









Integrated Feed & Forage System

Quality Forage & Feed

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GRASS SILAGE

Harvesting

Grass must be cut early in the season, before heading. This will result in a greater percentage of nutrients (sugar and protein) in the leaf material. High sugar levels will aid grass silage preservation.

Try to ensure that grass does not have excessive nitrate levels as they can act as a preservation buffer.

Grass should be cut late morning / early afternoon, to ensure surface moisture is minimised and available sugar is at its optimal level.

Grass should be wilted for 24 – 48 hours, depending on the moisture level at cutting.

The use of a mower conditioner unit will help to spread the crop. The resulting reduction in moisture concentrates sugar levels and aids preservation.

A cutting height of 3 inches (7.5 cm) will reduce the risk of soil pick-up and contamination. It will also encourage a more rapid re-growth, which is vital for subsequent cuts. The use of a crop specific additive should be considered with all grass species and certain legumes (red and white clover, lucerne and sanfoin).



'Low Dry Matter'

Low DM grass (<30%) needs a rapid pH drop to preserve nutrients, such as sugar and protein. The lower the DM, the lower the drop in pH needed to produce a stable silage.

When a rapid pH drop is achieved, it is not only beneficial for nutrient preservation, but also for a reduction in anaerobic bacteria that cause secondary fermentation and butyric silage. Low dry matter grass should be treated with **Biotol axphast gold**.

'High Dry Matter'

High DM grass (>30%) normally produces a good fermentation. It has a high level of residual sugars compared to low dry matter grass.

Higher DM grass is vulnerable to rapid growth of yeast and mould when exposed to air (aerobic spoilage).

Yeasts can utilise sugars and fermentation acids to grow. This produces heat in the clamp and results in silage waste and a reduction in silage quality. High dry matter grass silage should be treated with **Biotol axcool gold**.

Clamp management

- Fill the clamp as quickly as possible.
- Fill the clamp with no more than 9-12 inch (23-30 cm) layers being buckraked at any one time.
- Treat shoulders and joins with additional additive before sheeting down.
- Side sheet the clamp with 500-1000 gauge polythene sheets.
- Consolidation and elimination of air is crucial for good quality grass silage.
- Roll as thoroughly as possible during ensiling and ensure an airtight seal at all exposed surfaces.
- Add tyres or bales to the top of the sheeted clamp to exclude any air.
- Ensure the top sheet is always in contact with the front edge of the clamp.
- Ensure that the sheets stretch from the floor to the top of the clamp with an overlap of 6 inches under the top sheet.

Clamp Hygiene

- It is vital to avoid soil or slurry contamination in the clamp to reduce the risk of secondary fermentation by organisms such as Clostridia and E. coli.
- Fertiliser and slurry applications should take place 8-10 weeks before silaging.
- Ensure the clamp storage area is clean, washing wherever possible.
- Power wash vehicles that will be used on the clamp.
- Use clean, unchlorinated water to mix the additive.
- Do not use tyres with exposed wires to weight the clamp.
- The clamp should remain sealed for a minimum of 4 weeks.

Feeding

- The clamp face should be kept clean and compact to minimise the risk of spoilage and waste.
- If spoilage does occur, contaminated forage should be discarded.
- When using a TMR system, silage should not be left in the mixer wagon overnight.
- If possible, use a block cutter, not a bucket or grab, to remove silage.



MAIZE SILAGE

Harvesting

Aim to achieve a crop dry matter of 28 - 32% for optimum yield and digestibility. Assess the crop in the field by looking at the grain. When the grain is squeezed between the thumb and forefinger:

- 20% DM - milky juice squirts out of the grain.
- 25% DM – grain is soft, but does not squirt juice – 2 weeks from harvest, depending on weather conditions.
- 30% DM – squeezed grain appears like soft/hard cheddar cheese.
- Liaise with the contractor, the crop will ripen at about 2% DM per week in average conditions.
- Use a Kemper header to harvest.
- Aim to leave a 12 inch (30cm) stubble to avoid any soil contamination at harvest.



Preservation

High DM maize crops require aerobic stability to minimise nutrient loss and forage waste during storage and feed out. With high DM maize silage (>28%) the fermentation process is usually quick and efficient, with a reduced pH drop required.

Higher DM crops are more susceptible to aerobic spoilage when exposed to air. The influx of air encourages the growth of yeast and mould. This is one of the main causes of maize silage heating and nutrient loss. High DM maize should be treated with **Biotol maizecool gold** or **solomaize**.

