FARMING PRACTICE
MANURE PROCESSING TECHNIQUES

IMPACT: GHG EMISSIONS

Reference 4

Emmerling, C; Krein, A; Junk, J 2020 Meta-Analysis of Strategies to Reduce NH_3 Emissions from Slurries in European Agriculture and Consequences for Greenhouse Gas Emissions Agronomy 10, 1633 10.3390/agronomy10111633

Background and objective

Research efforts are in place for the abatement of NH_3 emissions at the various stages of the manure management chain, namely; the feeding, housing, treatment, storage, and application stages to ensure a whole-farm management model. However, the impact of these mitigation strategies on the emission of other GHGs has not received equal attention. Investigate the consequences of the most effective measures to decrease NH_3 emissions from slurries, for the emission of other GHG (swapping effect)

Search strategy and selection criteria

A systematic literature search was conducted on the databases of Scopus, Google scholar, and gray literature, and from the websites of governmental/non-governmental agencies by combining the following keywords: ammonia emission, ammonia abatement, Europe, abatement strategies, integrated assessment, systematic review, meta-analysis, air quality, long-range transboundary air pollution (LRTAP), livestock, livestock management, animal housing, manure treatment, animal diet, Europe, France, Belgium, Germany, Netherlands, Spain, UK, Sweden, Finland. Not specified

Data and analysis

To analyze the combined effect of different measures, taking sample sizes into account, testing for moderators, and obtaining corresponding forest plots, the meta-analytical software OpenMEE was used (http://www.cebm.brown.edu/openmee). A random effect model was used to aggregate the collected data into a meta-analysis, to satisfy the assumption of variance heterogeneity.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
38	European agricultural systems with slurry fertilisation	Biological treatment (anaerobic digestion); Solid-liquid separation	No slurry treatment	Metric: GHG emission (CH_4, N_2O); Effect size: Relative difference between treatment and control	50

Results

- For anaerobic digestion, results from this present study showed an average reduction of −46% (CI −65, −27) in CH_4, and −26% (CI −42, −10) in CO_2.
- For N_2O, anaerobic digestion leads to a non-significant average increase of 10% (CI −10, 30) (7 studies and 26 observations).
- For solid-liquid separation, N_2O and CO_2 emissions were non-significantly increased by +24% (CI −4, +52) and +59% (CI −23, +95), respectively, while a significant reduction of −27% (CI −46, −8) was achieved for CH_4.

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Anaerobic digestion was effective to varying degrees for the abatement of CH_4 and CO_2 emissions, but also resulted in the (non-significant) increased emission of N_2O emissions. Solid-liquid separation showed no effect on CO_2 and N_2O emissions, while being effective for CH_4 emission abatement.