AGRICULTURE VICTORIA

Frequently Asked Questions about Silage

Frank Mickan
Pasture and Fodder Conservation Specialist
DEDJTR, Ellinbank Centre,
03 5624 2259, 0427 317 471,
frank.mickan@ecodev.vic.gov.au

Dairy Australia
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Department of Economic Development, Jobs, Transport & Resources
State Government Victoria

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Agriculture Victoria, Ellinbank Centre

CONTENTS **Page**

Silage is harvested and stored under many different management systems and climatic conditions using a wide range of machinery and varying levels of operator and contractor experience. High quality silage has to be made from high quality forage and harvested and sealed airtight as quickly as possible. The airtight seal must be regularly checked and holes in plastic sealed with silage specific tape ASAP.

Following are commonly asked Frequently Asked Questions from farmers, service providers and contractors. Please note that a some of these answers may be influenced by other factors beyond the scope of advice that can be provided below.

MAKING & STORING SILAGE

What is the correct Dry Matter (DM) content for each form of silage for a range of crops?
The recommended DM contents for a range of forages harvested with long and short chop forage harvesters or baled and storage types are summarised in Table 1.

Table 1: Target DM contents for various crop, harvesting methods and storage types

Crop type (Stage to cut)	Pit/stack (DM %)	Round Bale (DM %)[2]
Pastures (Vegetative - very early heading)		
Long chopped	30 - 35	40 – 50
Precision chopped	30 - 40	
Lucerne (Bud - <10% flowering)		
Long chopped	33 - 35	40 –50
Precision chopped	33 - 38	
Other pasture legumes (early – mid-flowering)		
Long chopped	33 - 35	40 –50
Precision chopped	35 - 40	
Whole-crop cereals (Vegetative – Must be wilted) (Oats[1], ryecorn[1], barley, wheat, triticale)		
Flag leaf – Boot stage	33 - 40	38 – 50
Whole-crop cereals (Direct harvest standing crop) (Barley, wheat, triticale)		
Late milk - Soft dough stage	36 - 42	38 – 45
Whole-crop cereals as **Alkalage** (Direct harvest + "Home'n'Dry®") (Barley wheat, triticale)		
Early – late hard dough stage	65 - 85	
Maize		
Precision chopped	33 - 36	
Summer Forages (Sweet sorghums, millets)		
Long chopped	30 - 35	35 – 45
Precision chopped	30 - 40	
Brassicas/Chicory[3]	33 - 38	35 – 45

[1] Oats and rye corn not recommended to be baled at the soft dough stage as quality is low, exclusion of air is difficult often causing poorer fermentation, resulting in a severe decrease in quality and increased mould growth.
[2] Large rectangular-baled silage could be 5 – 10% DM higher at the high end of each range but, if too dry, fermentation will be very restricted and losses due to yeasts, moulds and aerobic bacteria activity, leading to spoilage will be very substantial if plastic is holed! Individually or continuous inline stretch wrap these only.
[3] Thick stemmed brassica and chicory need to be mown with a roller mower-conditioner to squash the stems to even drying somewhat with the leaves.

How can I tell if the forage is ready to harvest for silage?
Use a microwave oven or food dehydrator to determine DM content. Hay moisture meters, in the past, were not suitable for measuring moisture contents for silage but some of the current hay moisture meters are claiming to be able to "indicate" moisture contents for silage (100 – moisture content = DM content). If purchased to measure silage dry matter, confirm readings with a micro-wave oven tests.

Some practical indicators are:-
Stack silage: If moisture drips/runs from hand squeezed forage sample after 1 minute (chopped into 2 – 3 cm lengths), or moisture oozing out of trailer during transport to the stack or from the stack during rolling it's too wet. Slight dampness on tractor wheels during stack rolling indicates correct DM content but no wetter.

Baled silage: Tractor blowing exhaust smoke. Bale has trouble turning in chamber or hard to expel from bale chamber. Flat ends of bale smeared black. Perimeter of bale glistens in sunlight from moisture. Too wet if 2 people cannot flip a 1.2 m x 1.2m bale (~50% DM) onto its flat when rocked 2 – 3 times. Needing 3 – 4 people when diameter is over 1.35 m. Balers can now make round baled silage of 550 – 800+ kg wet weight.