'Long chop'

There has been a trend in recent years, for short chop maize silage <1/4 inch (0.7 cm), to aid clamp consolidation. This can cause metabolic problems in the rumen when fed at higher levels.

Increasing the chop length of maize silage to 3/4 inch (~2.0 cm) will provide a greater amount of effective fibre for the rumen. The use of a crop specific additive will inhibit yeast and mould growth and reduce the risk of spoilage and waste, particularly when using a longer chop length.

Clamp management

- Fill the clamp as quickly as possible.
- Fill the clamp with no more than 9-12 inch (23-30 cm) layers being buckraked at any one time.
- Treat shoulders and joins with additional additive before sheeting down.
- Side sheet the clamp with 500-1000 gauge polythene sheets.
- Consolidation and elimination of air is crucial for good maize silage.
- Roll as thoroughly as possible during ensiling and ensure an airtight seal at all exposed surfaces.
- Add tyres or bales to the top of the sheeted clamp to exclude any air.
- Ensure the top sheet is always in contact with the front edge of the clamp.
- Ensure that the sheets stretch from the floor to the top of the clamp with an overlap of 6 inches under the top sheet.

Clamp Hygiene

- It is vital to avoid soil or slurry contamination in the clamp to reduce the risk of secondary fermentation by organisms such as Clostridia and E. coli.
- Ensure the clamp storage area is clean.
- Power wash vehicles that will be used on the clamp.
- Use clean, unchlorinated water to mix the additive.
- Do not use tyres with exposed wires to weight the clamp.
- The clamp should remain sealed for a minimum of 4 weeks

Feeding

- The clamp face should be kept clean and compact to minimise the risk of spoilage and waste.
- If spoilage does occur, contaminated forage should be discarded.
- When using a TMR system, silage should not be left in the mixer wagon overnight.
- If possible, use a block cutter, not a bucket or grab, to remove maize silage.



FERMENTED WHOLECROP CEREALS

Harvesting

Any cereal, be it wheat, barley, oats or triticale, can be harvested as fermented wholecrop. As with all forages, one of the most important decisions is when to harvest.

This will affect crop yield and the quality and level of nutrients. There are 2 types of fermented wholecrop cereal that can be produced. They have very different preservation and feeding characteristics.

Traditional Fermented Wholecrop (35-45% DM)

This is the conventional method of harvesting cereals for wholecrop. The crop canopy is turning from green to yellow and the grain can be squeezed between the thumb and fore finger with a 'soft cheddar' like consistency. The majority of cereals taken at this stage will be 35 – 45% DM.

The crop should be direct cut using a self propelled forage harvester fitted with a combine reel header or a specialist wholecrop header.

If the crop is under sown, it may need to be cut with a mower or swather and then

picked up with a forage harvester.

To maximise yield, reduce soil contamination and prevent stone damage, use a cutting height of approximately 4 inches (10cm). Chop length is also important. Chopping the crop at 1 inch (2.5 cm) should produce a variety of effective fibre lengths. This is important for optimum rumen function. If the grain is at the 'soft cheddar' stage there is no need to use a mill processing unit, The crop should be treated with **Biotal wholecrop gold**.

High Dry Matter Fermented Wholecrop (45-75% DM)

This is an alternative method for harvesting fermented wholecrop cereals, typically when the conventional harvest window has been missed. The crop canopy will be predominantly yellow. The grain will be hard and little or no 'cheese' will be expelled when it is squeezed. Cereals harvested at this stage will be 45-75% DM.

The crop should be cut using a self propelled forage harvester fitted with a combine reel header. The forager should

also have a mill processor unit, to ensure the harder grains are fully cracked, preventing them from passing through the animal. The chop length will be affected by the processor unit. It will produce a lot of shorter fibre lengths 1/2 inch (<1.5cm) creating a fast fermenting feed. Cutting height will depend on the forage end use. It can be anywhere between 4 and 12 inches (10-30 cm - flag leaf height). The crop should be treated with **Biotal wholecrop gold mill**.

