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Cutting fertilizer emissions without sacrificing productivity

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Replicated plots under the 4R Nutrient Management framework in Broderick, Saskatchewan. Dual static chambers in each plot are used for measurements of greenhouse gas flux. Photo courtesy of Cheyne Ogilvie.

Nitrogen (N) fertilizers are crucial for crop productivity but are also an important driver of nitrous oxide (N_2O) production as the largest global source of anthropogenic N_2O emissions. Given that it is a greenhouse gas about 273 times more efficient at trapping heat than carbon dioxide, there is considerable interest in reducing ag-related N_2O emissions—with enhanced-efficiency N fertilizers (EENFs) touted for their potential to significantly reduce emissions. However, the efficacy of EENFs is influenced by complex interactions among soil properties, crop characteristics, climate conditions, and management practices, and their impact on crop yields remains uncertain.



Harvesting the replicated plots in Broderick, Saskatchewan. Photo courtesy of Cheyne Ogilvie.

To understand how EENFs impact N_2O emissions and productivity, researchers in Saskatchewan conducted a 2.5-year field study comparing four EENF products with different modes of action to conventional urea. They found that EENFs employing a nitrification inhibitor (NI) were highly effective at reducing N_2O emissions without impacting crop productivity. Moreover, NI□O emission reductions were achieved with both spring and fall fertilizer applications, though reductions were greater with spring applications.

These findings provide valuable insights for refining on-farm N management practices and support for the adoption of NI-based EENFs in cropping systems of the Canadian Prairies, offering a promising strategy for greenhouse gas mitigation.

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Daly, E., Ogilvie, C., Lemke, R. L., & Farrell, R. E. (2026). An evaluation of the N_2O emission reduction potential of enhanced efficiency nitrogen fertilizers and application timing in a semi-arid cereal cropping system. *Journal of Environmental Quality*, *55*, e70251. https://doi.org/10.1002/jeq2.70251

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