Analysing Grass for Silage
Introduction

Producing enough silage of the right quality for each class of stock is key to enterprise performance and farm carbon footprint.

Feed and forage account for over 33% of production costs on many Welsh farms. There is scope to increase profit and improve efficiency by setting targets for silage feed value and using the best cutting and ensiling practices to produce a stable well fermented silage.

Setting targets for feed value can help producers plan to ensile grass of the right quality for all the stock on the farm. High quality silage for productive stock and either restricted amounts of high quality forage or lower quality silage for dry suckler cows and store stock to maintain the correct health and performance.

Knowing the quality of the grass to be ensiled is the first step to making the right quality silage for your system. Step two is to ensure it will ferment quickly to produce a stable, well preserved silage that livestock will eat and will not go off over the winter.

Feed values

The feed value of the grass ensiled and how well the grass has fermented is reflected in the overall quality of silage. There are several indicators of silage quality but production potential of grass silage is driven mainly by digestibility (“D value”) and how much livestock can eat (intake potential).

Research has shown increasing “D value” by 5% will improve:

- Milk yield by 1.85kg/cow/day
- Carcass gain of steers by 140g/day
- Ewe weight post lambing by 6.3kg and lamb birth weight by 0.3kg
- Lamb weaning weight by 0.93kg
- Carcass gain of lambs by 40g/day

The date of harvest is the main factor affecting silage digestibility. A week’s delay in harvesting reduces digestibility by 3 to 3.5%. Research shows this delay results in animals typically needing the following extra feed to maintain performance:

- Ewe in late pregnancy - 8kg concentrate
- Finishing lamb - 0.3kg concentrate/day
- Finishing beef - 1.2kg concentrates/day
- Lactating dairy cow - 1.5kg concentrates/day

(*Keady, Marley and Scollan 2012)
The Farming Connect Mileage in Silage Project:
Analysing pre harvest grass

Analysing growing grass crops can help farmers make decisions on cutting date, harvest methods and fermentation management. During 2012, five Farming Connect Demonstration Farms across Wales took part in a Farming Connect-IBERS project ‘Mileage in Silage’ which measured grass quality before cutting.

The farmers involved took weekly pre harvest grass samples for analysis to guide harvesting decisions and highlight when the grass was at the optimum stage for cutting. Sampling began three weeks before the anticipated cutting date for the crop. Analysis included digestibility, energy, true protein, soluble sugar content and nitrate nitrogen %. In the week when the farmer planned to cut the silage, the grass was also sampled for sulphur because low levels can reduce regrowth.

Mileage in Silage results were published weekly on the Farming Connect website at: www.menterabusnes.com/farmingconnect

<table>
<thead>
<tr>
<th>Crop</th>
<th>Targets</th>
<th>Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter (DM)%</td>
<td>30% for clamp 35-45% bales</td>
<td>Wilting lowers the moisture content, saves carting water and reduces loads/bales and effluent. In good weather wilt all grass swards to reach target moisture content - for no more than 24 hours. Longer wilts cause poor fermentation and loss of feed value. Red clover may need a longer wilt.</td>
</tr>
<tr>
<td>D value</td>
<td>Match to class of stock to be fed</td>
<td>As the crop bulks up and yield increases, D value drops as stems and heads are less digestible than leaves. As a rule: D value falls by 0.5 unit/day when grass starts to develop flowering stems.</td>
</tr>
<tr>
<td>ME MJ/kg dry matter</td>
<td>ME: Amount of energy available to the animal. It also drops as grass matures.</td>
<td></td>
</tr>
<tr>
<td>Crude Protein (CP)%</td>
<td>Match to class of stock to be fed</td>
<td>Estimates the total protein content of a feed, high levels may affect silage fermentation.</td>
</tr>
<tr>
<td>Nitrate N%</td>
<td>Below 0.1</td>
<td>Excessive nitrogen increases nitrates, reduces sugar levels and has a negative effect on fermentation and intake.</td>
</tr>
<tr>
<td>Soluble Sugar % @ 20% DM</td>
<td>Above 3%</td>
<td>Sugars drive fermentation and make acid to preserve silage. Wilting ‘concentrates’ the sugars</td>
</tr>
<tr>
<td>Sulphur %</td>
<td>0.25% of dry matter (DM)</td>
<td>Sulphur is not stored in the soil. Adequate sulphur raises soluble sugar and true protein levels in silage cuts. Grass needs between 30-50% as much sulphur as nitrogen.</td>
</tr>
</tbody>
</table>

