

Corn+Soybean Digest.



CROP PROTECTION > FERTILIZER

Big challenges to cut nitrate loading

Need efforts beyond 4Rs to include no-till/strip till, cover crops, controlled drainage, wetlands, buffers and more – plus landowner help.

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THINK DIFFERENT

Water Quality: Agren founder and CEO Tom Buman knows that even if all farmers did all the right things to manage nitrogen for optimal use in a corn-soybean rotation—the 4Rs: right source, right rate, right time, and right place—scientists project that we may reduce nitrogen loading by 6% to 15%. Unfortunately, that reduction doesn't come close to the 45% reduction in nitrogen loading expected from states in the upper Midwest.

Soil Health: Iowa farmer Wayne Fredericks did an equipment cost analysis for 8 years and concluded he was saving \$65/acre in equipment and \$27/acre in labor costs each year with strip till compared to conventional tillage. Using no-till, strip till and cover crops, he's seen organic matter levels grow from 3 percent in 1984 to 4 to 6 percent in 2015.

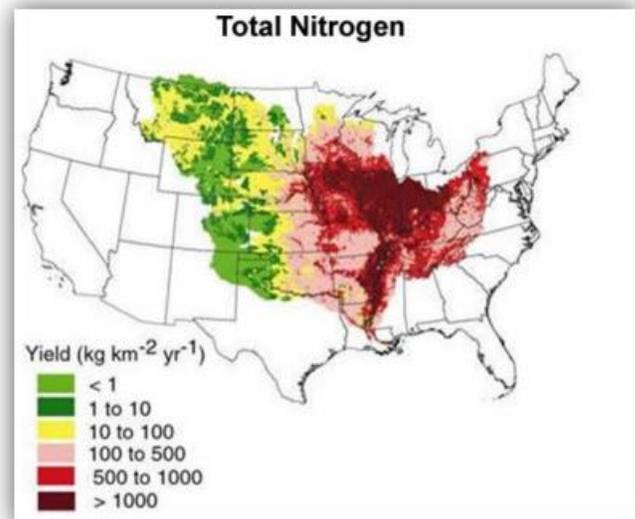
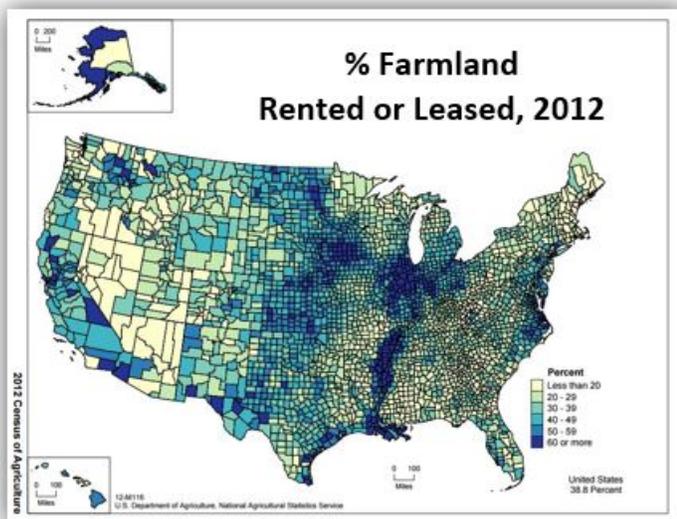
In a blog post this spring, Tom Buman laid out the huge challenge facing Iowa farmers to voluntarily meet nitrogen loading reduction goals (<https://www.agrentools.com/nitrogen-problem-numbers/>). Noting that models demonstrate agriculture is responsible for 70 percent of the nitrogen and phosphorus load delivered to the Gulf of Mexico, Buman, took a look at the numbers needed to meet Iowa's Nutrient Reduction Strategy (NRS). What this founder and CEO of Agren found was a staggering gap between current application rates and projected needs.

In a corn-soybean rotation, Buman wrote, if all farmers did all the right things to manage nitrogen for optimal use by crops—the 4Rs: right source, right rate, right time, and right place—scientists project that we may reduce nitrogen loading by 6% to 15%. Unfortunately, that reduction doesn't come close to the 45% reduction in nitrogen loading expected from states in the upper Midwest.

Rye and oat cover crops, controlled drainage, shallow drainage, wetlands, saturated buffers, bioreactors, and living mulches—all practices encouraged by NRS leaders—are keys to a practical solution to nutrient loading problems, Buman wrote. As he compared the current use of those practices to the projected goals and needs, he concluded the task of implementing the needed practices is overwhelming.