Clamp management

- Fill the clamp as quickly as possible.
- Fill the clamp with no more than 9-12 inch (23-30 cm) layers being buckraked at any one time.
- Treat shoulders and joins with additional additive before sheeting down.
- Side sheet the clamp with 500-1000 gauge polythene sheets.
- Consolidation and elimination of air is crucial for good wholecrop.
- Roll as thoroughly as possible during ensiling and ensure an airtight seal at all exposed surfaces.
- Add tyres or bales to the top of the sheeted clamp to exclude any air.
- Ensure the top sheet is always in contact with the front edge of the clamp.
- Ensure that the sheets stretch from the floor to the top of the clamp with an overlap of 6 inches under the top sheet.



Clamp Hygiene

- It is vital to avoid contamination in the clamp by soil or slurry reduce the risk of secondary fermentation by organisms such as Clostridia and E. coli.
- Ensure the clamp storage area is clean.
- Power wash vehicles that will be used on the clamp.
- Use clean, unchlorinated water to mix the additive.
- Do not use tyres with exposed wires to weight the clamp.
- The clamp should remain sealed for 4 weeks.

Feeding

- The clamp face should be kept clean and compact to minimise the risk of spoilage and waste.
- If spoilage does occur, contaminated forage should be discarded.
- When using a TMR system, wholecrop should not be left in the mixer wagon overnight.
- If possible, use a block cutter and not a bucket of grab to remove silage.
- Use a downward motion to block cut and remove forage from the clamp.

CRIMPED CEREALS & LEGUMES

Harvesting

Wheat, barley and oats are harvested between 25 & 40% moisture for crimp. Triticale, peas, beans and lupins are harvested at 30% moisture.

It is important that visual and practical checks are made four weeks before conventional harvest dates to establish moisture content.

Visual checks

Wheat, triticale, oats:

The straw will have lost most of the green colouring.

Barley:

80% of the ears will be bent over at a 45° angle to the stem. The stem (between the leaf and the ear) will be pale and the awns will have lost their green colouring.

Peas:

Pod colour will have changed from fresh green to pale green/yellow.

Beans:

Pods will be dark brown or black and the beans will be just starting to lose their green colour.

Lupins:

Pod colour will change from green to brown. The inside of the seed will have turned yellow/orange.

Practical checks

Wheat, triticale, barley:

Squeeze the grain between finger and thumb (not nail). The grain will dent but not express any cheese. For barley, choose grain from the middle of the ear and for wheat and triticale, choose grain from the bottom of the ear.

Oats:

Choose grain from the top of the ear and try to cut it with a thumbnail. When it can only be dented, it is ready for combining.

Peas & lupins:

Seeds will be hard to squash.

Beans:

Seeds will be easy to bite through.

Combining

Combining cereals at this moisture level does not present any particular problem. A few minor adjustments may be necessary:

- Reduce the combine speed to cope with the increase in crop volume.
- Keep the combine sieve fully open and adjust the windfan speed according to conditions.
- Concave should be on tightest possible setting.
- Drumspeed should be set to maximum revolutions.
- Adjust the outlet flow to avoid blockages and always ensure the tank and augur are emptied at night.
- Fill grain tank quarter, or half full, at start of harvesting.
- Do not leave grain in the tank overnight.
- Grain samples do not need to be clean.

Crimping

After combining, the grain should be stored on a clean concrete base near the clamp and crimped within 48 hours. Load the grain into the crimper hopper and follow the crimper manufacturer instructions. Crimped grain should be treated with **Biotol bioCrimp**, applied at 4-8 litres per tonne of grain.

Water should be added to drier grain or seed samples via the crimping machine. This will ensure the material is ensiled at the correct moisture level. Checks on the output of the crimping machine must be undertaken regularly throughout the crimping process, and the rate of **Biotol bioCrimp** application adjusted accordingly.



Clamp Management

Construction & preparation

- Clean clamp area thoroughly.
- Clamp walls must be strong to withstand rolling and consolidation.
- Clamps should be lined with 1000 gauge polythene sheeting.
- The polythene sheet should be able to overlap the surface of the clamp.
- 0.9 tonne of moist crimped grain will occupy 1 cubic metre.

Clamp filling

- Fill the clamp in thin layers, 15-20cms.
- Consolidate with a tractor or quad bike and flatten down corners and sides by foot to avoid damage.
- Complete the ensiling process as soon as possible. Never leave the clamp unsheeted for more than 12 hours.
- Ensure the clamp surface is level.
- Cover the clamp with side sheets (or an extra top sheet) and ensure good sheet contact.
- Make sure the clamp is airtight.
- Apply an even weight, without gaps, across the entire clamp surface.
- Use vermin control to prevent damage.
- Ensile for a minimum of 30 days before opening clamp for feeding.

