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## **CROPPING SYSTEM NITROGEN MANAGEMENT - IS YOURS SUSTAINABLE?**

**When fertilizer or manure N are applied to farm fields to provide the essential nutrient used in the greatest amounts by crops, it is also important to replenish the supply of N in soil organic matter.** Normally, some portion of the applied N and some of the N released from soil organic matter and crop residues escapes uptake by annual crops and leaks into the environment (atmosphere, surface water, groundwater). With some leguminous crops like clovers and alfalfa, which are sometimes grown in rotation with annual field crops, it is possible to increase soil N levels through the symbiotic relationship between roots and specific N-fixing bacteria. In soybean systems, however, there is increasing evidence that the net soybean cropping effect may actually be a mining of soil N levels; not soil N replenishment or enhancement.

**To sustain the N in soil organic matter, the N which is held in ionic form on soil exchange sites, and some portion in the mobile nitrate-N form held loosely in soil pores, farmers must annually fight the daunting uphill battle against the whims of Mother Nature; and do so profitably. Failure to implement such N management goals ultimately results in declining soil productivity and reduced profitability.** It has often been said that if we could perfectly predict the weather, we could perfectly predict crop N management demands, and perfectly deploy the right N source, at the right rate, at the right time, and in the right place (4R N Stewardship). Although we might yearn for such perfection, we must face reality and do our best to hedge against the risks of inefficient crop N uptake, which are affected by crop genetics, the weather and management.

**To help reduce the leakages of mobile N forms out of the field and into the environment, there are many opportunities and choices of tools that can enhance profitability, environmental protection and long-term sustainability.** One of the first tools to use is a simple N budget, which estimates and documents the applied N and crop N removal at harvest. Measures of soil organic matter (surface and subsurface) can be made by soil testing over a period of 3 to 5 years (not just year-to-year comparisons, since such changes are often quite difficult to measure accurately), at the same location and depth in each field, to monitor levels and determine if the large pool of N in soil organic matter is being sustained. If soil organic matter is declining, the cropping system may be "mining" soil N, and causing a decline in crop and soil system resilience.

**Evaluate your 2013 crop and soil N needs in view of both short and long-term sustainability goals.** Talk with fertilizer dealers, crop advisers, extension workers, and leading farmers in your community. Know whether your farm lies within a watershed with recognized water quality problems like seasonal algae blooms, or elevated nitrate-N levels. Consider choices of crops and crop rotations which use N efficiently and effectively; tillage systems that protect the soil, water, and air resources, adequately; cover crops which may be appropriate for your region; other proven soil conservation practices (vegetative buffers, grassed waterways, riparian zones, biofilters, etc.); current fertilizer, equipment, and digital technologies that mesh well with your management skills. Do not be afraid to be bold in trying something new on your fields in 2013. Observe, measure, evaluate, and document the outcomes of your management choices and track your progress toward economic, environmental and social goals. It will make a difference for you and your family, your neighbors and your community.

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Abbreviations: N = nitrogen