FARMING PRACTICE
LIVESTOCK FEEDING TECHNIQUES

IMPACT: AIR POLLUTANTS EMISSIONS

Reference 22

Wang, Y; Li, XR; Yang, JF; Tian, Z; Sun, QP; Xue, WT; Dong, HM 2018 Mitigating greenhouse gas and ammonia emissions from beef cattle feedlot production: A system meta-analysis ENVIRONMENTAL SCIENCE AND TECHNOLOGY, 52, 11232-11242. 10.1021/acs.est.8b02475

Background and objective

Beef cattle production systems are the largest contributors of greenhouse gas (GHG) and ammonia (NH_3) emissions in the livestock industry. The overall objective of this study was to make a quantitative assessment of GHG and NH_3 emissions from beef cattle feedlot production systems and the effects of (sets of) mitigation options on the methane (CH_4), nitrous oxide (N_2O), and NH_3 emissions from the whole production chain using meta-analysis. Here, effects of different feeding techniques on NH_3 emissions are reported.

Search strategy and selection criteria

The ISI Web of Knowledge database and the Chinese journal database were used to search all published datasets as of December 2017. Specific search terms were combined and used, including animal categories (beef, cattle, bull, steer, bovine, heifer, and livestock), manure, manure management (feedlot, pad, yard, open-lot, pen, compost, and stockpile), land application (surface spread, and incorporation), gaseous emissions (NH_3, CH_4, N_2O, and GHG gas), and mitigation measures (diet, crude protein, additive, amendment, urease inhibitor, biofilter, biotrickling, cover, nitrification inhibitor, incorporation, reduction, mitigation, and abatement). 1) The research object was beef cattle; 2) the study included at least one of the CH_4, N_2O, and NH_3 gases; 3) gas emission flux or gas emission factor was available; and 4) for literature related to mitigation, only studies that reported at least one control group were selected, so that emission mitigation efficiency (ME) could be calculated.

Data and analysis

The median mitigation emission (Em) values for each measure were calculated using an analytical approach adapted from Benayas et al (2009) and Tuomisto et al (2012). The normality of the data was tested using the Kolmogorov–Smirnov test. Not all of the Em values for each mitigation measure were normally distributed; therefore, the Wilcoxon Signed-Rank test was used to determine if the median Em values were significantly different from 0 when there were sufficient results for specific measures. SPSS 20.0 software was used for the statistical analyses.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
104	Beef cattle	1) Ionophores; and 2) Electron receptors additives supplementation; 3) Low crude protein (CP) diet	1-2) No additives; 3) Normal diet	Metric: Ammonia (NH_3) emissions; Effect size: Ratio of the considered metrics in the intervention to the considered metrics in the control	62.5

Results

- The only four observations collected for NH_3 mitigation caused the result to be not significant.
- NULL
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Feed additives and low crude protein diet showed no effect or uncertain effect due to the low number of studies.