

Research behind EEFs



What does the research say...

Numerous meta-analyses and research articles have been published outlining the effects of EEFs on yields and environmental loss reduction. There is clear consensus that these products can be used to reduce N losses while maintaining yields.

Findings from Researchers

- One 2022 meta analysis found that the overall range of N₂O mitigation potential for the technology-driven solutions like EEFs was 22%–49% (Grados et al., 2022).
- Another 2022 meta-analysis found that urease inhibitors **reduced NH₃ volatilization by 51% and nitrification inhibitors reduced N₂O emissions by 49%**. The authors also stated using a combination of nitrification and urease inhibitors *“...enables producers to balance crop production and environmental conservation goals without pollution tradeoffs.”* (Fan et al., 2022).
- In a 2016 meta-analysis, nitrification inhibitors (DCD and nitrapyrin) were found to **reduce emissions on average by over 40%, and polymer coated urea by 20%** (Thapa et al., 2016).
- A recent meta-analysis found EEFs were as effective in reducing annual mean emissions as those during just the growing season (Pelster et al., 2023).

The Bottom Line

While these products are beneficial to the farmer, they are more beneficial to society. Farmers are paid for yield, but they are not paid for the societal benefit of reduced emissions.

Payments to farmers to increase adoption is well-justified as a GHG emission reduction strategy.

1. Fan D, He W, Smith WN, Drury CF, Jiang R, Grant BB, Shi Y, Song D, Chen Y, Wang X, He P, Zou G. Global evaluation of inhibitor impacts on ammonia and nitrous oxide emissions from agricultural soils: A meta-analysis. *Glob Chang Biol*. 2022 Sep;28(17):5121-5141. doi: 10.1111/gcb.16294. Epub 2022 Jul 1. PMID: 35678108.
2. Grados, et al. (2022). Synthesizing the evidence of nitrous oxide mitigation practices in agroecosystems. *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/AC9B50>
3. Pelster, D.E., A. Thiagarajan, C. Liang, M.H. Chantigny, C. Wagner-Riddle, et al. 2023. Ratio of non-growing season to growing season N₂O emissions in Canadian croplands: an update to national inventory methodology. *Can. J. Soil. Sci.* 103(2): 344–352. doi: 10.1139/cjss-2022-0101
4. Thapa, R., Chatterjee, A., Awale, R., McGranahan, D.A. and Daigh, A. (2016), Effect of Enhanced Efficiency Fertilizers on Nitrous Oxide Emissions and Crop Yields: A Meta-analysis. *Soil Science Society of America Journal*, 80: 1121-1134. <https://doi.org/10.2136/sssaj2016.06.0179>