

## IMPACT: AIR POLLUTANTS EMISSIONS

### Reference 4

Emmerling, C; Krein, A; Junk, J 2020 Meta-Analysis of Strategies to Reduce NH<sub>3</sub> 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<sub>3</sub> 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<sub>3</sub> 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, no storage cover, or band spread application	Metric: NH <sub>3</sub> emission; Effect size: Relative difference between treatment and control	50

### Results

- For anaerobic digestion, the results showed an aggregate NH<sub>3</sub> emission reduction of -14% (CI -27, -1) (4 studies and 16 observations).
- The mean reduction in NH<sub>3</sub> emission by solid-liquid separation, for the present meta-analysis, was very limited, i.e., -1% (CI -13, +11).
- The strategies focusing on the decrease of ammonia emissions neglected the consequences of the emissions of other greenhouse gases.

### Factors influencing effect sizes

- No factors influencing effect sizes to report

### Conclusion

Anaerobic digestion was effective to varying degrees for the abatement of ammonia emission, but also resulted in the increased emission of at least one other greenhouse gas. Solid-liquid separation showed no effect on NH<sub>3</sub> emissions.