Dairy
Towards Net Zero

What are the key emission challenges influencing this sector?

Methane from digestion

Methane is a greenhouse gas mainly produced during enteric fermentation in which fibre is broken down by bacteria in the rumen. Almost 75% of energy contained in feed and consumed by cows is converted into methane; 46% of dairy cow emissions is from their digestion[1]. Achieving balanced feed use efficiency is important since enteric methane is a function of feed intake per unit of output[2].

Feed imports

Feed production and imports account for almost 26% of the emissions from milk production[3]. Embedded in the concentrates and straights fed to cows are emissions associated with growing, storing, transporting, and processing the feed. Feeds associated with land use change (e.g. soya) will also tend to have higher emission factors.

Nutrient and Soil management

Nitrous oxide emissions contribute between 24–40% of total emissions. These emissions result from nitrogen turnover in soil from the use of synthetic fertilisers and manure and excreta deposited during grazing. Soil type, drainage, degree of soil compaction and climate all influence nitrous oxide emissions.

Where should you start to prioritise reducing emissions on your farm?

You can start to prioritise emission reduction practices through small changes, which can have a significant impact. Calculating the annual carbon footprint of your farm is one of the primary actions you can take to identify areas with the greatest emissions and therefore, where efforts should be focussed.

Consider how you can improve managing the health and welfare of your herd as it can result in improved milk quality, lower mortality[4] and limit negative consequences of disease and/or health conditions of the cattle. Furthermore, tackling energy efficiency through heat recovery systems can reduce carbon dioxide emissions on-farm as they help reduce water heating costs and provide heated water every time milk is being cooled. Water heating can require up to 30–35% of the energy use in a dairy parlour and can be halved by using this technique[5].

LLOYDS BANK

Looking beyond, there are eight immediate practices that can be implemented in order to reduce emissions at farm level:

1. Improving animal health to reduce respiratory, lameness, mastitis and disease issues
2. Improving energy efficiency
3. Feed efficiency through reducing crude protein and maximising forage quality
4. Fertility management, optimising replacements on-farm and breeding the next generation of cows
5. Soil management through mob grazing
6. Feed additives to reduce methane production
7. Low emission slurry spreading and covering slurry stores
8. Urea-based fertiliser management

What practical steps could you take?

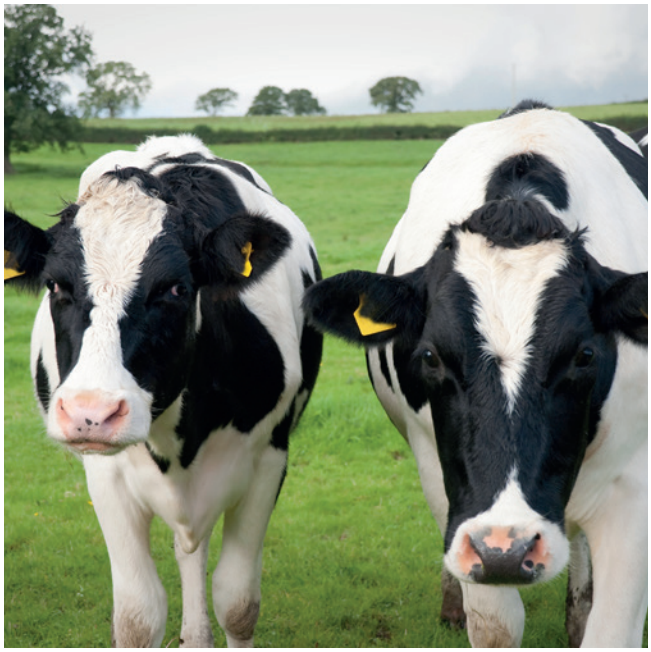
What is the practise?	Why would this be of benefit to your farm?	How can I do this well?
Improving feed efficiency	Feed efficiency measures a cow's ability to turn feed nutrients into milk and is explained as pounds of milk produced per pound of dry matter consumed. To improve feed efficiency farmers should: ▪ Provide higher quality feeds and supplements ▪ Increase fat content ▪ Reduce embedded carbon factor in feeds i.e. import feeds closer to your farm	Higher quality feeds and supplements (e.g. seaweed) can reduce emissions per head per day quite significantly. Increasing the level of non-structural carbohydrates in the diet (by 25%) can reduce methane emissions by as much as 20%[6]. Build diets that have low embedded carbon levels, including avoiding using feeds that involve land use change such as soya and palm, and importing feeds closer to home. Feed efficiency can increase profits and reduce environmental impact.
Optimising replacements on-farm and genetic improvement	Farm replacements maintain herd size. Replacements should be genetically superior to culled cows in order to contribute to efficiency and productivity of dairy farm. Sexed semen can produce genetically superior replacements, reduce number of dairy bulls and also provides the option to sell surplus heifers[7,8]. Fertility management also determines the herd's growth, health at calving, recovery before mating, heat detection, mating and conception[9]. Age at first calving should be targeted at 24 months as this can offset greenhouse gas emissions through earlier milk production[10].	Genetic improvement combined with a replacement strategy can bring improved performance and increased profitability. Improved genetic merit can: ▪ Enhance health traits and increased longevity ▪ Control or eliminate endemic diseases ▪ Improve management of fertility, pregnancy rates, calving and replacements Lowering replacement rates from 30% to 25% will mean that there are 17% fewer heifer replacements on-farm, greatly reducing associated emissions such as methane.
Adopt regenerative grazing strategies e.g. mob grazing	Regenerative dairy is a whole-systems approach to reintegrate farming practices with nature while making farming and food businesses more resilient. Mob grazing is based upon cattle grazing an area of grass for a short duration and then allowing it to rest between 40–100 days to give the soil time to recover. The focus is on soil health, biodiversity, carbon sequestration and water management, so the dairy sector can continue to produce high quality nutrition and improve profitability[11]. Housing cattle is expensive and so this system gives you the possibility of extending the year and reducing the time spent indoors[12].	Grass receives a longer recovery period than usual and was found to produce improved soil health, healthier cattle and it produced lower costs due to reduced inputs. Need for fertiliser is reduced due to cattle only being housed over winter and no extra feed needs to be brought. Mob grazing allows plants to grow taller, large, complex and deep root systems are formed and when they die off, they build up to 43% more organic matter in the soil[13]. Trampling of significant quantities of forage onto the soil surface also provides a better environment for the microorganisms and other soil life while increasing the soil organic matter[13].

