FARMING PRACTICE
ANURE LAND APPLICATION TECHNIQUES

IMPACT: AIR POLLUTANTS EMISSIONS

Reference 6

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 & Technology 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. Much work in literature has evaluated gas emissions or mitigations targeted at one specific gas or one emission stage, while little research has considered it in a comprehensive way. The objective of this meta-analysis is to quantify the mitigation efficiency of several mitigation strategies for manure composting and stockpiling to reduce NH_3 emissions.

Search strategy and selection criteria

The ISI Web of Knowledge database (www.isiwebofknowledge.com) and the Chinese journal database (www.cnki.net) 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, livestock), manure, manure management (feedlot, pad, yard, open-lot, pen, compost, stockpile), land application (surface spread, 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, reduce, mitigation, abatement). Literature sources used in this study were selected based on the following criteria: 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; 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 Wilcoxon Signed-Rank test was used to determine if the median values of mitigation efficiency were significantly different from zero when there were sufficient results for specific measures.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
104	Cattle manure	Manure incorporation; Manure additives (lava meal)	No mitigation strategy	Metric: NH_3 emissions; Effect size: Ratio of the considered metrics in the intervention to the considered metrics in the control	68.75

Results

- Incorporation showed a significant ammonia mitigation effect of 64.8% ($p<0.05$).
- Manure additives such as lava meal can reduce ammonia emission by 62.5% ($p=0.068$). The p value was superior to 0.05 so the result was considered as not significant.
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

This study shows that manure incorporation significantly reduced ammonia emissions, compared to land application, while adding additives to manure had no significant effect.