If my silage is not quite wilted enough and rain is coming, can I use an additive?
Yes, but to ensure a good fermentation (pleasant, sweet smelling silage), apply a silage fermentation stimulant/enhancer additive (Inoculants, buffered acid salts, Sulphur based compound + Amylase mix, etc.) from reputable companies which have independent research to back up their products. Apply at the recommended rate per tonne of fresh crop acknowledging extra cost due to extra weight of the water in under-wilted crops.

If my hay is not quite cured enough and rain is coming, can I make silage out of it?
If the crop has been on the ground for many days (e.g. 4+ days) and/or has been severely affected by rain, the crop will be probably largely depleted of plant sugars, essential for ensiling. Wrapping may/may not allow a crop to be salvaged as high DM silage.

Applying a buffered acid silage additive (or other appropriate silage additive) at baling may assist the restricted fermentation process. Applying a traditional fermentation stimulating-type bacterial inoculant probably won't assist due to lack of sugars although there are now a few available claiming to preserve slightly over-wet hay as specific hay preservative already do, some needing to be used at higher rates. Baling as hay using a hay preservative would be the preferred option.

How do I know if the stack is rolled enough?
It is well compacted if the forage is not depressed by the rear wheels more than a few centimetres as they pass over the stack. Rolling slowly rather than quickly allows the weight of the vehicle to be transferred to the forage, greatly aiding compaction. It is compacted enough if the ends of your fingers cannot be pushed past the first joints into the stack being filled or into an opened stack face (at feed out).

How do I know if the bales are baled tightly enough?
Bales should hold their shape some time after baling when left on their round side. Fingers can only be pushed into the first joints into the ends of bales.

How much silage is in my stack?
This will depend on silage DM content, chop length, stack depth and how well the stack was compacted. Table 2 shows the silage densities of 168 silos in America - similar densities would apply in Australia. Roughly one cubic metre of silage of chopped silage (~33% DM) and chopped to 2 – 4 cm will weigh approximately 660 kg wet weight or about 220 kg DM.

Table 2. Approximate weight of silage per cubic metre (kg/cubic metre)

Weight basis	Pasture, Lucerne	Maize
	Density (kg/cubic metre)	
	Average (Range)	**Average** (Range)
Fresh weight basis	**590** (210 – 980)	**690** (370 – 960)
Dry weight basis	**240** (110 – 430)	**232** (125 – 378)

NOTE: Longer cut and wetter silage gives a lower dry matter density.

How much does baled silage weigh?
Fresh bale weights increase substantially when baled at lower DM contents than at recommended DM contents and if the diameter is increased (Table 3).

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Table 3. Approximate weight of silage bales (kg/bale)*

50% DM					
Bale Size (L x D) (metre)	**Volume (m3)**	**Wet weight (kg)**	**Dry weight (kg DM)**	**Chopped bales (+8 to 15%)**	
				+8%	**+15%**
				(Kg DM)	
1.2 x 1.2 (4')	1.43	500	250	270	288
1.2 x 1.4 (4'6")	1.80	630	315	340	362
1.2 x 1.5 (5')	2.21	774	387	418	445

* Recent balers can compact bales much more densely now so bale weights may be 20 – 30% heavier

QUANTITY versus QUALITY

Although quantity will be down and the material will cost more to harvest/t DM, the extra cost will be well offset by the higher quality silage producing more milk. High yielding crops also incur higher cost overall (more bales or tonnes being harvested using more twine, netwrap, plastic, increased transport in/out, etc.). Not so obvious is that the animals need to eat substantially more to produce the same level of production, and may not achieve this if quality is too low (~8.5 – 9.0 MJ ME/kg DM).

Table 4 is indicative of several experiments showing the effect of ensiling high quality forage (albeit lower yielding) versus higher yielding (albeit lower quality) ryegrass. Early cut and short lock up time will result in higher quality silage and more regrowth of higher density and quality also compared to later cut, longer lock up periods.

Management, specific equipment (conditioners, tedders) and silage additives may be essential to achieve this early cut silage due to less favourable weather and moist ground conditions.

