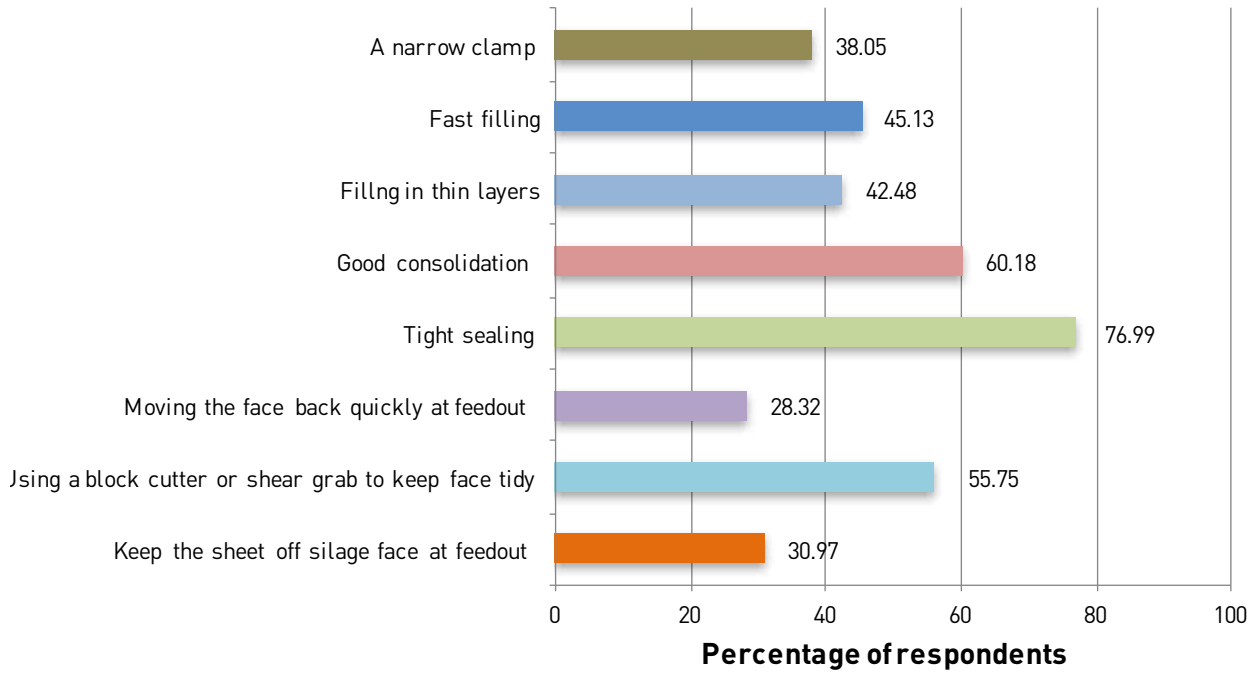
Indeed, results from two years of surveys of UK dairy farms suggest there is huge scope for improving how maize silage is made.

For example, while good consolidation and tight sealing were the most common methods used to manage aerobic spoilage (heating) – named by 60% and 77% of respondents respectively in the 2017 survey – this still left a large percentage of producers who weren't using these important techniques to the full.

When planning your maize harvest, make sure you take the importance of good preservation into account, and that your contractor is lined up for your anticipated harvest date and has the appropriate additive.

If growing modern, 'stay green' varieties, they should not have died off (or dried off) by the time they are harvested.

Methods used to minimise aerobic spoilage (heating and moulding) of maize silage



Source: Ecosyl survey of UK dairy farmers growing forage maize, 2017

2 Harvesting

Harvest at the optimum dry matter.

Harvesting maize at the wrong whole plant DM can result in reduced silage quality. Don't leave maize to die off before harvesting it, as many farmers do. Harvest instead according to the correct dry matter – for example, when the whole plant is at around 30-33% DM. However, don't leave it to get too dry as this makes it more difficult to consolidate in the clamp.

To help identify the % dry matter, the cob and kernel maturity, which directly correlate to DM, can roughly be assessed in the field in two steps.

