FARMING PRACTICE
MANURE STORAGE TECHNIQUES

IMPACT: AIR POLLUTANTS EMISSIONS

Reference 2

Ba, SD; Qu, QB; Zhang, KQ; Groot, JCJ 2020 Meta-analysis of greenhouse gas and ammonia emissions from dairy manure composting Biosystems engineering 10.1016/j.biosystemseng.2020.02.015

Background and objective

In order to minimise nutrient losses, comprehensive overviews of the magnitude of gaseous emissions from manure composting processes and the factors that influence these losses are urgently needed. Assess the impacts of six mitigation efficiency for composting on different gas emissions.

Search strategy and selection criteria

Articles published before December 2018 were collected from Web of Science (WOS, http://apps.webofknowledge.com/) and the China Knowledge Resource Integrated Database (CNKI, http:// www.cnki.net/). The language was set to English or Chinese. The keywords aimed to iden- tify papers focusing on the cattle husbandry sector, com- posting technologies and the emission indicators. The papers included in this study were selected based on the following criteria: (1) studies focused on dairy manure composting; (2) studies included at least one of CH_4, CO_2, N_2O, and NH_3 emissions; (3) studies reported cumulative gas emission factors. With these criteria, 41 publications (27 from WOS and 14 from CNKI) with 153 compost treatments in total were selected.

Data and analysis

A Shapiro-Wilk test was conducted to test the normality of data. The median of EF values was chosen to compare gaseous emissions from different composting methods since the data did not show a normal distribution. A nonparametric Wilcoxon Signed Rank test was performed to evaluate and compare significant differences of EFs among four composting methods. All statistical analyses were performed using R software (version: 3.5.1)

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
41	Dairy manure composts	Six mitigation practices in the dairy manure composting process: "sawdust or straw additive", "microorganism additive", "phosphogypsum additive", "compressed and covered", "vermicomposting" and "compost biofilter".	No mitigation measure	Metric: NH_3 emission; Effect size: Ratio of the considered metrics in the intervention to the considered metrics in the control	68.75

Results

- Applying compost biofilters was the most effective way to reduce ammonia emission with ME value of -97%.
- Compressing and covering were also used to significantly reduce ammonia emissions during the composting process. The analysis showed that the mitigation efficiencies of this method could reach 24.3% for ammonia emission.
- Microbial additives delivered a mitigation potential for ammonia emission during manure composting with ME of −9.15% ($p = 0.005$).
- Using phosphogypsum additives in composting process, the emission of ammonia can be reduced by 55.7% ($p = 0.013$).
- The results showed that the additives can be effective in ammonia mitigation, with ME values of −44.0% ($p < 0.001$).

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Applying biofilters, storage covers and additives as sawdust, straw, microorganisms and phosphogypsum were effective ways to reduce ammonia emissions during manure storage/composting.