Table 4. Effect of date and length of closure on total spring growth

Date of Closure	Early 23rd. September		Late 10th. October	
Duration of Closure (Weeks) and Cutting date	**4** **21-Oct**	**6** **4-Nov**	**4** **7-Nov***	**6** **21-Nov**
Pasture and Silage Yield (t DM/ha)				
Pre-closure ***(Grazing)*** (t DM/ha)	0	0	1.8	1.9
Silage Yield (t DM/ha)	2.4	3.4	1.6	2
Regrowth to 16/12 (t DM/ha)	4.1	1.9	0.8	0.4
Total Yield	**6.5**	**5.3**	**4.2**	**4.3**
Silage DM content (%)	39	35	43	51
Silage DM Digestibility (%)	73.5	71.6	69.2	66.2
DM Intake (kg DM/day)	15.3	14.1	15.6	14.2
Digestible DM Intake (kg DDM kg/day)	11.2	10.1	10.5	9.6
[1]FCM production (kg/day)**	**12.2**	**11.3**	**11.2**	**10**

Source: G.L Rogers (1984).

[1]Silage fed to late lactation cows of lower liveweights (~475 – 520 kg) than current cows (~550 – 650 kg)

* Dry period in early November

**Fat Corrected Milk

Table 5 shows the impact of increasing the quality of silage and also reducing the harvesting, storage and feed out losses when the higher quality silage or extra silage (saved by reducing the losses) is converted to milk. Eight MJ ME is used to produce one litre of milk (cp. 5.5 MJ ME/L) as this allows for walking, pregnancy, putting on condition, some substitution, etc. so is a very conservative conversion rate.

Table 5. Impact of improved quality and reduced losses on the additional value of milk produced

Quantity of fodder stored p.a.	300	tonne DM
Existing quality	9.5	MJ ME/kgDM
Target quality	10.5	MJ ME/kgDM
Existing losses estimate	25%	of total storage
Target losses	15%	of total storage
Value of milk	40	cents per litre milk
Conversion to milk	8	MJ/litre from silage

Loss range	**Quality range MJ ME/kgDM**		
	9.5		**10.5**
25%	0		$11,250
15%	$14,250		**$27,000**

If 300 tonne dry matter of silage was made at 10.5 vs 9.5 MJ ME/kg DM and losses are reduced by 10% there is an increase in milk income of approximately $27,000 compared to producing the same material of 9.5 MJ ME/kg DM with 25% losses.

SEALING SILAGE STACKS

Should I cover the stack during harvest?
Ideally, yes. The rolled stack will contain some air no matter how tightly compacted, allowing plant respiration and microbial bacteria activity to occur overnight, resulting in DM and quality losses. Carbon dioxide + water + heat are given off and rise as hot air! This heated air rises out of the stack to be replaced by cool air. This cool air is heated, rises and is replaced by more cool air! View this as cold air in, $$$$ out. A plastic sheet dragged over the stack with a few tyres or gravel/sand-filled sausage bags placed around its perimeter will greatly slow this cycle. Not always easy but worth considering!

When should I cover the silage stack after harvesting is finished?
As soon as the final rolling is completed. Rolling should have kept up with stack filling and so should not need too much extra rolling at the end. If late at night, at least drag the plastic sheet over and place tyres or gravel/sand-filled sausage bags around the perimeter. Next day, place weight such over the entire stack surface and seal edges airtight. Do not roll the night after harvest as this will "pump" fresh air into the stack!

Are there alternatives to using tyres for sealing and weighting plastic sheets?
Ideal: A thin layer (3 – 5 cm) of soil over the plastic over entire stack surface and 10 – 15 cm past the plastic edges. Painful to remove soil but consider throwing some grass seed on top to act as handles to easily remove soil at feed out.

Make "sausages" containing dirt, sand, pea gravel, etc. out of last year's sheet plastic (Figure 1a & b) and lay in overlapping rows along plastic edges, along overlaps on the stack and in rows across the stack surface. Commercially available plastic are available which can be filled with pea-sized gravel or washed sand (Figure 2a & b).