Much more conservation, soil building needed

“To achieve Iowa’s Nutrient Reduction Strategy goals, we need to see enormous gains in use of nitrogen-reducing practices,” Buman wrote, “and keep in mind we need to reach the required level of implementation for every practice, not just one.” For example, it’s encouraging that cover crops are now being used on about 600,000 acres in Iowa, but the NRS calls for more than 25 times that, from 12 to 15 million acres. There are nearly 100 nitrogen reducing wetlands, but 7,000 are needed. The projected need for bioreactors and saturated buffers is 120,000—but fewer than 100 have been installed.



Among the practice options for reducing nitrates in water to meet Iowa Nutrient Reduction Strategy goals, the most effective and practical are shown in gold and blue, Buman says.

The cost to apply all the practices needed in Iowa to meet the goals of the Nutrient Reduction Strategy is estimated at \$4 billion, using a combination of practices. Sean McMahon of the Iowa Agriculture Water Alliance thinks the goal can be met. He's encouraged by increased private sector engagement in conservation, and by groups of landowners and tenants who are working together in small watershed projects to make a plan that optimizes soil health and nutrient management practices. Watershed plans also include edge of field practices like bioreactors, saturated buffers and wetlands.

Water quality solution: Cover crops, strip till and no-till

A farmer leader in one of those groups, Wayne Fredericks, says most of Iowa's water quality and soil erosion problems would be solved if all farmers would adopt no-till, strip till and cover crops. A past president of the Iowa Soybean Association, Fredericks farms 900 acres of corn and soybeans by himself in Mitchell County in northern Iowa. He's no-tilled soybeans since 1992, strip tilled corn since 2001, and experimented with cover crops ahead of both since 2011.



Mitchell County, Iowa, farmer Wayne Fredericks told other farmers strip till, no-till and cover crops are viable options to build soil health, maintain yields, and help meet goals of Iowa's Nutrient Reduction Strategy.

“What I’ve learned about cover crops is there is no significant difference in crop yields,” Fredericks told an audience at Iowa State University’s Soil Health Conference in February. “I haven’t had any termination issues, no trouble planting, and I’ve watched them sequester nutrients for crop use and improve soil health.” He saw nitrate-N levels from 7 samples in tile lines drop to an average of 4.17 mg/L in 2016. When that water was treated with a bioreactor he has on the farm, nitrate levels fell to almost nothing.

Fredericks' message for other farmers was that conservation practices can improve the bottom line, and make a difference in water quality.



Fredericks no-tilled soybeans into a 2-foot high green cereal rye cover crop this spring. Nitrate levels from tile sampled in the field this spring were 3.46ppm and 3.22 ppm—very low levels of nitrate in tile waters. “The stream we’re trying to prevent nutrients from entering, Rock Creek, is currently testing about 10 ppm in nitrate-N,” Fredericks says. “That tells me my practices are helping make Rock Creek cleaner.

When his replicated plots of strip till and conventional till in 2005 both produced 194-bushel corn yields, Fredericks was sold on that practice. “On our heavy soils, strip till made us money, reduced labor, gave me some family time back, improved rain absorption, reduced soil erosion, and rebuilt lost organic matter,” Fredericks said.



After running a strip till machine and seeding cover crops last fall, Fredericks planted corn no-till this spring.

He did an equipment cost analysis the next 8 years and concluded he was saving \$65/ac in equipment and \$27/ac in labor costs each year with strip till compared to conventional tillage. Using no-till, strip till and cover crops, he's seen organic matter levels grow from 3 percent in 1984 to 4 to 6 percent in 2015.

Iowa's hydrology changed

McMahon said Iowa's hydrology was changed when 10 million acres of corn and soybeans replaced hay and small grains in the state during the last half of the 1900s. "We're putting 7 acre-inches more water into our streams as a result of losing small grains and pasture," McMahon said.

Key Practice	Current Level of Implementation	Required Level of Implementation
Cover Crops	500,000 acres	12,000,000 to 15,000,000 acres
Nitrogen Reducing Wetlands	81	7,000
Bioreactors & Saturated Buffers (combined)	80	120,000