Firstly, collect at least five representative cobs and pull back the outer leaves. Pressing your fingernail into the kernels should result in a soft cheese texture at top of the cob and leave no indentation in kernels in the middle and bottom.

Secondly, break the cobs in half to examine kernels. A visible line will indicate where the solid yellow starch changes to the milky white sugar portion of the kernel. One-third to one-half of the kernel should be yellow starch.

These rough assessments should be confirmed with an oven or microwave DM test.

Use the optimum cutting height and chop length.

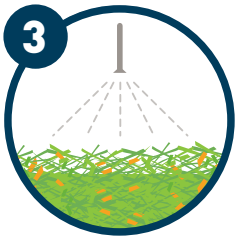
In addition to percent dry matter, get plant cutting height right. The bottom of a maize stalk has little nutritional value. Most of the energy and dry matter yield comes from the cob. So, set your cutting height based on the DM content and energy content you want to achieve. In all cases, always leave at least 15 cm of stubble to avoid soil contamination. The stem below this height is also likely to contain high levels of Fusarium – carrying the risk of mycotoxins.

For chop lengths, while short chop lengths make consolidation easier in the clamp, they will have a direct impact on how the silage performs in the rumen. Consider a chop length of 1.5 to 2 cm. Be aware, though, that longer chop lengths will make consolidation to remove air from the clamp more difficult, increasing the risk of aerobic spoilage (silage heating).

Cob Ripeness

Grain Description	Clear Grains	Milky Ripe	Soft Dough	Firm Dough	Hard and Mature
Starch Level	No Starch	Starch Kernel can be found	Good Gritty Starch	Smallest drop of moisture can be squeezed from grain	Floury Starch
Approx. Time until Harvest	1 month+	2-3 weeks	7-10 days	Harvest for Forage now	Combine
Appearance of Grain/Cob					
Approx. Whole Plant DM%*	Less than 18%	18-25%	25-28%	Approx. 30%	More than 35%

** This is only a guide as whole plant DM% will vary depending on how green or how senesced the stem and leaves are. Source: MGA*



Treating

Maize silage can be prone to losses from poor fermentation. These losses are invisible and can run at about 8% for maize harvested at the recommended dry matter content. However in some cases they may be higher – e.g. with some suggestion that DM losses can be as high as 20-30% between the field (pre-harvest) and what finally ends up in the rumen.

In addition, maize silage is very prone to losses that occur when silage heats up. These losses take place when naturally-occurring yeasts on the crop survive the fermentation process and initiate the process of aerobic spoilage (characterised by heating) once the clamp is opened. This affects the keeping quality and allows the growth of moulds that can potentially produce mycotoxins, which carry through to the ration.

Greener maize with higher moisture content, on the other hand, may need extra help with fermentation. That said, even if harvesting at the correct DM, the base of the plant is almost certainly starting to senesce, so will contain a lot of yeasts and moulds that will be introduced into the clamp.

Select the right additive.

When it comes to selecting an additive, therefore, unless you can absolutely guarantee you will only get one of these issues, it can be a good idea to consider one that covers both bases. For example, one that contains beneficial bacteria, proven to improve fermentation and ideally animal performance (e.g. Lactobacillus plantarum MTD/1), and which also contains either a second bacterium targeted against the yeasts and moulds that cause aerobic spoilage / heating (e.g. Lactobacillus buchneri PJB/1) or a chemical preservative.

Some examples of the benefits of including *Lactobacillus plantarum MTD/1* bacteria to produce a faster, more efficient initial fermentation:

- Makes better use of available sugars
- Preserves more nitrogen as true protein
- Reduces fermentation DM losses
- Minimises undesirable microbial activity

Some examples of the benefits of including *Lactobacillus buchneri PJB/1* bacteria to inhibit the activities of the yeasts and moulds that cause aerobic spoilage:

- Less heating
- Less physical waste
- Less risk of mycotoxins
- Lower DM losses
- Higher energy feed

An example of an additive containing both of these beneficial bacteria is Ecocool.

Benefits of Ultra Low Volume (ULV) application

Certain bacterial additives can be applied in ultra-low volumes of water – down to just 20 ml/tonne of forage.

