



SILAGE GUIDE



About Our Guide

Making the best quality silage from the grass crop you have grown is vitally important as this can provide exceptional quality feed throughout winter. Forage is a valuable resource as it provides the necessary fibrous component of the ruminant diet so essential for healthy rumen function. It can also be the cheapest form of energy and protein available on the farm.

Poorly produced forage either results in lower animal performance or an increase in the amount of purchased supplementary feeds, which can make the difference between a viable and a non-profitable unit. To optimise livestock performance and maximise output from forage, it is essential to ensure that the potential nutritional value of the forage is successfully achieved. Therefore, good growing, preservation and storage techniques are extremely important.

This guide aims to give advice on how to produce the best quality silage for all systems be it dairy, beef or sheep enterprises.

Fertility

The same basic fundamentals apply to a silage crop as to other grass crops and indeed other crops in general to get the most from the crop you have spent time and money on growing. Soil fertility is key to every crop and should be checked every 3-5 years by soil sampling to ascertain the soil pH, P (phosphate), K (Potash) & Mg (magnesium) status. A pH 6-6.5 is optimal for grass crops, a pH of 5-5.5 can result in a yield loss of 30-40%! Sub optimal pH will also mean vital nutrients needed for grass growth are locked up in the soil being unavailable to the plant. Removing grass from a field is removing nutrients too. For example, every tonne of 30% DM silage made removes over 2kg P and over 7kg K which needs replacing as these are vital for establishment, regrowth and recovery after cutting.

Generally high silage yields require high fertility in terms of nitrogen. So fertiliser and / or slurry applications can be well utilised (refer to AHDB Nutrient management guide (formerly RB209) for crop requirements & use guidelines). For less intensive systems utilising clover in a seed mixture will reduce the amount of artificial N needed as clover fixes nitrogen. White clover can fix up to 150kg N/Ha while Red clover can fix up to 200 Kg N/Ha. The addition of clovers will also increase the protein levels of silage. Grassland can utilise 2.5kg/ha of N per day (2 units/acre/day) in ideal weather conditions; however too much N or N applied too late produces grass with low sugar levels and makes unpalatable silage. Conversely, too little N applied produces lower yields of low protein silage. Avoid late application of fertiliser. Apply nitrogen at least 8 weeks before mowing. Work back from your desired cutting date using the 2 units a day utilisation.

Sulphur deficiency is now a widespread and common problem across all cropping systems due to the lack of natural atmospheric deposition from industry. Grass plants require Sulphur to take up and utilise N efficiently. Sulphur can also increase crude protein (CP) levels by around 4-7%. Deficiency is increasingly common in second or later cuts where high rates of nitrogen have been applied, and therefore plants cannot use it fully, especially on shallow or sandy soils. These deficiencies can cause large reductions in yield.

Farmyard manures are another important source of nutrients. Typical values are shown in the table below; however, these can vary by enterprise, application timing and ground conditions. It is essential to analyse batches of FYM to make the best allocation of nutrients within a farm nutrient plan.

Manure	Available N (kg/t)	Available P (kg/t)	Available K (kg/t)
Cattle Slurry	1.2	0.6	2.9
Cattle Manure (old)	0.6	1.9	7.2
Pig Slurry	2.5	0.9	2.2
Broiler Litter	10.5	15	16.2

Do not apply slurry within 10 weeks of mowing, and preferably not at all, because of the presence of undesirable micro-organisms.



Weed Control

1

Weed populations in a grass crop can have a massive impact on the yield and quality of the silage produced. They also affect the fermentation process and palatability. Weeds compete for light and have the ability to shade out grass plants. They also use up vital nutrients which have been applied for the benefit of the grass crop therefore wasting money! For example, a field with a Dock plant population of 20% will lose 20% of yield and productivity. Control weeds when they are actively growing and at the ideal growth stage to take up herbicides. Always follow manufacturer's label instructions for product use, rates, restrictions and correct use of the products to be applied.

Grass Types

Grass seed mixture requirements for an out and out silage crop differ to those of a grazing ley or cutting and grazing ley. Short-term Italian Ryegrass mixtures which last up to 2 years, such as Bar Forage High D maximise yields but they need to be managed well. Italian Ryegrasses will provide 20% more forage than a perennial ryegrass. Italians grow at temperatures as low as 3°C. However, they need cutting every four to eight weeks to maintain maximum quality. Hybrid ryegrasses as in Bar Forage Hybrid 4 x 4 strike more of a balance lasting around four to five years and yielding 10% more than perennial ryegrass leys. Hybrids grow at temperatures as low as 5°C and, while not as extreme as Italians still require frequent cutting.

