FARMERS FOR CLIMATE SOLUTIONS

A brief analysis of the Fertilizer Canada report:
Implications of a Total Emissions Reduction Target on Fertilizer

October, 2021

In late September, Fertilizer Canada and Meyers Norris Penny (MNP) released their report *Implications of a Total Emissions Reduction Target on Fertilizer*. The report is a response to the December 2020 announcement by the Federal Government that it would "set a national emission reduction target of 30% below 2020 levels from fertilizers [by 2030] and work with fertilizer manufacturers, farmers, provinces and territories, to develop an approach to meet it."[1] The MNP / Fertilizer Canada report presents a model that assumes that a 30% reduction in fertilizer-related emissions requires a 20% reduction in applied nitrogen tonnage and that this, in turn, would lead to an approximately 20% reduction in crop yield.

Unfortunately, the report makes several errors and takes unwarranted shortcuts, usually in the form of poorly supported assumptions. Moreover, each error and bad assumption builds on and compounds the preceding ones, making the combined error for the entire report very large and making the conclusions non-credible. The following are some of the most important flawed assumptions made in the report:

Reducing nitrogen fertilizer use will automatically reduce yields. The report assumes that a 20% reduction in fertilizer use will result in a 20% reduction in yields. There is no evidence presented to support this assumption. Available research indicates that relatively large reductions in nitrogen use could be made with little or no impact on average yield or profit.[2] This is because there is a tendency to calculate

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[1] Environment and Climate Change Canada, *A Healthy Environment and a Healthy Economy: Canada's Strengthened Climate Plan to Create Jobs and Support People, Communities and the Planet* (Ottawa: ECCC, December 2020), https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/healthy_environment_healthy_economy_plan.pdf

[2] See Pannell DJ, Gandorfer M, Weersink A (2019) How flat is flat? Measuring payoff functions and the implications for site-specific crop management. Computers and Electronics in Agriculture 162, 459-465.
De Laporte AV, Banger K, Weersink A, Wagner-Riddle C, Grant B, Smith W (2020) Economic and environmental consequences of nitrogen application rates, timing and methods on Corn in Ontario. University of Guelph.
Yanni SF, De Laporte A, Rajsic P, Wagner-Riddle C, Weersink A (2020) The environmental and economic efficacy of on-farm beneficial management practices for mitigating soil- related greenhouse gas emissions in Ontario, Canada. Renewable Agriculture and Food Systems, In Press.

nitrogen requirements based on target yields, rather than agronomic or profit-maximizing yields, and because factors other than nitrogen availability (especially water) are often the limiting factor in plant growth. The report repeatedly refers to a fixed ratio between fertilizer and grain in terms of "pounds per bushel." In effect, the report assumes that Canadian fertilizer application rates are now fully optimized, that fertilizer is being used with maximum possible efficiency and that every unit of reduced fertilizer input will inescapably result in a unit of reduced crop output.

Reducing total N use by 20% is necessary to reduce emissions by 30%. The report assumes that a 30% reduction in emissions overall requires a 20% reduction in applied tonnage, and that just 10 percentage points in emission reduction can come from non-rate measures such as more accurate placement, optimized timing or split application, alternate formulations and enhanced efficiency fertilizers, the use of cover crops, etc. Numerous published studies and meta-analyses have found that non-rate measures alone have the potential to reduce emissions by more than 30%.[3]

Farmers will not adapt or innovate. The report assumes that farmers will reduce fertilizer use and simply accept lower yields. It entirely ignores the possibility of farmers adopting innovative practices to protect and increase yield while reducing fertilizer use. There is a whole suite of practices currently available that can reduce synthetic nitrogen requirements, many of them developed by farmers, including cover cropping, utilizing biological sources of nitrogen, more frequent soil testing to determine actual N requirements, integration of livestock into cropping systems, and extending crop rotations.

Reducing fertilizer use will reduce farmer incomes. The Fertilizer Canada/MNP report claims to measure "financial impacts" on farmers but does not do so. It measures negative effects on gross revenues, but omits positive effects in the form of cost savings from reduced fertilizer costs. It doesn't calculate farmers' net incomes, and it thus overstates the magnitude of economic impacts on farmers. Indeed, it may be the case that a well-managed and well-supported transition to optimizing and reducing fertilizer tonnage via better placement, timing, and utilizing biological sources of N will increase, not decrease, farmers' net incomes. Recent spikes in fertilizer prices also underscore the potential financial benefit to farmers of reducing fertilizer use. By pursuing efficiency and adopting best-management practices, it is

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[3] Burton, D.L. 2018. A Review of the Recent Scientific Literature Documenting the Impact of 4R Management on N_2O Emissions Relevant to a Canadian Context. Fertilizer Canada.

likely that farmers can reduce tonnage and costs while maintaining yields and revenues.

Business as usual is a viable option. The report utilizes a Business as Usual (BAU) scenario incompatible with Canada's emission-reduction commitments and with the kind of stable, benign climate farmers need. The report utilizes a BAU scenario in which crop tonnage increases by 34%. By the report's own logic, this must mean that fertilizer tonnage must also increase by 34%—more crop must mean *more* fertilizer. It follows that greenhouse gas emissions from farmers' use of fertilizer must also increase by a comparable percentage. Canada, however, has committed to cut economy-wide emission by more than 40% by 2030 and to reach net zero by 2050. The BAU scenario used by MNP and Fertilizer Canada clashes with these realities.