What is the practise?	Why would this be of benefit to your farm?	How can I do this well?
Low emission slurry spreading and covering slurry stores	Low emission spreading techniques include: Shallow injection, trailing shoe or dribble bar equipment. This equipment reduces contact with the air and therefore reduces ammonia emissions. 80% of the nitrogen contained in slurry can be lost to the environment when splash plate equipment is used. Shallow injection can reduce ammonia emissions at spreading by up to 70%[14].	Slurry covers help reduce ammonia escaping into the atmosphere. Flexible sheeting systems can be used (check eligibility for grant funding) and covers help keep out rainwater which reduces storage capacity, while maintaining slurry nitrogen value.

What's next? What should I look at beyond two years?

Looking ahead, novel feeds, genetic advancements, carbon sequestration, and agritech all offer major opportunities to limit emissions on your dairy farm. Examples of actions you could consider investigating and plan for change on your farm include:

- Feed additives can support animals' nutritional requirement and improve the animals' performance and health while reducing emissions[15]. They have been found to impede methanogens in the rumen, and subsequently reduce enteric methane emissions. Emerging science illustrates that feeding red seaweed to cattle can limit on methane emissions[16], leading to better efficiency of feed utilisation[17].
- Robotic milking systems are a form of precision livestock technology. Livestock sensors have also been shown to increase milk yield by up to 10% helping raise productivity and lower emissions per litre of milk. Cows can voluntarily milk themselves, saving human labour and enhancing milk yields by 2–12%, largely to increased frequencies of milking achieved in comparison to twice a day conventional systems[18].
- Genetic improvements can significantly reduce emissions by focusing on component traits such as productivity relative to cow size, feed efficiency, fertility, longevity, and health. By selecting for breeding sires based on the rumen microbiome and the presence of preferential microbes, emission can be reduced from rumination[2].
- Silvopastoral agroforestry offers opportunities to enhance carbon sequestration by introducing trees into grazing systems. The presence of trees also offers benefit of shade, shelter and fodder, as well the potential for added productivity when planting fruit and nut trees.



Visit **lloydsbank.com/sustainable-agriculture**

To find out how we can help your business, please speak to your relationship manager.

References

[1] RABDF. Emissions.

[2] European Union. 2019. Impact of animal breeding on GHG emissions and farm economics.

[3] DairyCo. Greenhouse gas emissions on British dairy farms. Published online 2014.

[4] FAO. Animal Health. N.D.

[5] Farmers Weekly. Guide to water heating options for your dairy parlour. 2019.

[6] EU. 1998. Options to reduce Methane Emissions.

[7] DAERA. Sexed semen in the dairy herd. 2019.

[8] Aberystwyth University. Using sexed semen and genetic technologies to improve dairy and beef herds. 2021.

[9] AHDB. Fertility in dairy cows. 2014.

[10] Farming for a better climate. N.D. Working towards Net Zero Carbon Emissions: How do we reduce emissions from dairy?

[11] FAI Farms. Regen Dairy. 2022.

[12] AHDB. Mob grazing – what's it all about?. N.D.

[13] The Organic Research Centre. SOLID participatory research from UK: Mob Grazing for Dairy Farm Productivity. 2015.

[14] AHDB. Five ways to reduce ammonia emissions for dairy farmers. 2020.

[15] Food Standards Agency. Animal feed additives. 2020.

[16] Dairy Foods. Seaweed and dairy: the perfect marriage. 2019.

[17] Department of Primary Industries and Regional Development. Agriculture and Food. Carbon farming: reducing methane emissions from cattle using feed additives. 2022.

[18] Aberystwyth University. Robotic milking and cattle welfare. 2020.

Please contact us if you would like this information in an alternative format such as Braille, large print or audio.

SUSAGRDAI_LB (09/22)