Compared with traditional, higher water volumes, ULV can offer a number of benefits to both the contractor applying the additive and to the farmer whose crop is being treated:

- Much less fetching and carrying of water – allowing more time to be spent at the clamp e.g. on consolidation, which is also important for producing good silage
- Less mixing and fewer stoppages in the field to fill up – leading to time savings
- More acres harvested per day – leading to increased chance of harvesting crops in optimum condition e.g. if the weather breaks

Before using this method, check first whether your additive is approved / suitable for ULV application. Some additives (e.g. Ecocool) are suitable, but others are not.

4 Clamping

Preparation

Before getting started, clean out old silage. If you had a problem with mouldy silage the previous year, be particularly thorough with clamp hygiene.

Next, line the clamp walls with polythene sheeting – leaving a large overlap to ensure proper sealing with the top sheet. Thorough sheeting is vital to keep oxygen out of the clamp because this is what is required for the yeasts that cause aerobic spoilage (characterised by heating) to grow. It is important to take steps to prevent them growing at every stage of silage-making, otherwise they will continue growing and cause major problems later.

Also, keep the area surrounding the clamp clean to avoid soil contamination brought in by machinery. Soil introduces more spoilage organisms into the clamp.

Clamps also need to be filled and sealed within 2 days of cutting to get the fermentation process started and to minimise air exposure.

Consolidation

Filling the clamp evenly in thin layers of a maximum of 15 cm will help with consolidation, since this is the maximum depth that can be compressed effectively.

Use single wheeled packers, and roll continuously for increased packing pressure. And make sure packers can keep up with the speed of arrival of new loads into the clamp. Don't compromise consolidation, because this is essential for preventing air ingress.

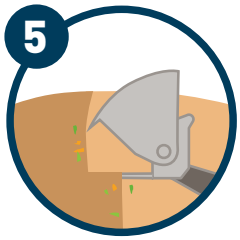
Ideally, calculate the weight of machinery needed to achieve a target bulk density of maize in the clamp of around 750 kg of fresh weight per cubic metre. As an example, estimates suggest that even having two, 14-tonne tractors rolling continuously wouldn't be enough to achieve this with a fairly typical harvest rate of 120 tonnes per hour.

After filling, in order to protect the shoulders and clamp surface, which are particularly vulnerable to aerobic spoilage, apply salt and fork into the top few inches.

Sheeting

To help keep clamps airtight, seriously consider an oxygen barrier film if you don't already use one. On top of this, to make the most of resources while getting a tight seal, use two 500-gauge polythene sheets, for example with the bottom layer being new and the top recycled from the previous year's clamp. Alternatively, a single 1000-gauge sheet can also be used.

After pulling sheets tight, weigh down with heavy woven sheets and sand or gravel bags. Touching tyres can be used as alternatives. Finally, use netting over the top to stop birds pecking through the sheets, and bait to ensure you keep rodents at bay.



Feeding

After sealing maize in the clamp, leave for the required amount of time (at least three weeks) before opening so that it has time to consolidate fully and stabilise.

Face care

While air exposure can't be avoided completely once it's time for the clamp to be opened, its damage can be minimised by using a block cutter or shear grab to keep the face tidy.

In addition, to minimise the period of exposure to air, move the clamp face back quickly at feedout – at a minimum of a metre per week in cooler seasons, and more in the summer. To aid rapid progression across the face, use narrow clamps wherever possible – for example, consider dividing wider clamps into two.

To prevent mould, never leave the sheet hanging over the face, since this creates a microclimate that encourages mould growth. Cut or roll the sheet back as you progress through the clamp, keeping weights on the front edge. Silage that falls off the face should also be cleaned up, since mouldy spores can blow up and contaminate the clamp.

TMR

Once out of the clamp, maize silage being fed as part of a total mixed ration (TMR) may benefit from using an additive with yeast and mould-inhibiting components at feedout to combat spoilage and keep it fresh.

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For help with consistently better silage and to book your free silage consultation

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For more details: **Freephone 0800 919808 (UK) or 00800 86522522 (Ireland)**

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