Figure 1a & b. "Sausages" made from old plastic, gravel and large square bale hay twine

Gravel filled Silostop socks are very easy to manoeuvre and long lasting (Figure 2a), reducing the need for tyres. The socks follow indentations in the stack or ground surface so providing a very effective seal. Socks are very useful for sealing along walls in concrete bunkers. Best to overlap 2 rows around the stack perimeter for best seal (Figure 2b).

Figure 2a. Silostop socks and tarp

Figure 2b. Gravel socks overlapped

What is an oxygen barrier (OB) film?
The original OB sheet film is a non UV-treated film of about 45 micron thickness which is 20 times less impermeable to oxygen than the traditional black and black/white films. It needs a protective cover such as the traditional white/black plastic sheet or a woven plastic mat in a "2 step" system (See last page) to protect it from light breakdown. These covers are relatively easy to apply but expensive so care is needed to ensure several years use. The OB technology has also been incorporated into a white/black film ("1 step system) but still needs extremely good perimeter sealing and still prone to holing.

Research has shown less than 10% loss in the top one metre of the stack compared to 20% with traditional white/black sheets or over 50% with no cover.

There are now several other companies supplying a clear non-UV treated film incorporated in the roll with the overlaying white/black film but which is less effective as an OB film (6 – 10 times vs 20 times cp the white/black sheets). However, if the exterior of the stack or bunker is extremely well sealed, ie. Air-tight, then they are worth considering.

BALED SILAGE

When should bales be wrapped?
Preferably as soon as practicable after baling and if not, preferably within 2 hours later. Never leave them unwrapped overnight but if unavoidable, stand bales on their butt to make wrapping possible the next morning.

How many layers of plastic on round and rectangular bales?

- Four layers all over round bales at 55% stretch with no underlapping.
- New Zealanders recommend six layers, but stretch their plastic to 70 per cent, ie thinner per layer with earlier type films.
- Recently, manufacturers have produced 5 layer stretchwrap films & recommend 70% stretch with 4 (but prefer 6) layers for round bales & 6 layers for large square. Companies recommend 6 layers being applied to tubelines (continuous in-line sausages) and sometimes – 8 layers at the joins.
- 6 layers are also recommended for large rectangular bales as the plastic is often prone to slipping off the corners.
- Six layers are recommended for stemmy crops, for transporting bales, if being left in paddocks on stubble or if being stored for for sheep and horses.

- If a known proportion of bales are to be carried over each year, wrap these in 6 or even 8 layers to potentially provide two years safe storage.
- An Oxygen Barrier (OB) stretchwrap film has recently been developed which is 100 times more impermeable to oxygen than traditional stretchwrap film. Research has shown a 40% reduction in losses (From 7.7 to 4.6%) and resultant silage will be of slightly higher quality due to less air in bale. The OB film will still only survive about 12 months. Currently expensive so do the maths.
- **Watch this space:** Stretchwrap plastic is continually evolving such as 7 layer films becoming available, a film more suited to continuous in-line wrapping, clear stretchwrap and various other colours.

What are the advantages of chopper balers?

- Overseas research has measured 8 to 15 per cent extra weight in chopped bales compared to unchopped bales of similar size, hence less bales/hectare and less plastic/tonne DM although slightly higher cost to bale.
- Depends on operator, number of knives used, bale chamber pressure setting and baling speed.
- Easier to feed out, especially in mixer wagons BUT not suited for some feed out buggies.
- No great advantage in straw, hay or grazing height pasture.

When should bales be moved from the paddock?

- Move bales 3 – 4 bales after baling to allow plastic tackifiers to complete sealing. If not, better to leave them in the paddock for 2 – 3 weeks to allow fermentation to finish.
- Birds feed on exposed insects, worms, beetles, etc. immediately after baling then attack bales left in paddocks. However, seagulls, crows, galahs, cockatoos etc. are often persistent problems in many locations.
- Bales left on their sides in paddocks for several weeks are prone to damage from bale moving equipment causing plastic damage in slumped bales + bird attack.
- Store bales on end if they are to be left in paddocks for several days to weeks.

Why does the plastic wrap bulge soon after wrapping and what should I do?

This indicates a good seal and the fermentation gases, eg. Carbon dioxide, are being trapped. It will dissipate within three days. DO NOT puncture the film. More noticeable in hot weather.

