

## Fertilizer Reductions Are Possible

Ralph C Martin

The 4R principles promoted by [Fertilizer Canada](#) are increasingly accepted and practiced by farmers across Canada. It makes sense to apply nutrients from the Right source, at the Right time, in the Right place and at the Right rate.

However, recent Fertilizer Canada lobbying has morphed the fourth principle from Right rates to holding the line at rates without “[a mandatory reduction in the use of fertilizers.](#)” These are 3R and STIR (same to increased rates) principles. Is this right?

The stewardship section on the [Fertilizer Canada](#) website has many commendable points about optimizing nutrient management, better crop and soil management, improving fertilizer efficiency, reducing energy use per harvested unit of farm production and improving net farm profit. Nevertheless, these assertions, and especially the last one, can be contradicted with their proviso, “without sacrificing yield potential.”

Highest yields may not be the most profitable yields depending on fertilizer and other input costs and weather conditions, which often constrain nutrient availability. Applying more fertilizer than can be used by a crop leads to inefficient nutrient management, leakage of nutrients from soil and wasted energy of fertilizer manufacturing, transportation and on-farm application.

It's not hard to imagine why Fertilizer Canada advocates for maintaining current or higher amounts of fertilizer on Canadian farms, given the correlation of fertilizer amounts with sales revenue. Their stated rationale is that if the government of Canada enforces its 30% fertilizer emissions reduction target by 2030 then [Canadian famers will lose \\$48 billion](#). Daniel Schuurmann and Alfons Weersink in their brief and potent analysis, “[Is Fertilizer Canada Crying Wolf?](#)” deftly refute the \$48 billion claim.

Fertilizer Canada also warns that a reduced overall amount of fertilizer in Canada “risks Canada’s contribution to the global supply of food,” the putative slam-dunk argument for not sacrificing yield potential. Yields of what? For example, in our current food system the [EU uses 3.3 million tonnes of wheat and 6.4 million tonnes of corn for biofuels](#). Sara Menker of Gro

Intelligence calculates that [global biofuel crops diverted from food could have provided 2000 calories per person per day to 1.9 billion people.](#)

Furthermore, Steffen and his colleagues demonstrated over a decade ago that we have crossed the planetary boundary into the [high-risk zone of excess reactive nitrogen \(N\) and phosphorus](#) in our biosphere, and correlated with synthetic fertilizer applications. The 4R principles, especially right rates, might prevent excess leakage of nitrous oxide (a greenhouse gas (GHG) 300 times more potent than carbon dioxide) into air and nitrates into water. However, insistence on 3R and STIR thwarts efforts to lower such pollution.

In our current moment of planetary history, we use prime farmland to grow more feed than needed and give food grade grain to livestock. By optimizing food processing by-products and forages for livestock, [Ontario could reduce arable land for feed production by 40% while maintaining sufficient animal protein in an adequate diet.](#) Farmers could choose to grow food crops on that 40% of land now used for feed.

I recommend that farmers be incentivized to reduce fertilizer rates. Let's suppose that on average corn farmers apply 180 lbs of N fertilizer/acre for a yield of 180 bushels corn/acre, a ratio of 1.0. For those who reduce the ratio to less than 1.0, payments could be proportional to the reduction.

For example, by employing genuine 4R principles a fertilizer rate of 150 lbs N fertilizer/acre might result in 170 bu corn/acre, a ratio of 0.88. Others may use 4R principles with manure to limit N fertilizer to 90 lbs/acre with a corn yield of 180 bu/ac and thus a ratio of 0.5. Organic farmers, not applying synthetic fertilizer, would have a ratio of 0, albeit with lower average yields of about 150 bu/ac.

Similar incentive payments could be calibrated to average fertilizer to yield ratios for each crop, in each region. Payments should be contingent on submission of a nutrient management plan to ensure that manure or other organic amendments are not applied in excess.

N fertilizer when manufactured is an energy hog and accounts for [more than 50% of total energy use in commercial agriculture.](#) The fossil fuels, especially natural gas, to manufacture N fertilizer result in concomitant GHG emissions.

For Canadian agriculture to meet its 30% fertilizer emissions reduction target by 2030, it is critical to reduce the overall amount of N fertilizer used in Canada and not default to 3R and STIR. This target and beyond is possible, so let's get on with it.

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