Harvesting

Any legume (peas, beans, lupins) or bi-crop can be harvested as fermented wholecrop. As with all forages, one of the most important decisions is when to harvest.

This will effect crop yield and the quality and yield of nutrients. For legumes, it is important that protein yield is maximised.

Fermented Wholecrop Peas

The correct time of harvest for wholecrop peas occurs at the 'pod fill' stage. The canopy will be turning green to yellow. Pods towards the middle of the plant will be fully formed. The peas inside the pods will also be fully formed and can be easily split between the thumb and forefinger.

These features will occur some 14-16 weeks after sowing, although there may be some variety differences.

The crop should be cut using a conventional mower (without a conditioner) and left to wilt for 2-3 days.

This will help to increase dry matter to a target 30%. The crop should be picked up with a forage harvester. A chop length of 1 inch (2.5 cm) will ensure good clamp consolidation and provide effective fibre for livestock.

Alternatively, direct cut and harvest the crop using a self propelled forage harvester fitted with a combined reel header. To achieve the target dry matter the peas will need to be sprayed with a suitable dessicant and left for 7-10 days before harvesting. Fermented wholecrop peas should be treated with **Biotol wholecrop legume**.

Fermented Wholecrop Beans

The harvest window for beans can be wider than peas, due to the lower risk of lodging. The recommended stage for harvesting beans occurs when the foliage is still green. The pods will appear fully developed, similar in appearance to garden broad beans.

Beans can be harvested when the pods are still pliable, but turning black, and the bean has a rubbery texture.

Beans can be harvested using a conventional mower (without a conditioner)

and left to wilt for 3-4 days. This will help to increase forage dry matter. The crop should be picked up using a forage harvester or round baler. A chop length of 1inch (2.5cm) will aid clamp consolidation and provide effective fibre for livestock.

The other option is to direct cut the crop using a self propelled forage harvester fitted with a combine reel header. A dessicant is needed as above. Fermented wholecrop beans should be treated with **Biotol wholecrop legume**.



Fermented Wholecrop Lupins

The correct time of harvest for fermented wholecrop lupins will depend on lupin species; white, blue or yellow ('spike like' or 'bushy' canopy). The crop should be harvested when the canopy is turning green to yellow. This could be 14-18 weeks after sowing. The pods will be swollen and at their full size. At this growth stage, the moisture content of the crop will be lower.

Lupins should be cut using a mower without a conditioner. The crop will be wilted for 1-2 days to increase forage dry matter. After wilting, the lupins should be picked up using a forage harvester. A chop length of 1 inch (2.5cm) will ensure that the woody stem is broken. This will aid clamp consolidation and improve livestock forage utilisation. Fermented wholecrop lupins should be treated with **Biotal wholecrop legume**.

Fermented Bi-crops

Bi-crops combine a cereal and a legume. Harvest decisions are even more important because different crops do not always mature together.

Examples of Bi-crops are shown below:

- **Spring triticale & lupins**
- **Spring wheat & lupins**
- **Spring barley & peas**
- **Spring oats & peas**

Consultation with your seed or forage specialist regarding time of harvest is crucial to ensure that you maximise the full potential of a bi-crop.

Bi-crops should be direct cut with a self propelled forage harvester fitted with a combine reel header or specialist wholecrop header. Chop length will be 1 inch (2.5 cm). This will aid clamp consolidation and provide effective fibre for livestock.

If the bi-crop is undersown, it can be cut using a mower (without a conditioner) to limit grain or seed loss. The crop should be picked up immediately using a forage harvester, preventing excessive drying out. All fermented bi-crops should be treated with **Biotal wholecrop legume**.

Clamp management

- Fill the clamp as quickly as possible.
- Fill the clamp with no more than 9-12 inch (23-30cm) layers being buckraked at any one time.
- Treat shoulders and joins with additional additive before sheeting down.
- Side sheet the clamp with 500-1000 gauge polythene sheets.
- Consolidation and elimination of air is crucial for good wholecrop silage.
- Roll as thoroughly as possible during ensiling and ensure an airtight seal at all exposed surfaces.
- Add tyres or bales to the top of the sheeted clamp to exclude any air.
- Ensure the top sheet is always in contact with the front edge of the clamp.
- Ensure that the sheets stretch from the floor to the top of the clamp with an overlap of 6 inches under the top sheet.