Why are bales sometime wetter at the base than at the top?

Baled silage that has water at the base or is wetter towards the base indicates that the material was not wilted enough before baling, OR is deteriorating in the bale due to air entering through degrading plastic, underlapped film or due to several holes in the plastic.

Why are bales wet where they are touching other bales?

Bales which were baled slightly too wet, high temperatures and deteriorating silage all produce moisture or condensation. Where bales are pressed together, this moisture can sometimes build up here and often result in a breakdown of the lactic acid originally produced into lesser acids by clostridia and other bacteria resulting in an undesirable pH lift.

Are brightly coloured moulds in silage dangerous?

Not necessarily. It is the mycotoxins sometimes produced by a range of coloured moulds which can cause problems, including the white to grey coloured moulds occasionally, but many mouldy silages (and hays) are eaten by stock with no noticeable animal health effects.

However, intakes may be depressed and sometimes consumed mould may produce products which may cause problems. The safest management option is to avoid feeding mouldy silage to any stock at all; and at the very least **not pregnant animals and never to sheep or horses.**

What plastic tape should I use to repair holed silage plastic?

- Repair tape specifically manufactured for sheet and stretch wrap plastic should be used.
- Duct tape is not suitable for more than a few weeks.
- Plastic should be clean, dry and cool before patching.
- Use light coloured tape on light coloured plastic film to avoid differential in heating/contracting causing tape failure.
- Cut tape to length and allow to "shrink" before applying over hole

What are Continuous in-line wrapping, 3D wrapping and Film on Film technologies?
Individually wrapped bales have many unnecessary layers on their bale ends so various innovations have been developed to overcome this issue.

- Continuous in-line sausage wrapping: As round and square bales are wrapped in a continuous row with bales end on end, about 30% – 40% of plastic is saved when the wrapped with the traditional 4 layers. However, bales of varying diameter results in the plastic splitting where these bales met causing substantial losses due to aerobic spoilage. To avoid this, plastic companies started to recommend 6 layers with some suggesting 8 layers at the joins so reducing the advantage of continuous in-line wrapping.
- 3D Wrapping: A combination baler/wrapper was developed incorporating 3D wrapping. The bale is wrapped once across the bale ends then the pre-stretchers turn 90 degrees to wrap the bales with overlapping layers around the bale perimeter and then turns 90 degrees again to cover the bale ends. About 7 layers are applied with 4% – 15% saving in plastic and improved fermentation.
- Film on Film or net replacement wrapping: Film replaces the netwrap around the bale perimeter resulting in a tighter bale (~100L less air), improved fermentation and slightly heavier bales (+7 – 10 kg DM) and 10 – 12L/bale more milk. Plastic around the bale perimeter and sealing the bale is all removed at once.

SILAGE ADDITIVES

What is the difference between silage additives and silage inoculants?
Silage inoculants are only one group, albeit a large and well promoted group, of a wide range of silage additives. Silage additives can be classed into fermentation enhancers, fermentaation inhibitors, aerobic spoilage inhibitors and combinations of the above. There are many additives of varying modes of action, most well substantiated by research, some not!

Can silage be over inoculated?
Yes, but mainly from the needless money spent if excess is applied. Will also depend on the additive type used. However, the main problem which often occurs is that many silages are under inoculated.

Why do silage additives/inoculants work sometimes but not other times?
There could be many reasons for additives not working, but the following are some of the obvious causes:

- An inoculant could be out of its use-by date or unused additive has been kept for too many days after last application despite being "topped up" with new additive.

- Additive may have been mixed with town water containing fluoride/chloride, dirty water, algae infected water, etc. - all can kill or severely affect the efficacy of most inoculant bacteria.
- Incorrect additive application rate. Most recommendations are based on the weight of a fresh crop passing through the chopper or baler. Material that is too wet or containing heavy dew at harvest will be substantially wetter requiring higher rates of additive application. This can prove difficult for contractors moving between farms who are dealing with different DM contents, species, yields, and farmer requests for different additive type, etc.
- Equipment may be out of calibration or need recalibrating with different additives.
- The forage may occasionally already contain enough desirable bacteria, so added bacteria inoculant may be superfluous. Hard to pick this either way.
- Incorrect additive may be applied to a specific crop in a wrong situation.

