Farmers sought for nutrient project

THE Iowa Corn Promotion Board, Iowa State University, and the Iowa Department of Agriculture and Land Stewardship are partnering on a new effort to improve farm productivity and water quality.

The project involves documenting the effectiveness of in-field and edge-of-field nutrient management practices for selected drainage districts (DD) in Palo Alto (DD 15 North), Pocahontas (DD 65, 48-81, 178) and Clay (DD 8) counties in Iowa.

Farmers who participate will lead the voluntary-based approach to reduce nitrogen and phosphorus exports to downstream waters by using documentation at the multiple-farm scale. Documentation will note potential N and P losses in relation to in-field and edge-of-field nutrient management, which support the efforts of the Iowa Nutrient Reduction Strategy.

Farmers can anonymously evaluate their individual nutrient application rates and crop yields to possibly improve yields, fine-tune inputs, and consider if improved drainage within the drainage district can increase potential crop yields and enhance water quality.

UNIQUE PROJECT: Farmers taking part in this research project can anonymously evaluate their individual nutrient application rates and crop yields. The goals are to improve yields, fine-tune nutrient inputs, and see if improved drainage can increase potential crop yield and enhance water quality.

"Project partners are committed to working with farmers and documenting what can be done in the voluntary-based approach. Ultimate success will depend on the assistance of farmers in documenting practices," says ISU ag engineering professor Matt Helmers.

Farmers in these districts can learn more by calling Helmers at 515-294-6717 or email *mhelmers@iastate.edu*.

Prairie method cuts N, P loss

THE first year the prairie strips were strategically planted in corn and soybean fields at the Neal Smith National Wildlife Refuge, they worked to reduce loss of nutrients and improve water quality. "With water quality, we saw real benefits from the very beginning," says Matt Helmers, an Iowa State University ag and biosystems engineer who works with the project.

Converting just 10% of a crop field into prairie reduced the soil and sediment leaving the field by 95%. Phosphorus loss decreased by 90% and nitrogen loss by 85%. And the prairie created habitat for pollinators, birds and animals.

The thick-stemmed native prairie grass, flowers and other plants slow water flow and allow it to soak into soil. Four different row crop and prairie configurations in 12 sloping fields are being studied. One is all corn and soybeans; another is 10% prairie at the foot of the slope. A third trial adds a few prairie strips to the field with prairie at the foot, totaling 10% prairie, and the last trial adds strips to the foot slope, totaling 20% prairie.

The program, Science-based Trials of Row-crops Integrated With Prairie Strips, fits into the state's plan to reduce water pollution. The program began in 2007 and 2008 in Jasper County near the Neal Smith Wildlife Refuge, on land owned by the refuge. "We had a lot of rain when we started the prairie strips those two years," says Helmers. "But we still saw dramatic benefits."

As for how many rows are taken out of production, some strips are 20 feet wide, some 25 feet. Some may take 10 rows of crop out of production for an individual strip.

It is cost-effective at $24 to $35 an acre to seed, says Helmers, and they are taking 10% of the land out of production. How does it compare to cover crops? "We're getting similar benefits," he says. "There are advantages and disadvantages to each one. Cover crops may be similar in cost per acre."

You don't have to be an organic farmer to use prairie strips. Just be careful when spraying to keep from killing the prairie. "The strips are being used in organic and nonorganic farming operations," he notes. How do strips fit into the Iowa Nutrient Reduction Strategy? It's another tool, another option farmers have to help reduce nutrients leaving their fields, says Helmers.

Source: Iowa State University

3-year rotation improves soil

By **NICK OHDE**

FOR nearly 15 years, a team of Iowa State University researchers has been comparing the agronomic, environmental and economic performance of two-, three- and four-year crop rotations at the Marsden Research Farm near Boone. They continue to find that the three- and four-year rotations not only have better environmental performance, but also can produce similar corn and soybean yields and be even more profitable than two-year systems.

Southeast Iowa farmer Tim Sieren is giving a third crop a shot. A couple years ago, Sieren was intrigued by an article in Wallaces Farmer about the ISU research and about Dick and Sharon Thompson, members of Practical Farmers of Iowa. He saw PFI was looking for folks to conduct on-farm trials of a small-grain crop grown with a legume and he signed up.

Sieren farms near Keota where he owns a diversified crop and livestock operation, including field crops, hogs and cattle. The soil has always been important on his family's farm. They've been no-tilling for almost 40 years. He says, "Dad was one of the first farmers around to try no-till in 1979 when he bought a planter setup for no-till. We went 100% no-till when he bought a no-till drill in 1990."

For Sieren, adding additional crops into the rotation along with corn and soybeans was a natural transition to add to the conservation and soil health benefits of no-till. His farm includes a lot of rolling ground, and he started adding a few strips of cereal rye onto the farm in the more erosion-prone areas about 10 years ago. After heavy rains, he saw firsthand how cereal rye could hold onto soil: "It was phenomenal how rye held the crop residue and the soil in place." After that, he began planting rye on more acres. Sieren says rye is "like having a grass waterway on your whole farm."

