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Han, Z; Walter, MT; Drinkwater, LE 2017 N₂O emissions from grain cropping systems: a meta-analysis of the impacts of fertilizer-based and ecologically-based nutrient management strategies NUTRIENT CYCLING IN AGROECOSYSTEMS, 107, 335-355. 10.1007/s10705-017-9836-z

Background and objective

Understanding how agricultural management practices impact nitrous oxide (N₂O) emissions is prerequisite for developing mitigation protocols. An extensive analysis of all management practices was conducted to assess the full range of options currently available for N₂O mitigation. The trade off between N₂O mitigation and yield outcomes in grain cropping systems was quantified. Here, only results regarding the effect of organic fertilisers on N₂O emissions are reported.

Search strategy and selection criteria

An exhaustive literature search of studies investigating N₂O emissions from grain cropping systems was conducted with ISI-Web of Science for articles published before June 2014. Because the first search produced a limited numbers of papers for enhanced efficiency fertilizers, cover crops and diversified rotations, we conducted a second search focusing on these practices in December 2015 to increase the size of the database and enable meta-analysis of these practices. 1) Only studies conducted in field conditions that were at least one growing season in duration were included; 2) The authors included cover crop studies that measured N₂O emissions from cover crop growth periods, cash crop growth periods or both.

Data and analysis

It was performed an unweighted meta-analysis because roughly more than half of the studies did not report a measure of variance. Bias-corrected 95% Confidence Intervals (95% CIs) were generated through a bootstrapping procedure in MetaWin 2.0 (5000 iterations). The effect sizes was explored with categorical variables such as soil texture, fertilizer rates and manure forms and continuous variables such as manure pH and manure C:N ratios to examine how specific management regimes impact N₂O emissions.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
21	Arable crops	Deep placement	Shallow placement	Metric: Area-scaled N ₂ O emissions; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	68.75

Results

- Altering the depth of fertilizer (both organic and inorganic) application did not significantly reduce average annual N₂O emissions.
- NULL
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

This meta-analysis was unable to detect a significant pattern in N₂O emissions resulting from fertiliser (both organic and inorganic) placement techniques.