What are aerobic spoilage inhibitors?
These products delay the onset of aerobic spoilage in silages when it is exposed to air at opening and is indicated by heating and mould growth The products work in a range of modes to kill/restrict growth of aerobic deteriorating micro-organisms (mould, yeasts, aerobic spoilage bacteria) which use the air to populate, feed on the silage for energy and degrade the protein faction.

What is *Lactobacillus bucheri 40788*?
Lactobacillus buchneri 40788 is a 'heterolactic' bacteria that was originally isolated from naturally occurring aerobically stable silages, ie will not deteriorate quickly when exposed to air. The 40788 refers to the particular strain of *L. buchneri* which was found to be most suitable as an aerobic inhibitor. It was further developed into an inoculant and produces mainly acetic acid which has antifungal properties, along with possibly other antifungal compounds. Several other strains of *L. buchneri* are currently being investigated.

What is *Lactobacillus brevis?*
Lactobacillus brevis is another bacterial inoculant that has been developed as an aerobic spoilage inhibitor and is alleged to work similarly to *L. buchneri 40788.* Watch this space as new aerobic spoilage inhibitors are currently being researched and developed, eg. *L. hilgardii.*

Can I use left over inoculant from this season for next harvest?
- No, if the packet is opened the remaining freeze-dried inoculant will absorb moisture from the air and potentially cause the bacteria to die.
- No, if mixed with water.
- Yes, if the packet is unopened and stored as directed, usually in a freezer.
- Always read storage instructions as additives vary widely in constituents.

OPENING SILAGE STORAGES & TESTING SILAGE

When can I open my silage after it is made?
- *Stack silage:* Silage requires at least 4 to 6 weeks for the whole stack to ferment if compacted tightly and sealed airtight within hours after harvest is completed. If material is too dry, not rolled well, only covered and not sealed, etc fermentation will take several weeks longer so should not be opened for 6 – 10 weeks. If opened earlier, the open area of the stack will be flooded with air and fermentation will be affected with loss of dry matter (DM) and nutritive value.

- *Baled silage:* Individually wrapped bales can be opened anytime as long as the bale is consumed within the day. Fermentation won't be complete, but that won't matter although the bale odour will not be the sweet, smelling smell expected at this stage. Normally requires 2 – 3 weeks for fermentation to be complete.

- Stack large square bales under sheets of plastic in compartments and don't open for 6 to 8 weeks due to the excessive air entrapped in the stack.

When can silage be analysed?
Silage stacks can be sampled for analyses after about 5 to 6 weeks in a well preserved stack. A well preserved stack will have been cut, wilted, harvested and sealed airtight soon after the last load was put in and compacted. Unfortunately this is rarely achieved on many farms causing inefficient and slower fermentations occur meaning that testing should be left to about 8 to 10 weeks after sealing.

Bales can be tested after about 3 to 4 weeks. Silage analyses will not be indicative of the finished product if sampled earlier than this.

What do the silage analyses mean?
A silage analysis indicates the nutritive value of the sample of silage at the time of arrival at the laboratory. This assumes that the sample is representative of the stack or bales to be fed, that it was not left in a 'hot ute' for any time and that it was packaged, cooled/frozen and sent to the laboratory as quickly as possible.

The majority of laboratories will provide the following tests (some do more) and are measures as a percentage of dry matter (DM):