SOIL QUALITY: Red clover underseeded in cereal rye was found to have at least 43 pounds of nitrogen fertilizer replacement value in on-farm research at Tim Sieren's farm.

Grow your own fertilizer

When the opportunity arose to incorporate a nitrogen-fixing legume into the mix, he was excited to set up a trial to see if it worked on his farm. His experiment involved four replications of two treatments: one of corn followed by rye intercropped with red clover, and the other of corn followed by rye alone. These treatments were laid out in randomized strips running the length of a field. Also, to pinpoint the "nitrogen replacement value" of clover, each treatment included two groups, one that received a low amount of nitrogen and another that received a high amount.

For each treatment, Sieren drilled 120 pounds per acre of rye seed in October 2012 following his corn harvest. The red clover was broadcast-seeded the following spring at a rate of 14 pounds per acre. The rye was harvested for grain and straw in mid-July, and the clover was allowed to continue growing until the following year. Clover was terminated with herbicide in April, and corn was planted to all strips two weeks later in May. All groups received a starter fertilizer, and all but the "low N" rye-clover plots received some amount of N sidedressed.

There were no differences in yield between the "high N" rye-clover crop and the two rye-alone groups. Because there was no yield difference between the "high N" rye-clover crop, which received a total of 100 pounds per acre of N, and the "low N" rye-alone crop, which received 143 pounds per acre of N, the fertilizer replacement value of the clover could be assessed at 43 pounds per acre at least.

By growing his own fertilizer with the green manure crop, Sieren saved money. But for him, saving money on nitrogen is only part of the story. Sieren says his goal is to "apply at least two forms of nitrogen on his corn crop each year." A legume crop adds another tool in the nitrogen tool box.

"Growing your own fertilizer is kind of like using swine manure; you can't rely on it for everything, but you can definitely cut back on commercial nitrogen," he says. Just like a diversity of farm enterprises is important for generating a healthy income, a diverse array of nitrogen sources is important for a profitable crop, he says.

Agronomy professor Matt Liebman, Henry A. Wallace Chair of Sustainable Agriculture at ISU, and leader of the research project at Marsden Research Farm, says legume crops not only can replace commercial fertilizer, but also make nutrients available to plants in a way that's qualitatively different. "Nitrogen from biological sources is more like a slow burn than a flash in the pan," Liebman says. This can especially be important late in the season, when nitrogen from other sources may have already leached away or been used up. He says corn fertilized from sources like decomposing clover is essentially being "spoon-fed" nitrogen.

GROWING N: Tim Sieren of Keota describes how he "grows his nitrogen" using red clover underseeded in cereal rye. But saving money on N is only part of his story.

The organic residue provided by the rye and clover may be just as important to Sieren as the nitrogen. Sieren says although he initially became interested in growing a small grain crop on his farm for soil erosion control, he has been seeing more and more benefits. "It's hard to explain it and put a price on it, but it's there."

Sieren once heard a researcher use the term "underground livestock" to describe the soil organisms that contribute to soil health. "You have to feed your underground livestock just like you have to feed your aboveground livestock," he says.

Liebman agrees that feeding the soil biological community is very important. While the amount of total organic matter in the soil changes slowly, certain farming practices can impact the "particulate" organic matter content of the soil relatively rapidly. It takes about 10 pounds of organic material-residues, such as crop residue, to make 1 pound of organic matter–humus. This is the portion of soil organic matter that is most highly decomposed. When you hear organic farmers talk about "building up their organic matter," this is what they're referring to.

Building organic matter

Soils high in organic matter have a number of chemical, biological and physical properties desirable for crop production. First, they "aggregate" or stick together better, so are less susceptible to compaction and erosion. They also have lower bulk density, so there's more room for roots to find oxygen and nutrients. Because there's more room in the soil, it's easier for water to infiltrate, and it's easier for water to be stored there. This can be especially important during drought years, and it helps to reduce erosion by reducing runoff.

Liebman and his colleagues at the Marsden Research Farm found that adding a perennial crop like clover improves soil quality in measurable ways. Soils from crops with three- and four-year rotations are higher in particulate organic matter, lower in bulk density and higher in total microbial biomass than in two-year rotations.

Besides feeding the "underground livestock," another benefit of a diverse crop rotation is giving them year-round shelter. Because a longer rotation involves crops with roots growing at different soil depths at different times of year, it provides a place throughout the year for those microbes to feed, live and continue growing.

Sieren has seen the differences in the soil. "It's hard to explain. It's looser, yet it's firm. It's much more mellow." He's able to get out in the field a day or two earlier in the spring because of this. Liebman notes that soils high in organic matter often feel spongy to walk on, because the aerated structure of the soil holds in place instead of collapsing and compacting.

Adding a third crop to the rotation, creates many possibilities. "There's dozens of different ways you can do it and all kinds of things you can do. You just have to figure out what your end goal is, and what works on your farm," says Sieren.

Ohde is the new research and program assistant at Practical Farmers of Iowa.