FACTSHEET February 2017

Best Practice Clamp Management - Reduce your losses whilst improving your quality!

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The cost of Silage Losses

Silage is a major investment on livestock farms in Wales.

Taking the costs of production figures from Nix Farm Management Pocketbook 2017 of:

£89/tonne
of **Dry Matter** to make silage

↓

a clamp holding
500 tonnes
of **fresh silage**

↓

with a fairly average
DM content of
28%
(giving a total of 140 tonnes of DM)

↓

has a **cost of production** of
£12,460

This represents a fairly major annual investment in winter feed. Unfortunately however, these are not the real costs, as every clamp loses quantity and quality between filling and feeding. The average loss is estimated to be 25% of the total DM, with the lowest losses still being 10%. Many of these losses are unseen as they are a result of water production *(so the silage gets wetter)* and CO_2, which is lost to the atmosphere.

How higher losses increase the cost of the silage:

	DM content *(tonnes)*	Cost/tonne of DM
Clamp with 500T Fresh	140	£89
10% losses	126	£98.89
25% losses	105	£118.67

The clamp still costs the same to make but the losses mean the costs/tonne of DM are higher.

There is a potential £20 difference between 10% and 25% losses for every tonne of DM (£5.60/T Fresh), which is an extra £2,800 for a 500 tonne clamp of grass silage.

Having discussed the value of the DM losses, it is also worth considering the change in quality as a result of these losses. Between cutting and feeding the metabolisable energy (ME) can reduce by 0.6 MJ/kg DM, or 3.75 % D value resulting in forage of lower quality and lower energy content. Thus at 25% losses this represents 63,000 MJ of energy lost in the clamp. Assuming 5 MJ of energy produce a litre of milk that's 12,600 litres of milk lost, valued at £3,150 if sold at 25p/l. Therefore the total DM and energy losses are just short of £6,000 or £42/T of silage DM.

Having done the sums hopefully the remainder of this factsheet will show a significant payback on your time invested in reading it.

Many of the losses encountered in ensiled forage are as a result of storage losses, predominantly in the first few days after the sheet has gone on, and at feed-out whilst the clamp is open. Following a few simple rules can significantly help reduce these losses. Gelli Aur College Farm, a Farming Connect Innovation site focusing on silage related projects recognise the importance of taking the time and effort to manage their grass silage with the same degree of attention to detail as they manage their grazed grass. This is critical in reducing both losses of quantity and quality.

Silage Density

This all starts with ensuring the silage is of a good density during filling, the target density should be 750 kg/m^3 on a fresh matter basis or around 220-250 kg/m^3 on a DM basis depending on the % DM. Using the corer method of measuring density at various points on the face at feed-out showed that the Gelli Aur clamp hit the target in all six samples examined and in the lower portions of the clamp was nearly 1000 kg/m^3. The better the density the lower the losses during the first few days of ensiling. Table 1 shows farm survey work in the USA where density and losses during storage were measured and it's clear to see that as density increases DM losses decrease. However, improved density also reduces feed-out losses that occur as a result of aerobic spoilage or heating of the clamp.

Table 1 showing the effect of the compaction density during filling on the Dry Matter losses after 180 days of storage in clamp silages.

Density of Silage kg DM/m^3	*Density of Silage kg FM/m^3 at 30%DM*	%DM losses
160	533	20
192	640	18
224	746	16
256	853	14
288	960	12
320	1066	10

To achieve this density the most important factor is layer depth at filling, with an even and maximum layer depth of 6 inches/15 cm, and compacting each layer as you go. Increasing this layer depth to 10 inches/25 cm and changing nothing else will reduce the density by 120 kg/m^3 FM.

Measuring Density - Step by Step

Consultants will use a silage corer to sample your silage, however you can use a metal tube with a sharpened end pushed into the silage clamp face with a screwing action to sample your silage and measure the density.

Measure the diameter of the corer in order to work out the surface area of the core by using the following equation;

- Surface Area = πr^2
- π = 3.1416
- r = diameter/2
- In this case SA = 3.1416 * $(0.047/2)^2$ = 0.0017 meters^2

Then measure the depth of the hole and also convert this measurement to metres. Use this equation to find the volume of your core;

- Volume = surface area x depth
- In this case: 0.0017 x 0.16 = 0.00028m^3

Then weigh the mass of the silage from your core and convert this into kilograms. Use the following formula to then work out the density;

- Density = Mass / Volume
- In this case: 0.187 / 0.00028 = 673 kg FM/m^3

By assessing the density at numerous points in your silage clamp you can assess strengths and weaknesses and improve next year.

Key points at feed-out

Pulling back the Top Sheet and Top Waste

When pulling back the top sheet pull as little as possible to facilitate silage removal and always place weight on the cut edge of the sheet, preferably gravel bags touching, to ensure oxygen cannot penetrate between the sheet and the silage and increase the aerobic spoilage losses on top of the clamp. Removing too much of the sheeting not only results in the potential for more silage losses due to aerobic spoilage, but if the silage is rained on it will have a lower DM content which can affect silage intake and the overall balance of the ration.

If you have top waste - dark slimy sludge - then make sure you remove it and never feed any of it. Not only would this layer be twice to three times the depth if it had been good quality silage, but it has very poor nutritive value and an odour that will reduce the intake of all the feed presented, especially if it is well mixed with a TMR. A ruminant's sense of smell is around 18 times more sensitive than a humans and is the first factor influencing palatability. If this top waste silage is fed, not only will it reduce the silage quality fed, but it further reduces the degradability of the silage in the rumen by its negative effect on the fibre degrading rumen micro-organisms.

Any top waste should be removed immediately when the sheet is pulled back and not left to soak through into the layer below, as it potentially contains water soluble toxins which can wash into the good silage beneath, causing animal health risks.

Silage Removal

It's essential to remove silage without disturbing the remaining silage in the clamp. Oxygen is the enemy of silage quality and the friend of the yeasts that start the heating process. When silage heats it's the yeasts that are growing and consuming the energy, leaving less for your stock, so a sharp cutting device is required. Gelli Aur use a block cutter *(see figure 1)* which leaves the clamp face clean and tidy and very tight, thus not allowing air to penetrate and ensuring the energy content is not lowered. Having rugged surfaces as a result of poorly maintained shear grabs or even worse feeding out with a bucket result in a much bigger surface area of exposed silage in the clamp *(at least two or three times greater than a smooth face)*, thus enabling much more oxygen to come into contact with the silage and reducing the feeding value. Also, oxygen can penetrate into the clamp face a few inches as a result of tearing/pulling the silage out of the clamp rather than cutting, further increasing losses. Having a smooth clamp face is desirable in ensuring your silage losses will be as low as possible.

Figure 1

Finally making sure the area in front of the silage face is kept clean also reduces losses. This is for two reasons; firstly, if the concrete is clean then any edible silage that falls off the face during removal can and should be scraped up and fed, if it is mixed with dirt in a poorly managed silo then if fed it will reduce feed value and if not fed it increases losses. Secondly, leaving heaps of spoiled silage - be it top waste or aerobically spoiled mouldy silage - in front of the face acts as a reservoir of undesirable microbes that will be spread on to the silage face and start to grow, thus further increasing losses and reducing quality.

Figure 2

Figure 2 shows the clean feed area at Gelli Aur, as an example of good practice.

Time spent maintaining good clamp management during filling and feed-out should be seen as a good investment and by examining the negligible costs involved a very substantial return on investment can be expected.

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