- ***Moisture content (MC %):*** This is the amount or per cent (%) of water in the sample, removed by oven drying.
- ***Dry matter content (DM %):*** This is the % of dry material left after oven drying to remove the plant moisture. 100% - Moisture content = DM% and 100% – DM content = Moisture %. Most feedlot and total mixed rations are based on the DM percentage as feeds and costs vary greatly according to DM content.
- ***Crude Protein (CP %):*** Crude Protein contains mainly true protein but often also contains non-protein nitrogen such as nitrates, ammonia and urea. Calculated by multiplying the % of nitrogen in the sample x 6.25. High producing milking cows require a CP of 16 to 18 per cent CP in their total ration. An animal requires a minimum of 8 to 9 % CP just to survive.
- ***Digestibility of the Organic Dry Matter (DOMD %):*** Calculated to represent the amount of the silage organic matter that is digested by the animal and accounts for inorganic matter (ash).
- ***Digestibility of Dry Matter (DMD %):*** The percentage of dry matter actually digested by the animal and estimated by laboratory methods which is standardised against Digestible Dry Matter values from feeding trials.
- ***Metabolisable Energy (Megajoules of Metabolisable Energy per kilogram of Dry Matter or Mj ME/kg DM):*** This is the energy value of the sample and is calculated from the Digestible fractions above. High producing milking cows require ME values above 11 and a minimum of about 7.4 ME just to survive.
- ***Water Soluble Carbohydrates (WSC %):*** A measure of the total soluble sugars, such as glucose, fructose, sucrose and fructans present in a forage.
- ***Neutral Detergent Fibre (NDF %):*** Measures the fibre portion of plant cell walls composed of hemicellulose, cellulose, lignin, silica, tannins and cutins. Usually, the

lower the NDF, the higher the nutritive value, a desirable total diet value being 30% – 35%.

- ***Acid Detergent Fibre (ADF %):*** Composed of the indigestible portions of cellulose and lignin. The lower the value, the better the feed.
- ***Acid Detergent Insoluble Crude Protein (ADICP %):*** This is a measure of the amount of protein damaged by heating or protein unavailable to the animal for digestion.
- ***Ammonia - Nitrogen (NH_3–N as % of total N):*** This indicates the quality of the fermentation process. The higher the ammonia-N level, the greater is the protein degradation and poorer the fermentation. Levels above 10% indicate protein degradation, usually a result of poor fermentation.
- ***Silage pH$_{(water)}$:*** This is the final level of acidity in the silage after fermentation has finished. Bulk/stack silage should be in the pH range of about 3.5 to 4.3 and for bales just about 5.0 to 5.2. DM%. Outside these ranges will result in less desirable silage.

NOTE: The silage being fed may only be a small or large part of an animal's total ration and the analyses must be used accordingly to balance the entire ration.

SILAGE ATTRIBUTES

What can a visual appraisal of silage tell me without having it tested?
Firstly a laboratory analysis provides an accurate objective assessment, if the sub sample is representative of the stack or bale and the sample is managed according to protocol.

A visual appraisal of a sample is subjective, but can provide useful support when diagnosing many problem silages. Look for leaf vs stalk vs seed heads, amount of clover, weeds, dirt, parts of dead animals (can cause botulism), other contaminants.

Remember, both good and poor quality silages can have a desirable or sweet smelling fermentation. This means despite correct harvesting techniques, if a paddock contains many weeds and/or low quality annual grasses they can still be ensiled well, but are likely to have a low nutritive value. However, both high and low quality silages can have an undesirable and unpleasant smell due to a poor fermentation. An example is when leafy ryegrass pasture if wilted for too long, harvested too wet, poorly rolled, or inadequately sealed, etc. it can undergo a poor fermentation.

Mouldy or rotten silage indicates poor compaction and or air penetration throughout storage.

Colour

- Light green to green or brown indicates a normal fermentation for grass, cereals and maizes.
- Darker olive green or brown indicates the same for wilted legumes.
- Brown to dark brown indicates heating due to inadequate compaction, delayed and or poor sealing and will have undergone substantial dry matter and quality losses.