Clamp Hygiene

- It is vital to avoid contamination in the clamp by soil or slurry reduce the risk of secondary fermentation by organisms such as Clostridia and E. coli.
- Ensure the clamp storage area is clean.
- Power wash vehicles that will be used on the clamp.
- Use clean, unchlorinated water to mix the additive.
- Do not use tyres with exposed wires to weight the clamp.
- The clamp should remain sealed for 4 weeks.

Feeding

- The clamp face should be kept clean and compact to minimise the risk of spoilage and waste.
- If spoilage does occur, contaminated forage should be discarded.
- When using a TMR system, silage should not be left in the mixer wagon overnight.
- If possible, use a block cutter and not a bucket or grab to remove wholecrop.
- Use a downward motion to block cut and remove forage from the clamp.

BIOTAL PRODUCT GUIDE

axphast gold

Recommended for low dry matter, low sugar grass silage (including red & white clover) up to 30% dry matter. A rapid pH drop is achieved to preserve grass silage and prevent secondary fermentation. This product contains a patented, high specification enzyme system which improves grass silage digestibility and the fermentation process. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

axcool gold

Recommended for grass silage above 30% dry matter. Yeast and mould are inhibited by a specialist, high dry matter bacteria to reduce aerobic spoilage. This product also contains a patented, high specification enzyme system which improves grass silage digestibility. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

supersile

Recommended for low dry matter, low sugar grass silage up to 25% dry matter. A combination of lactic acid bacteria produce a rapid pH drop to prevent secondary fermentation. This product contains a patented enzyme system which improves grass silage digestibility and the fermentation process. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

biohay

A specialist, high dry matter inoculant which, prevents yeast and mould formation in unwrapped bales at moisture contents up to 25%. This widens the window for harvesting and adds value to the feed by reducing waste and nutrient loss. Apply at 2 litres per tonne.

biostable

A specialist, high dry matter inoculant which, prevents yeast and mould formation in wrapped haylage bales up to 75% dry matter. This will reduce heating and forage nutrient waste, resulting in better quality feed. Apply at 2 litres per tonne.

solomaize

Recommended for aerobic stability in high dry matter maize silage above 28%. Yeast and mould are inhibited by specialist, high dry matter bacteria. This will reduce heating and waste in the clamp and during feed out. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

maizecool gold

Recommended for aerobic stability and enhanced feed performance in high dry matter maize silage above 28%. Yeast and mould are inhibited by specialist, high dry matter bacteria. This will reduce heating and waste in the clamp and during feed out.

A patented enzyme system is included to increase forage digestibility. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

wholecrop gold

Recommended for aerobic stability and enhanced feed performance in fermented wholecrop cereals between 35 & 45% dry matter. Yeast and mould are inhibited by specialist, high dry matter bacteria. This product contains a patented, high specification enzyme system which breaks down cereal fibre, increasing forage digestibility. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.

wholecrop gold mill

Recommended for aerobic stability and enhanced feed performance in fermented wholecrop cereals between 45 & 75% dry matter. Yeast and mould are inhibited by an increased level of specialist, high dry matter bacteria. This product is a biological alternative to urea based alkaline wholecrop additives. Apply at 2 litres per tonne.

bio crimp

This is a biological alternative to acid treatment of moist crimped grain between 25 & 40% moisture. An elevated inclusion level of specialist, high dry matter bacteria inhibit yeast and mould. This improves aerobic stability, prevents heating and minimises feed waste. Apply at 4-8 litres per tonne.

bio grain

This is a biological alternative to caustic or urea treatment of whole grain wheat and triticale. Whole grain can be treated between 15 & 45% moisture via the addition of water through a mixer wagon. A maximum inclusion level of specialist, high dry matter bacteria inhibit yeast and mould. This improves aerobic stability, prevents heating and minimises feed waste.

bio straw

A specialist, high dry matter inoculant which prevents yeast and mould formation in unwrapped straw bales at moisture contents up to 22%. This reduces moulding and dust in straw to be used as bedding or feed. Apply at 2 litres per tonne.

wholecrop legume

Recommended for preservation, aerobic stability and enhanced feed performance in fermented wholecrop legumes (peas, beans and lupins) and bi-crops between 20 & 50% dry matter. Combinations of bacteria ensure preservation and stability. This product contains a patented, high specification enzyme system which breaks down fibre increasing forage digestibility. Apply at 2 litres per tonne or 40 ml per tonne through the Biotol Low Volume System.