FARMING PRACTICE
MANURE STORAGE TECHNIQUES

IMPACT: AIR POLLUTANTS EMISSIONS

Reference 10

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 (ammonia) 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 ammonia 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	Additives to stockpiles; Stockpile covers; biofilters	No mitigation strategy	Metric: NH_3 emissions; Effect size: Ratio of the considered metrics in the intervention to the considered metrics in the control	62.5

Results

- The results showed that additives can be effective in both CH_4 and ammonia mitigation, with ME values of -97.0% (p=0.102) and -30.0% (p=0.109) but it may increase N_2O emission by 135.0% (p=0.109). The results showed that additives can be effective in ammonia mitigation, with mitigation efficiency of -30.0% (p=0.109). The p value is above 0.05, so the result was considered as not significant.
- The ammonia emissions from compost can be reduced by 80.5-99.9% with compost biofilter with a median mitigation efficiency of 95% (p<0.05).
- The ammonia emission could be reduced by 33.0% (p<0.05) by beef manure covering.

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

This study shows that compost biofilter and stockpile covering were significantly effective in reducing ammonia emissions, while adding additives to manure was not effective.