



Fitting the 4Rs into Nutrient Cycle Stewardship

by Dr. Tom Bruulsema

The farm nutrient cycle is now a central focus of sustainable development discussions. It plays crucial roles in global issues including food security, climate change, biodiversity, and water quality. Thus it is important to understand where 4R Nutrient Stewardship fits into the stewardship of the cycle.

The flow of nutrients through a farm includes inputs from the atmosphere, internal turnover, and outputs in the form of crop removals and losses with soil erosion, in drainage water, and back to the atmosphere. The 4Rs address an important part of that cycle: the application of nutrients to the soil. Agricultural service providers have a large but not total influence on producer decisions regarding the right source, right rate, right time and right place for nutrient application. The 4R concept addresses everything included in those decisions, but implementation requires a context of total system stewardship touching on other important controls of nutrient flows into, within, and from the farm.

It's no surprise that the 4R concept has been widely embraced by agricultural service providers. It is the most appropriate place to start in any effort to reduce nutrient loss. While the 4Rs on their own may not be enough, why put effort into controlling and trapping excess nutrients coming off the edge of the field, before doing what can be done to avoid loss at the point of application? From a grower's perspective, it's the most profitable way to reduce nutrient loss.

The 4Rs address the full decision cycle for choices of source, rate, time and place.

Any technology relating these choices to the full farm nutrient cycle can be considered part of 4R Nutrient Stewardship. Enhanced efficiency fertilizers, soil testing, and variable rate application can't be considered technologies separate from the 4Rs. They are included, along with a list of traditional practices like plant analysis and scouting for

symptoms, and precision tools like GPS, GIS, yield monitors, sensors, and weather-based computer models.

Nevertheless, the agricultural service provider's role in the stewardship of nutrient cycling need not be limited to the 4Rs. Crop, soil and pest management practices interact strongly with 4R choices. Key performance indicators of nutrient stewardship—crop productivity, soil health, and nutrient use efficiency—can be influenced as much by choices of crop genetics, pest control, and conservation tillage as they are by choices of specific 4R combinations. Cover crops and drainage systems also influence the amounts and forms of nutrients lost. Many retailers already provide service relating to these choices.

In many cases, reducing nutrient losses to societally acceptable levels will require going beyond agronomic practices.

'Control and trap' practices beyond the edge of field may be necessary because, face it, to attain the productivity levels demanded for today and tomorrow, crops need nourishment beyond natural levels. Over the past 20 years, service providers have increasingly engaged technologies supporting 4R and beyond. Many already provide seed, pest control products, and integrated crop and pest management advice. And others are considering ways to go further. Building a business providing services addressed at nutrient losses beyond the edge of the field is challenging, but efforts are being made. Possibilities for making it profitable include environmental credit trading, food industry supply chain sustainability initiatives, and other collaborative actions.

Society increasingly expects agriculture and agri-business to improve its stewardship of the nutrient cycle. Starting with the 4Rs enables agricultural service providers to embrace every opportunity to engage this challenge.

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