Grass silage

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Summary

- In conventional beef systems at Grange, grass silage accounts for 24-27% of total intake of feed, but for 29-39% of the total feed bill (land charge included).
- Losses during silage production can range from below 20% to well in excess of 30%. This range has a major impact on the cost of providing silage to cattle. Thus, there is a clear reward for good management practices that minimise these losses.
- Besides delayed harvesting, low silage digestibilities occur when dead vegetation accumulates at the base of swards. This can be avoided by grazing swards to a stubble height of 5 cm or lower when they are being closed for silage production.
- Soil fertility status must not be limiting if good silage yield and quality are to be achieved with consistency.

Perspective

Grazed grass, grass silage and concentrate are the primary feed inputs on beef farms, and collectively account for over 70% of direct costs. Within the Grange suckler calf-to-beef (steer) system, grazed grass, grass silage and purchased concentrate account for 66, 27 and 7% of feed dry matter (DM) intake, respectively, but for 44, 39 and 17% of feed costs (land charge included). Correspondingly, within the Grange dairy calf-to-beef system, they account for 55, 24 and 21% of feed DM intake, but for 31, 29 and 40% of feed costs. The economic sustainability of these beef production systems therefore depends on optimising the contribution of grazed grass to the lifetime intake of feed and on providing silage and concentrate as efficiently and at as low a cost as feasible.

Losses during silage-making are costly

Quantitative and qualitative losses occur during silage making. Of every 1000 kg grass DM in a silage sward, between 150 and over 300 kg does not make it into the animal's mouth as silage. Furthermore, the digestibility of ingested silage can be 0-7% units below the digestibility of the silage sward. These losses occur in the field (leaf shatter, respiration, leaching by rain, soil contamination, incomplete pick-up, etc.), at the silo (respiration during silo filling or feedout, effluent, inefficient fermentation, etc.) and in the feed trough (respiration, spillage, etc.). Some of these losses are unavoidable but others can be greatly reduced or prevented.

For example, a sward yielding 6000 kg grass DM/ha produces 5040, 4620 and 4200 kg edible silage DM/ha where quantitative losses of 16% (excellent management), 23% (good management) and 30% (poor management) occur. Corresponding quality losses could be 0, 1.5 and 4% units digestibility. The yield loss difference between 16 and 30% DM loss results in over 80 fewer animal feed days/ha. The digestibility loss difference of 0 vs. 4% units digestibility requires over 1 kg concentrate/animal daily to undo. Thus, DM losses of 16, 23 and 30% (+ digestibility loss) result in costs of €207, €230 and €263 to provide cattle with feed energy (1000 UFL) as silage.

These values demonstrate the importance of management practices that reduce losses during silage production and feedout. They include efficient mowing, conditioning and pick-up, effective wilting during good drying weather, fast filling and perfect sealing of the silo, ensuring good fermentation and relatively little effluent, fast and tidy feed-out, and sensible feed provision and waste removal at the feed trough.

Avoid pitfalls if you want highly digestible silage

Silage quality (digestibility, preservation and mould-incidence) depends on both the quality of the harvested sward and the success of the silage-making and feedout processes. The quality of the harvested sward depends firstly on its growth stage – leafy grass has a much higher energy value (digestibility) than stemmy grass with mature seed-heads. The species and varieties of grass, and the presence of clovers (good) or 'weeds' (bad), also impact on digestibility. Together with fertiliser (including slurry) application rate and timing, and prevailing weather conditions, they also establish the ease with which the sward will preserve properly in the silo.

The optimal balance between grass yield and digestibility for producing silage of high feed value is achieved by harvesting intermediate-heading ryegrasses when their seed-heads start to emerge. To achieve comparable feed value with late-heading ryegrasses it may be necessary to harvest before seed-heads appear. These general relationships between grass growth stage and digestibility can be misaligned if there is an accumulation of dead vegetation at the base of the sward. Dead vegetation accumulates, for example, if fields for silage production are not grazed bare (i.e. to a stubble height of 5 cm or lower) in late autumn or early spring. Sward digestibility is reduced because this dead vegetation, accumulated over several months, can have a digestibility below 50%. The scale of impact of such dead vegetation is summarised in Table 1 and shows that, on a given date in mid-May, it can reduce sward digestibility by 6-7% units. It would take almost 2 kg supplementary concentrate per head daily to undo the impact of this scale of unplanned reduced digestibility. The message, therefore, is that sward regrowths need to start from a 'bare stubble' when they are to be used for producing high digestibility silage.

Table 1 — Grass digestibility (DMD%) for a first-cut harvest on 18 May, depending on previous management (average of two years results)

	Previous grazing management		
	Ungrazed in	Graze to 5cm stubble	
	autumn or spring	In late autumn	In early spring
DMD%	75.4	82.1	81.8

Soil fertility – accelerator or brakes?

Sub-optimal soil fertility (and sometimes impeded drainage) is probably the core reason that target silage yields and (indirectly) digestibilities are not achieved on many farms. Low soil phosphorus (P), potassium (K) or pH values reduce the potential yield response to fertiliser nitrogen (including from slurry). As a consequence, the yield of grass available to harvest when the sward is at an optimal growth stage will likely be lower than required. In many cases, the management response will be to defer harvesting by some weeks until sward yield has increased sufficiently. However, since each 1 week delay in harvesting results in a 2-3% unit drop in sward digestibility, subsequent silage intake, feed efficiency and growth rate by cattle will suffer. It will require 0.6-0.9 kg concentrate/animal daily to undo the effect of the drop in silage digestibility and restore animal performance. In addition, sub-optimal soil fertility makes it difficult to maintain the persistence of perennial ryegrass in swards. The latter increases the frequency and thus the cost of reseeding, and facilitates the development of swards that are more difficult to preserve as silage.

Thus, soil P and K status both need to be at Soil Index 3 and pH at approximately 6.3 (mineral soils), based on soil analyses. Correcting a soil nutrient deficiency is costly and should be addressed as part of a longer term farm business plan.