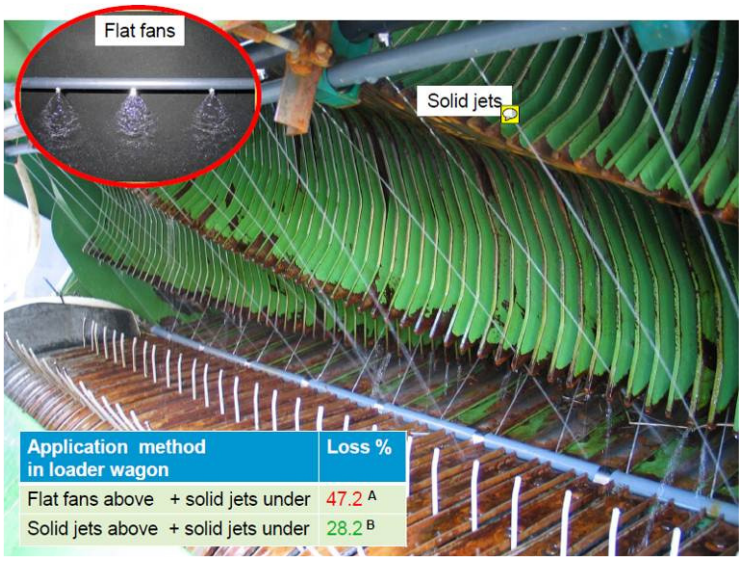
Aroma

- A mild, pleasant, acidic or natural yoghurt smell indicates desirable lactic acid fermentation.
- Very little smell, but slightly sweet aroma indicates heavily wilted silage which has undergone little fermentation, eg, baled silage.
- A sour vinegar smell indicates a less than desirable fermentation producing acetic acid indicating a low dry matter and low sugar forage silage.

- A putrid smell, like rancid butter, indicates a very poor fermentation dominated by undesirable clostridia bacteria that produce butyric acid. It also indicates material was too wet when ensiled and may be slimy. It will have lost substantial DM and nutritive value. It will be less palatable to livestock, often refusing to eat it when fed but may do so on day 2 when the pungent volatile gases/smells such as ammonia have wafted off.
- If there is a strong tobacco or caramel smell, it indicates heat damaged silage which is highly palatable to stock, but very low in quality.

Silostop 2 Step system: OB film + UV inhibitor treated woven cover +gravel-filled Socks

Rules for patching bales



Additive application sites above/below material

GUIDE TO ESTIMATING DRY MATTER CONTENT OF PASTURE AND SILAGE

1. Hand Squeeze Method

Take a representative sample of pasture ready for ensiling. Cut it into 2 - 3 cm lengths and **tightly** squeeze a handful for ~60 seconds. Then quickly open your hand. The table below gives a rough indication of the DM % of the material.

Using this technique, in conjunction with the Microwave Oven Drying Method (or Food Dehydrator - tare plate, weigh, heat at 60˚C and reweigh 4 hours later – accurate to within 1% of 24 hrs drying) will allow you to calibrate yourself with this Hand Squeeze Method, which is faster, but not as accurate.

Dry Matter Content	Condition of the sample after squeezing
Below 25%	Ball holds its shape. Lots of free juice. Hand is wet or moist.
25% - 30%	Ball just holds it shape. Hand barely moist. Ideal for wilted silage.
30% - 40%	Ball falls apart slowly. No free juices. Makes excellent silage, but because of its springiness, requires fine chopping or extra care to exclude air.
Over 40%	Ball springs apart quickly. Suitable for round bale silage but total air exclusion is essential.

Microwave Oven Method

1. Collect and thoroughly mix representative samples from the crop, sub sample to get a test sample.
2. Weigh out approx..100 g sample to the nearest gram.of the chopped forage **taring** the weight of the container beforehand. Exactly 100 gm makes calculation simple.
3. Spread the weighed forage sample on a paper tray and put it in the microwave oven.
4. Place a 250ml glass three-quarters full of water at the rear of the oven to prevent the sample igniting and to absorb some of the odour. Replace water during oven use.
5. Heat at 80% to 90% of maximum power for 4 minutes if sample is estimated to be 30% - 50% dry matter. Wetter the sample, longer the oven drying periods required.
6. Remove the sample, reweigh, mix and place in oven. Renew the glass of water.
7. Continue to re-heat for 1 - 2 minute intervals, re-weighing each time. To prevent burning, use lower heat and 30 sec. intervals as the sample approaches being dry. If the sample chars use the last weight recorded. Accurate to within 1 – 2% of its final DM wt.
8. Calculate dry matter content as follows:-

   $\frac{\text{Dry weight (g)}}{\text{Initial Weight (g)}} \times \frac{100}{1} = \ldots.\%\ \text{Dry Matter}$

   eg. $\frac{38}{100} \times \frac{100}{1} = 38\%\ DM$

Moisture Meters: Some are claimed to be accurate down to 30 %DM (70% moisture). Be wary and check some samples that have been dried with a microwave oven!