This summer of 2012 was the wettest in England and Wales for 100 years and the very poor conditions were evident in the results of the grass samples shown in Table 2:

**Grass Sample Results 2012**

<table>
<thead>
<tr>
<th>Crop</th>
<th>2012 Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter (DM)%</td>
<td>Crops tended to be wet across all samples (range: 12-23%), with higher values tending to be the old stemmy samples where cutting was delayed. Even the better quality crops were cut wet this year due to persistent rain. Wet silage tends not to ferment easily and can result in reduced intake.</td>
</tr>
<tr>
<td>D value % and ME MJ/kg DM</td>
<td>Young leafy samples had high energy, protein and D value and animals needed less supplementary feed.</td>
</tr>
<tr>
<td>Crude Protein % (CP)</td>
<td>CP key to cost of concentrates</td>
</tr>
<tr>
<td>Nitrate N%</td>
<td>High Nitrate N; poor fermentation. The average 0.07%, masked some high figures (range 0.01-0.31%)</td>
</tr>
<tr>
<td>Soluble Sugar % @ 20% DM</td>
<td>Low sunshine levels and high moisture content led to low sugars averaging 2.8% over the season (range 1.5-6.1%). The highest sugar levels were found in a young leafy organic Italian ryegrass and Italian ryegrass-red clover ley after a period of sunshine in May.</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Good sulphur levels were found where sulphur fertiliser was applied for first cut. Four other samples were found at or above target and only one sample below target (range 0.19-0.37). Generally sulphur levels were adequate for grass regrowth and where sulphur was needed for second cut, requirements could be met by slurry/manure applications. Results were higher than anticipated when sulphur deposition from the atmosphere is reducing.</td>
</tr>
</tbody>
</table>
Case Study:
Ifton Hill Demonstration Farm, Port Skewett, Chepstow

Ifton Hill Farm is a 200 acre dairy unit run by Paul and Melanie Rymer and family. They milk 150 Holstein cows, have 130 followers and fatten 200 store cattle.

**Aim:** High quality silage for dairy cows yielding over 9000 litres

**Short term Italian ryegrass ley**

Grass for silage results up to first cut

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>16 April</th>
<th>23 April</th>
<th>09 May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter %</td>
<td>13.6</td>
<td>12.6</td>
<td>13.3</td>
</tr>
<tr>
<td>D value</td>
<td>71</td>
<td>71</td>
<td>67</td>
</tr>
<tr>
<td>ME MJ/kg dry matter</td>
<td>11.3</td>
<td>11.2</td>
<td>10.6</td>
</tr>
<tr>
<td>Crude Protein %</td>
<td>23.9</td>
<td>25</td>
<td>18.5</td>
</tr>
<tr>
<td>Nitrate N%</td>
<td>0.19</td>
<td>0.31</td>
<td>0.02</td>
</tr>
<tr>
<td>Soluble Sugar % @ 20% DM</td>
<td>3.1</td>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Sulphur %</td>
<td>0.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key points**

- Low dry matter – wilt to reduce effluent and increase soluble sugars
- Good energy and protein – suitable for high yielding dairy cows
- Fluctuations in nitrate N - second result highlighted need to delay cutting to avoid poor fermentation
- Sugar content below target, wilt needed to help concentrate sugars and drive fermentation
- Sulphur levels above target - sulphur application not required for second cut

