FARMING PRACTICE
LIVESTOCK FEEDING TECHNIQUES

IMPACT: GHG EMISSIONS

Reference 25

Background and objective

While the use of feed additives is widespread, it is currently driven wholly by desires for increased productivity and improved animal health and not by their potential to deliver environmental benefit. To conduct a comprehensive systematic review to identify feed additives, listed on Annex 1 of the European Union Register of Feed Additives, that have potential to reduce polluting emissions from livestock and to conduct a very simple meta-analysis of the collated data in order to identity the potential efficacy of these substances and agents. Here, results on GHG emissions are reported.

Search strategy and selection criteria

Scientific papers, research and industry reports, and other literature were sourced mainly from online databases supplemented by manual searching of key journals and provision of information directly from industry. In addition, reference 'snowballing' was used, whereby the cited references in each publication are utilized as a rich source of other related works. 1) Farm-animal trial data published post-1990 and restricted to only those studies where direct environmental effects were measured. Consequently, this excluded studies with companion, zoo and wild animals, and also those that were dietary manipulation rather than supplementation. Studies with fish were also excluded; 2) Studies using lifecycle analysis, mechanistic and metabolic modelling approaches were omitted as well as those where environmental benefits were related to performance improvements alone.

Data and analysis

The main objective of this study was simply a screening exercise in order to provide a general picture of the range of substances and agents which when used as feed additives may have potential to reduce polluting emissions. A means of demonstrating the range and scope of effects identified was required even if a more precise picture of the potential environmental effect was less easy to quantify. This was achieved by using a metric-free approach such that data were converted to a % change value (%Δ), i.e. the change in environmental parameter compared to a negative control. Due to the potentially significant differences between the studies with respect to methods and metrics only substances and agents where a %Δ <-10 (i.e. decreases in emissions of more that 10%) were considered to have effectively demonstrated potential for beneficial effects and, likewise only those where a %Δ <=10 (i.e. an increase in emissions of equal to or more than 10%) were considered to have effectively demonstrated potential for a deleterious effect.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
270	Cattle, buffalo, sheep, goat, swine	1) Coconut oil; 2) Linseed oil; 3) Sunflower oil; 4) Monensin sodium; 5) DL-malic acid and disodium salt; 6) L-cysteine; 7) Allium arenarium oil; 8) Anethum graveolens oil; 9) Armoracia rusticana extract; 10) Cinnamomum verum; 11) Condensed tannins; 12) Ethanol; 13) Eucalyptus oil; 14) Fenugreek; 15) Juniperus communis berry oil; 16) Mentha piperita oil; 16) Origanum vulgare; 17) Psidium guajava; 18) Quillaja saponaria extract; 19) Rheum nobile extract; 20) Rheum officinale root; 21) Syzygium aromaticum; 22) Terminalia chebula; 23) Thymol; 24) Thymus vulgaris; 25) Fumaric acid; 26) Linoleic acid	No additive supplementation	Metric: CH$_4$ emissions; Effect size: not applicable	56.25

Results

- For cattle, several substances were found to reduce carbon dioxide emissions, for example cinnamon offered reductions of 42%Δ, garlic oil showed similar decreases of 40%Δ and both Juniperus communis berry oil and coconut oil also induced reductions albeit at a less significant level.
- The effects seen for sheep and goats are largely similar to those seen for cattle. Reductions in methane emissions appear potentially very significant
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Authors report that methane emissions could be reduced by up to 26% using feed additives, but the uncertainty is high due to the limitations of the methodology implemented.