Working towards net zero carbon emissions

Improving feed conversion efficiency and reducing waste in the dairy herd

Farming for a Better Climate

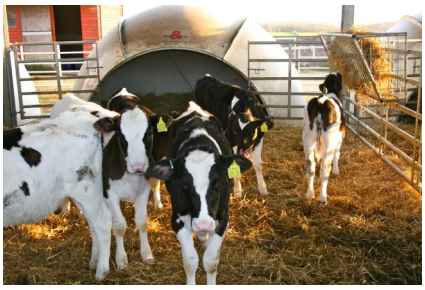
Practical Guide

With Scotland working towards net zero carbon emissions by 2045, the dairy sector has a key role to play. Reducing feed waste and improving feed conversion efficiency (FCE) are two areas that can help enhance productivity and reduce emissions from dairy farming.

This Practical Guide introduces some ideas that we can all consider to improve feeding efficiency and reduce waste from the dairy enterprise.

Reducing feed waste

There are many areas on the farm where feed is wasted. AHDB Dairy estimate that up to 6% of concentrate and up to 20% of forages can be wasted during storage and feedout, increasing the cost of production. Some areas where feed wastage can occur are as follows:



In the field: Feed value can be maximised by reseeding regularly and using grass varieties on the recommended list e.g. FAS Technical Note Recommended Grass & Clover Varieties available at www.fas.scot . Good grassland management with rotational grazing practices will also help to ensure high nutritional feed value. Cutting grass for silage at the optimal time and minimising wilting times also reduces nutritional losses.

During storage: Losses in forage dry matter and quality can be minimised by ensuring good consolidation and sheeting of the pit during silage making to prevent aerobic spoilage. Once the pit is open, aim to move back by 1.5m/week and twice as much in summer to avoid spoilage and heating on the face which will reduce the feed value.

At feedout: Many factors may affect dry matter intake such as feed and water trough space and ration sorting. Intakes can be encouraged with regular pushing up of feed; ensuring it is evenly distributed along the length of the feed passage, and by moving from once a day to twice a day feedout. Fresh feed is the biggest stimulus for encouraging intakes, which will benefit milk production and FCE.

In the cow: Assess FCE by monitoring the dung, both in terms of consistency and present of feed particles. Undigested forage and grain in the dung indicates the rumen is not working optimally or that grain may be inadequately processed.

*This practical guide is part of a series looking at steps you can consider to reduce emissions whilst maintaining a profitable farm business. For more information, tips and ideas and to read what other farmers have done, visit **www.farmingforabetterclimate.org**. Find us on **Facebook** and follow us on **Twitter** @SACFarm4Climate.*
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How do we reduce waste and improve FCE?

Managing refusals

Reducing feed waste at feedout is a balance between maximising dry matter intake and reducing the amount of refusals or waste. For milking cows feed to allow for 3 to 5% of refusals and slightly more for dry cows. Any leftover feed can be remixed and fed back to milking or dry cows if still fresh, however, if it has spoiled or is vastly different in composition to the original mix due to sorting behaviour, this is not recommended. Instead, it is best remixed for inclusion in older heifers or beef cattle rations where any negative effects of poorer palatability/unknown composition are less likely to result in metabolic problems or reduce performance.

Feed Conversion Efficiency (FCE)

FCE is a simple calculation to determine the kgs of milk produced from the kgs of dry matter eaten: **FCE = milk yield (kg) / dry matter intake (kg).**

FCE will vary according to stage of lactation and will be highest in early lactation, as milk yield peaks before dry matter intake peaks. For the whole herd, the target should be around 1.5 (see table below from the Joseph Morton webpage 'How to measure feed conversion efficiency').

Improving FCE requires more milk to be produced from the same amount of feed. While a low FCE is not cost-effective and increases emissions per kg of milk produced, a very high FCE can also be a problem. This can occur with high energy dense rations where forage intake in low in relation to the amount of concentrates being fed or when feeding protected fat supplements. Rumen health may be compromised, with risk of sub-acute ruminal acidosis, due to low forage intakes and low overall dry matter intakes, increasing the risk of metabolic disease. A low FCE could also be due to poor intakes and/or poor forage quality where energy is in short supply. The dry matter intake may be OK, but the cows are not producing for the level of intake.

Daily DMI kg	Daily milk output kg								
	20	22	24	26	28	30	32	34	36
15	1.33	1.47	1.60	1.73	1.86	2.00	2.13	2.27	2.40
16	1.25	1.38	1.50	1.63	1.75	1.87	2.00	2.13	2.25
17	1.17	1.30	1.41	1.53	1.64	1.76	1.89	2.00	2.11
18	1.11	1.22	1.33	1.44	1.56	1.67	1.77	1.88	2.00
19	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.90
20	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80
21	0.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
22	0.91	1.00	1.09	1.18	1.27	1.36	1.45	1.55	1.64
23	0.87	0.96	1.04	1.13	1.22	1.30	1.39	1.48	1.57
24	0.83	0.92	1.00	1.08	1.16	1.25	1.34	1.41	1.50
	Problem			Target			Excellent		

Source: Joseph Morton (https://bit.ly/307I63n)

Breeding for better feed efficiency

Feed efficiency is now incorporated into selection indexes. The Maintenance Predicted Transmitting Ability (PTA) is a stand-alone trait and provides information on feed efficiency. It is based on measurements of stature, body depth, chest width and angularity. When looking at maintenance PTA's of bulls, aim for those with a lower value. They range from roughly +50kg to -50kg. The lower the value, the lower the weight of the bull's offspring and therefore the lower the maintenance cost. These bulls will produce more efficient daughters if their production and health traits are the same.

By early 2021, another measure of feed efficiency from genomic breeding values will be available in selection indexes. RFI or residual feed intake is the difference between an animal's actual feed intake and expected feed intake and this is a heritable trait. Daughters from bulls with a low RFI have a reduced feed intake compared to daughters with a high RFI. If milk production (and composition) is similar, the low RFI is more feed efficient since the same amount of milk is produced from less feed.

Do dairy cows need soya?

Across SRUC's three dairy farms in SW Scotland, hipro soya and soya hulls have been removed from milking and dry cow rations, helping reduce the farm's carbon footprint. This is looked on favourably by the farm's milk buyer who is keen for their producers to move away from soya-based feeds to reduce the environmental impact.

Soya in purchased blends has been replaced with a combination of rapemeal, protected rapemeal and distillers wheat dark grains. The blends were carefully reformulated to have similar energy, protein and bypass protein levels. Soya hulls were also removed and replaced with sugar beet pulp and a small amount of palm kernel to maintain digestible fibre levels.

There has been very little change in milk output or milk composition, highlighting that high yielding dairy cows can perform well without soya.

The following table shows milk performance across the three farms before the change and two to three weeks later. Milk yield and composition data is averaged over seven days.

	Soya based feeds	Non-soya based feeds
Acrehead		
Yield/cow/d (l)	29.8	31.05
Butterfat (%)	4.28	4.26
Protein (%)	3.47	3.51
Barony		
Yield/cow/d (l)	30.0	32.5
Butterfat (%)	4.40	4.45
Protein (%)	3.24	3.20
Crichton		
Yield/cow/d (l)	31.8	32.9
Butterfat (%)	4.15	4.08
Protein (%)	3.28	3.27