Alongside these high performing leys, quality silage can also be made from dual purpose mixtures and these types of mixture will be better suited to mixed enterprise farms requiring grazing through the spring and summer months yet having the ability to take one or two cuts of quality silage for winter feed.

When deciding on a dual purpose mix for a cutting and grazing ley, choosing heading dates of varieties will be a compromise to provide the best grazing or best quality silage. Grass varieties have different heading dates which are triggered by different temperatures, e.g. early heading grasses can start to grow at low temperatures in March and April. So for a mix that will be grazed more, a spread of heading dates will be better suited. And for a cutting orientated ley closer heading dates are better suited to produce quality grass that will be of the same maturity at cutting.

So when reseeding, select a grass seed mixture which meets your requirements relating to what it will be used for; harvest date, yield, quality, soil type and climate.





Principles of Silage Making

The aim of silage making is to retain as much feed value as possible by encouraging lactic acid bacteria to ferment grass sugar to produce lactic acid.

The acid lowers the pH and prevents the growth of spoilage micro-organisms, allowing stable preservation of grass as silage. In order to achieve this, there must be sufficient sugar available, the fermentation must occur as quickly as possible and air must be excluded throughout (anaerobic conditions). This can be done in a silage clamp or in big bales, but both have the same objectives:

- Rapid removal of air (compaction)
- Rapid fermentation of grass sugars to lactic acid
- Maintenance of anaerobic conditions in the clamp/bale during storage

Wilkinson (2005) suggests dry matter losses are minimised by ensiling at 25-30% DM for clamp silage. And 35-45% for big bales. Silage is considered the better way to conserve forage crops. A forage crop can be cut early and only has to have 30% dry matter to be ensiled successfully. There is no need to dry out the plant material any more than that, so wet weather is not such a constraint as it is with making hay. This gives silage making a number of advantages:

- Stable composition of the feed (silage) for a longer period (up to 5 years)
- Plants can be harvested at optimal phase of development and are efficiently used by livestock
- Reduction of nutrient losses which in standard hay production may amount to 30% of the dry matter (in silage is usually below 10%)
- More economical use of plants with high yield of green mass
- Better use of the land with 2-3 crops annually
- Silage is produced in both cold and cloudy weather.

Production Stage	Average DM Losses	Recommendations to reduce losses
Harvesting/field losses	2 - 12%	Rapid drying/wilting, cut in good weather, avoid soil contamination.
Respiration & fermentation (including top & shoulder waste)	5 - 18%	Fill clamp rapidly with good compaction and air tight sealing. Use a silage inoculant to ensure an efficient fermentation is achieved. Seal the clamp effectively during breaks in harvest. Use side sheets.
Silage effluent	0 - 8%	Wilt for 24 hours. Use a silage inoculant to overcome high populations of spoilage organisms.
Feed-out losses	1 - 10%	Keep the clamp face smooth, remove 10 - 30cm of the whole face daily to keep material fresh and keep sheeting close to the face.
Total dry matter losses	8 - 48%	

Source: IGER2001



Cutting & Wilting

The stage of growth at which the crop is cut will have more influence on the feeding value of the silage than any other factor under the farmer's control.

As a grass crop matures the D value (digestibility) decreases along with the sugar content. However, a crop which is at its highest sugar content will be extremely leafy and too young for cutting as it will have a high moisture content which is unsuitable for ensiling.

Take a grass sample and have it tested to make sure there are no levels of nitrate N and there is a minimum of 2.5% grass sugar.

The optimum growth stage for cutting a grass crop for silage is when the plant is at 25% ear emergence. As the crop starts to bulk up and yield increases, quality starts to decline as the grass begins to produce stems and heads. These are less digestible than leafy growth.

Aim to mow grass crops at the time of day when sugar content is at its highest, this will usually be late morning or early afternoon on a sunny day, and dry matter will also be at its lowest depending on weather conditions. Always wait until dew or moisture have lifted and never mow in the rain.

Ideally you should be able to mow all your silage ground within 3-4 days to maintain optimum quality.

	Good	Moderate	Poor
D Value	70-76	65	60
% Ear emergence	25%	50%	100%
Energy ME (MJ/kg DM)	11.5	10.5	9.5
Crude protein content %	16	12	10

Chop Length

Chopping to the correct length with the forage harvester is critical. Some new machines have a theoretical cut length of 1cm, but if a blade of grass enters the harvester at an acute angle rather than straight on this could extend the length to 30cms! At that length it isn't going to make great silage. Chopping results in a quicker and more efficient fermentation since the sugars are rapidly released and the chopped material is easier to compact, trapping less air.

