

HOW MUCH METHANE DO SCOTTISH BEEF CATTLE PRODUCE?

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Ruminants have the ability to digest forages and convert them into protein for human consumption, producing methane (CH₄) as a natural by-product. CH₄ is a greenhouse gas and 1 tonne of CH₄ is equivalent to 28 tonnes of carbon dioxide (CO₂). CH₄ (half-life ~12 years) also degrades to CO₂ in the atmosphere (half-life 50-200 years).

There is wide variation in CH₄ emissions from beef cattle (37–372 g/day) but [little difference between breeds](#)¹. The amount of CH₄ produced is linked to the animal's feed efficiency - more efficient cattle produce less CH₄ per kg of milk or live weight gain. Feed intake (dry matter) explains most of the variation in CH₄ production but diet also has an effect - high forage diets produce [29-35%](#)² more CH₄ / kg dry matter intake than high concentrate diets.

HOW CAN FARMERS REDUCE METHANE EMISSIONS?

Genetics: [Around 25% of the variability](#)³ in cattle CH₄ production can be explained by genetics. Sires with low CH₄ production tend to produce low CH₄-emitting offspring. It is also important to ensure that breeding for reduced CH₄ doesn't [impact on production](#)¹, e.g. by reducing the animal's ability to digest fibre.

Feed additives: Feed additives either alter the chemical pathways in the rumen, suppress digestion or suppress rumen microbes. There are [three feed additives](#)⁴ for which solid evidence of CH₄ reduction has been identified to date. Other additives have insufficient evidence or variable results.

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Strategy	Mitigation Potential	Limitations
Dietary lipid (e.g. oils and fats)	8-14%	May affect animal performance if above 70 g/kg feed. Expensive.
3-nitro oxypropanol	13-29%	No limitations identified to date, but not approved for commercial use yet.
Nitrate	18-23%	Risk of toxicity - NOT recommended unless slow release technology is developed.

CAN TECHNOLOGY PLAY A ROLE IN METHANE REDUCTION IN THE FUTURE?

Efficient finishing: Up to half of a beef animal's lifetime CH₄ is produced during the finishing period. In 2019, [43% of cattle](#)⁵ did not meet target grades at the abattoir. Automatic weighing platforms and advanced [camera technology](#)⁶ may help ensure cattle are slaughtered at the optimal time and so help reduce the carbon cost per unit product produced.

Emissions scrubbing: New technologies may be able to capture CH₄ emitted by cattle and convert it directly to CO₂ or enable use of CH₄ as a fuel.

Animal Health: Poor health can impact on an animal's lifetime productivity and efficiency. [Technologies](#)⁷ that alert stockmen to potential disease early (before clinical signs are visible) and development of [rapid pen-side diagnostic](#)⁸ tests could prompt timely interventions. These advances, coupled with the development of vaccines to protect animals and sustainable disease control strategies, will help reduce emissions through improved health and efficiency.

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REFERENCES

- ¹ Dewhurst and Miller (2019) Policy Brief: How do different livestock types, sizes and breeds differ in their greenhouse gas emissions? ClimateXChange
- ² Duthie et al (2017) The impact of divergent breed types and diets on methane emissions, rumen characteristics and performance of finishing beef cattle. *Animal* 11:1762-1771
- ³ Brito et al (2018) Meta-analysis of heritability estimates for methane emission indicator traits in cattle and sheep. *Proceedings of the World Congress on Genetics Applied to Livestock Production* 11.740
- ⁴ Rooke et al (2016) Nutritional strategies to reduce enteric methane emissions. ClimateXChange
- ⁵ AHDB (2019) The UK cattle yearbook 2019. Agriculture and Horticulture Development Board
- ⁶ Miller et al (2019) Using 3D imaging and machine learning to predict liveweight and carcass characteristics of live finishing beef cattle. *Frontiers in Sustainable Food Systems*
- ⁷ Bowen et al (2019) Monitoring of activity and feeding behaviour for early detection of respiratory disease in pre-weaned calves. British Society of Animal Science Annual Meeting, Edinburgh
- ⁸ Walsh (2016) Development of a pen-side diagnostic test for liver fluke infection in cattle and sheep. British Cattle Conference 2016