Case Study:
Lan Demonstration Farm, Cynwyl Elfed, Carmarthenshire

Lan Farm is a 42 acre organic unit run by Phil Jones and family where they run 100 spring calving suckler cows

**Aim:** High quality silage for finishing cattle

**Short Term red clover/Italian ryegrass ley in organic rotation**

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<th>16 May</th>
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</thead>
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<tr>
<td>Dry Matter %</td>
<td>22.2</td>
<td>18.7</td>
<td>17.0</td>
</tr>
<tr>
<td>D value</td>
<td>75</td>
<td>71</td>
<td>71</td>
</tr>
<tr>
<td>ME MJ/kg dry matter</td>
<td>12.0</td>
<td>11.2</td>
<td>11.3</td>
</tr>
<tr>
<td>Crude Protein %</td>
<td>16.3</td>
<td>17.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Nitrate N%</td>
<td>0.01</td>
<td>0.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Soluble Sugar % @ 20% DM</td>
<td>6.2</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Sulphur %</td>
<td></td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

**Key points**

- Low/average dry matter – wilt to reduce effluent and increase soluble sugars
- Good energy and protein – suitable for productive stock
- Protein gradually increasing; red clover contribution
- Nitrate N - very low, no negative effect on fermentation, reflects no N fertiliser use on this organic farm
- Sugar content well above target, will provide energy to drive fermentation
- Sulphur levels below target – apply sulphur for second cut
- Provide sulphur from manures in organic farming systems; sulphur fertilisers can be applied in conventional systems
Key strategies used to improve silage making in wet conditions in 2012

1. Cutting height increased to 7.5-10cm (3-4 inches) to avoid harvesting dead and/or mouldy grass
2. Chop length increased to 8-10 cm (3-3.5 inches) for wet grass of less than 20% dry matter
3. Cut sward spread as widely as possible to increase rate of wilting
4. Wilt of no more than 24 hours
5. Wide tyres and half loads to reduce soil damage
6. Extra stone placed in gateways and a few loads of grass “sacrificed” for tractors to drive over to clean the wheels and reduce soil contamination of grass in the pit
7. Additive was applied to aid fermentation of grasses with low sugar content, the quantity was adjusted to treat any extra grass resulting from delayed cutting
8. Net wrap up to the edge with 6 layers of film applied to bales to reduce punctures caused by stemmy mature grass
9. Low dry matter bales stacked no more than two high to prevent “popping” of the sealed wrap, allowing air to enter the bales
10. Where late cutting reduced the availability of aftermath grazing and livestock were short of grazing strip grazing of silage fields was introduced

Lessons learned from Mileage in Silage 2012: The Wettest Summer for 100 years

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Flexibility pays
Big Bales or a combination of clamp and bales, gives the opportunity to ‘snatch’ silage in a dry period of weather, preventing grass from becoming too mature and providing the best chance of saving concentrates.

Research at IGER (Fychan and Jones 1994) showed that well-made bale silage can be as good as clamp silage.

Undertake a financial analysis of the cost benefit of producing and feeding big bales for your system

Silage analysis crucial to getting rations right
In 2012 silaging was delayed on many farms and feed quality and fermentation suffered, leading to increases in supplementary feed needs and costs over the winter. The difficult conditions at harvest increased the benefits to farmers of undertaking silage analysis to highlight the need for careful rationing to maintain livestock performance and control costs.

Undertake silage analysis and careful rationing
Next Steps

- Have silage analysed
- Use the results
- Think about what you will change to make better silage
- Take advice; an independent nutritionist can provide information on the feeds available on the market, current prices and the best combination of feeds for each class of stock
- A Farming Connect Fact Sheet ‘Why Analyse Silage?’ is also available at: www.menterabusnes.co.uk/farmingconnect, or call 01970 636565.
- Technical mentoring from Farming Connect approved Mentors is available with 80% funding through the Whole Farm Plan. Contact your local Regional Co-ordinator for more details.

Follow the Mileage in Silage project via weekly bulletins at: www.menterabusnes.co.uk/farmingconnect

Contact

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