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## CROP NUTRITION WITH LOWER EMISSION OF NITROUS OXIDE

**Nitrous oxide is one of several greenhouse gases considered responsible for the warming trend in the climate.** Pound for pound, it is deemed about 300 times more effective in trapping heat than carbon dioxide. Experts recently agreed on a new approach to fertilizer stewardship to limit its emission.

**Greenhouse gas inventories for the USA and Canada currently estimate that nitrous oxide from agricultural soils contributes about 3.5% of their total greenhouse gas emissions.** The emissions in this category are considered to arise from application of fertilizers and manures, from organic materials in and on soils, and indirectly from N losses. Direct emissions from fertilizer application comprise roughly one-quarter of this category. Better management of N fertilizer could reduce the direct emissions of nitrous oxide—equivalent to 55 million metric tons (M t) of carbon dioxide—and also some of the even larger indirect emissions.

**Farmers can achieve better management through implementation of 4R fertilizer stewardship, applying the right source at the right rate, right time, and right place.** This approach starts with the definition of economic, social, and environmental sustainability goals. The 4Rs describe site-specific practices—based on sound agronomic principles and supported by objective research results—that contribute to the defined goals.

**Including nitrous oxide emission reduction as one of the goals leads to the selection of practices that are “right” for reducing nitrous oxide without neglecting the remaining goals.** Farmers may need to spend or invest more to implement such practices. However, the environmental benefit for the “public good” should be recognized as a carbon credit or offset in protocols for reduction of greenhouse gas emissions.

**A Consultation Workshop held in Calgary, Alberta, last fall kicked off the development of a nitrous oxide emissions reduction protocol (NERP).** Government, industry, and science representatives participated in a discussion process to propose levels of 4R fertilizer stewardship that would qualify for specific nitrous oxide emission reductions. The levels are differentiated by increasing management intensity in selection of source, rate, timing, and placement of N fertilizer. Work is continuing to select practices appropriate to Eastern as well as Western Canada, and to further define the appropriate practices.

**Recent studies by the USDA Agricultural Research Service with irrigated no-till corn in Colorado documented reductions of 25 to 50% in nitrous oxide emissions through use of enhanced-efficiency N fertilizer sources.** Similar reductions have been reported in other studies, and may be witnessed in on-going research in the USA and Canada.

**Investment in and implementation of 4R fertilizer management would seem attractive not only to farmers and society, but also to carbon credit and offset trading programs.** New and exciting technologies are being explored, and better crop management skills are being honed by professional agronomists, crop advisers, and farmers. As science-based nitrous oxide emission reduction protocols are developed, there may be potential for farmers to receive carbon credits to help optimize the performance of their cropping systems. Stay tuned !

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Abbreviations: N = nitrogen.