Chopped silage breaks down more rapidly in the rumen due to the greater surface area which in turn leads to greater uptake and increased utilisation of the forage at feeding.

Cut wetter material slightly longer and drier shorter, as dry grass chopped too long won't stack well at all in the clamp.

Additives

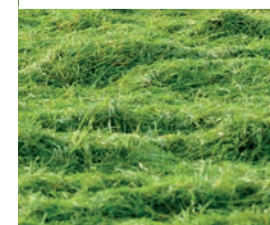
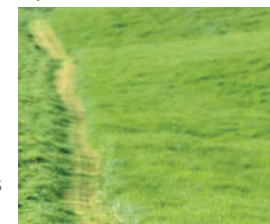
The use of additives is commonplace nowadays. They are applied at pickup either on the chopper or baler. However, using a silage additive on poor quality grass or grass that is too wet will not make it into good quality silage. If poor quality grass is going into the clamp then poor quality silage will come out!

When used properly silage additives can improve both the fermentation process in the clamp and also animal performance. There are many different types of silage additives so choosing the right one that best suits your needs is crucially important. won't stack well at all in the clamp.

Clamping

To ensure the best conditions in your clamp good preparation is vital. Clean out any old and mouldy remnants of the previous crop and check the pit walls for cracks or any place where air may get in and seal. If your clamp is lined by polythene check this and repair or replace any damaged sections that could let in air as the clamp needs to be air tight to prevent oxygen getting in. Check effluent drains are clear to allow any liquid to drain away and storage is sufficient to collect all the effluent the clamp may produce. Effluent can be spread onto land.

Fill the clamp as quickly as possible. Spread the chopped grass evenly and consolidate frequently making sure that the whole clamp is evenly consolidated to expel air. Do not roll the following morning as this creates a vacuum which sucks in air. Do not overfill the clamp as consolidation above the pit walls will be less and not sufficient. Seal the clamp as soon as it is full and consolidation is complete.





Baled Silage

The same principles apply to making excellent baled silage as they do to making clamp silage. The aim is to produce a firm tight bale that contains no air. If the baler has a chopper, then chop the grass as it enters the baler as this will enable tighter packing of the grass in the bale, better fermentation and therefore produce better quality silage. Buy a good quality wrap and don't skimp on the layers of wrap applied to a bale.

Remember plastic wrap breaks down under UV light; the cheaper the plastic and the fewer the layers, the quicker it will break down. Baled silage probably isn't going to be much good after 2 years out in the weather. Baled silage may have one real advantage to it though - if the baler is in the field with the forage harvester then the time between harvest and baling will be shorter therefore excluding the air. Excluding the air quickly is critical; it's not ideal to cart the grass too far from field to stack. Studies have shown that wrap colour can have a significant effect on the surface temperature of bales and therefore levels of spoilage.

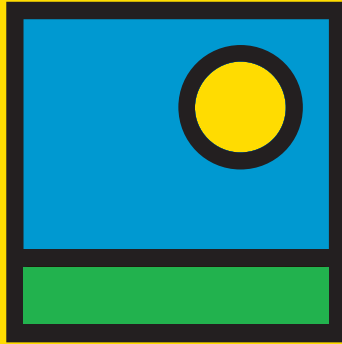
Wrap as quickly as possible after baling (within 12 hours) if the baler does not have a built in wrapper. Stack on a level site and use bird nets and bait boxes for vermin control. Bales within the stack retain their quality better than bales on the outside, so place the best silage within the stack.

Stock Class

The type of stock you have to feed will also influence the type of silage you need to make. Although we all strive to make the best silage possible, sometimes the weather or workload can delay cutting or impact the quality of the feed produced, as can the type and quality of the grass to be cut.

If the cutting is delayed beyond the 25% ear emergence to allow the crop to bulk up and produce a higher quantity of silage, the resulting quality will be lower. All is not lost as while this may not be top quality feed for dairy cows, finishing cows or ewes carrying multiples, it can feed young stock, dry cows, store cattle or suckler cows or ewes carrying singles.





BARENBRUG

Grow with Confidence

Barenbrug UK Ltd

33 Perkins Road, Rougham Industrial Estate
Bury St Edmunds, Suffolk
IP30 9ND

T 01359 272000

E info@barenbrug.co.uk

www.barenbrug.co.uk

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