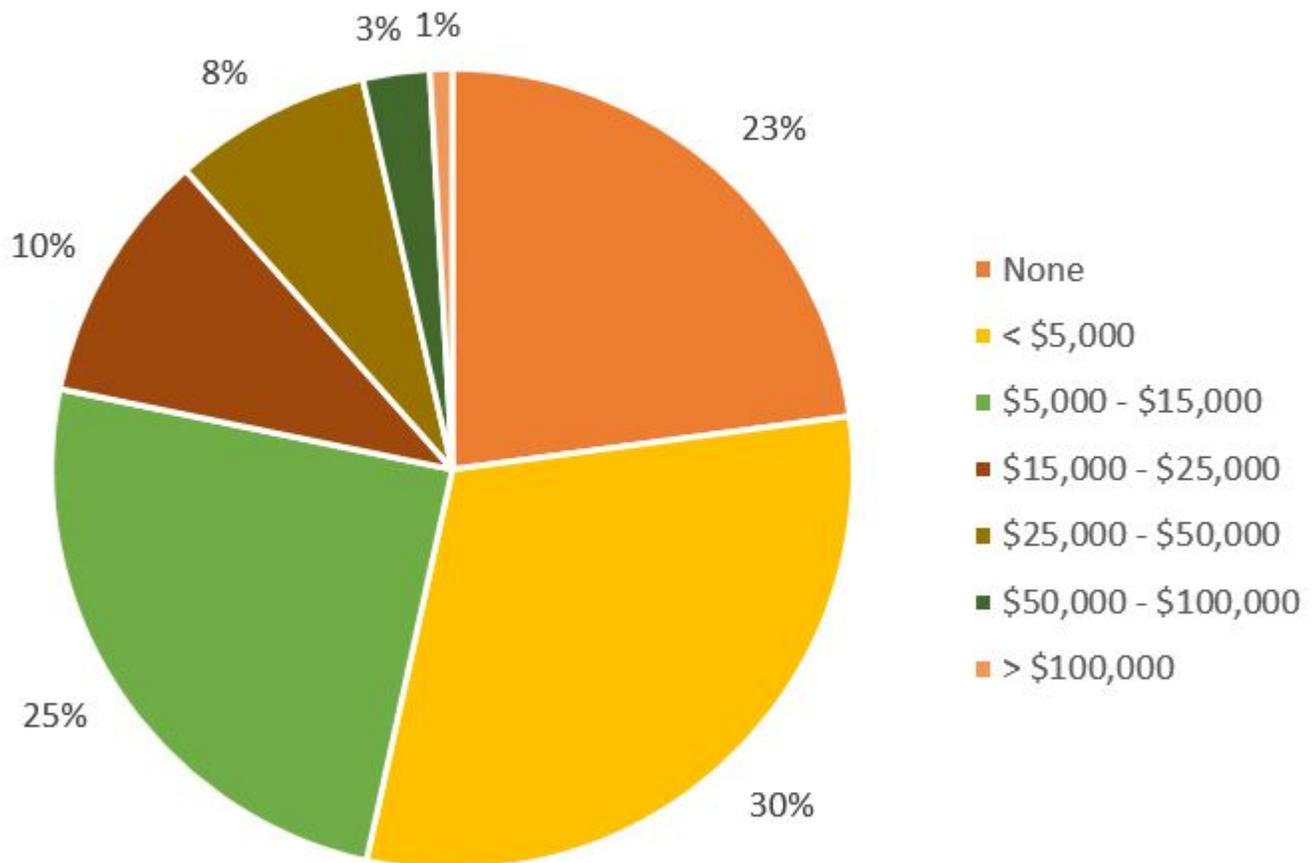
The gap between current levels of key water quality practices applied and required levels to meet the goals of Iowa’s Nutrient Reduction Strategy is huge.

The intensive cropping presents a challenge in meeting Iowa’s Nutrient Reduction Strategy, McMahan admits. “At current rates of practice application, it would take a century to meet the strategy’s goal of a 45% reduction in nitrate and phosphorus in Iowa streams and rivers, McMahan said, “so it’s going to take a transformational change.”

Challenges with landowners, short farmer leases

Buman pointed out that regions of the Midwest with the highest rates of nitrogen loss to streams and rivers correlate with the regions with high absentee ownership. In Iowa, 59 percent of the land is owned by absentee landowners who do not operate the land, Buman said, and those absentee landowners invest very little money in conservation practices. A survey of 638 absentee Iowa landowners in 2010 found that half the landowners invested less than \$5,000 on conservation in the preceding 10 years, and only 20% of them spent more than \$15,000 over those 10 years.

Amount invested in conservation over 10 years (including cost share)



A 2010 survey of selected absentee landowners in Iowa indicated low levels of investment in conservation practices over the past ten years.

“In a business arrangement with a short-term lease, how can we expect tenant farmers to install conservation practices that may not guarantee a return on investment, or practices that take years to recoup the initial investment?” Buman asked. “I don’t think we can expect them to bear this huge financial burden. But I do think we can expect more from absentee landowners. In fact, we can’t solve the nitrogen problem without them.”

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