

RESEARCH WITH IMPACT



THE CHALLENGE:

Nitrogen fertilizer has been identified as a significant source of agricultural greenhouse gas emissions. In particular, nitrous oxide is a potent greenhouse gas with a heat-trapping potential almost 300 times greater than carbon dioxide. A number of food sustainability groups, environmental advocates, and scientific organizations are working to develop a path for reducing nitrous oxide emissions.

Improved 4R Nitrogen Management Leads to Reduced Nitrous Oxide Emissions

nitrous oxide emissions that occurs by implementing 4R-based practices.

An expert consensus was achieved during the meeting, which defined what constitutes “Basic, Intermediate, or Advanced” fertilizer management practices for 4R Nutrient Stewardship in major corn, soybean, and wheat-producing areas of North America.

These recommendations were then coupled with the USDA greenhouse gas emissions inventory study (*Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory* [↗](#)).

This allows practitioners to estimate how adoption of specific 4R practices can minimize nitrous oxide emissions from fertilizer, based on the specific characteristics of the region, soil properties, cropping system, **and** 4R-based nitrogen management practices. This approach greatly improves on the previous universal estimates of nitrous oxide emissions that do not account for locally implemented innovation.

THE RESEARCH SOLUTION:

The simplest and often-favored solution to reduce nitrous oxide emissions from fertilizer is to establish a mandatory cut in fertilizer application rates. Although this proposed reduction seems to be an easy answer, it would likely fail to meet the desired goals for cutting greenhouse gas emissions and could have devastating impacts on farmer production and economic viability. Instead, on-farm fertilization based on 4R Nutrient Stewardship addresses the selection of the most suitable source, rate, time, and place combinations for nitrogen. Any proposed across-the-board cut in nitrogen fertilizer application rates only addresses one of these four management factors.

IPNI and The Fertilizer Institute invited leading research specialists from across North America to a conference designed to review field data on the potential impacts of 4R fertilizer management. Support from Fertilizer Canada facilitated the participation of leading Canadian scientists, with additional financial support provided by the 4R Research Fund.

THE RESULTS:

This first-of-its-kind workshop of nitrogen fertilizer specialists was convened and tasked with establishing a science-based foundation for crediting the reduction in



Field to Market[®]

This consensus of key researchers made it possible to improve the scientific basis of the nitrous oxide emission estimates used to measure agricultural sustainability by the national coalition: Field to Market - The Alliance for Sustainable Agriculture (www.fieldtomarket.org). This IPNI-led effort helped many of this coalition of agricultural producers and food supply chain members to understand that there is much more to optimizing nitrogen management and reducing environmental impacts than overly simplistic and often unwarranted reductions in nitrogen inputs. The final IPNI report: *Suites of 4R Nitrogen Management Practices for Sustainable Crop Production and Environmental Protection* is available here [↗](#).



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