

COVER CROPS TO MANAGE NITROGEN IN THE MIDWEST

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Problem

Agricultural systems are notoriously leaky, especially with regard to nitrogen (N). Unfortunately, much of the N lost from agricultural fields ends up in our lakes and streams. Studies have shown that corn plants take up only 35% to 60% of the N fertilizer that is applied. In any given year, corn plants also may obtain up to 70% of their N from soil N that becomes available through the mineralization (i.e. breakdown) of organic matter. So, although corn needs a lot of N and it usually yields more when we fertilize with N, corn does not take up all the N that is available and that remaining N is lost when water moves through the soil. Strategies to “tighten” the soil N cycle must not be limited to only managing N fertilizer rates or timing of application. Other management practices are needed to plug the N leaks from the soil, especially during the fall, winter, and spring when crop plants are not there to take up N.

Approach

Small grain cover crops have the potential for reducing the N leaks from farm fields by taking up N between harvest and planting of corn and soybean crops and then releasing that N later when the cover crops decompose during the summer. Over three years we measured N lost in tile drainage from field plots with a corn-soybean rotation as influenced by rye cover crops. Nitrogen fertilizer was only applied in May 2002 and 2004 shortly after corn planting. A rye cover crop was planted in the fall of 2001, 2002, and 2003 with a no-till drill following soybean or corn harvest and killed in the spring with herbicides 7-10 days before planting of the main crop. Each field plot had a drainage tile in the center that extended the length of the plot and that was connected to equipment that measured flow and sampled the water for nitrate N concentration. In the three years of the study, most of the drainage occurred between February and July.

Findings and Application of Results

The rye cover crop planted in the previous fall reduced nitrate-N leaching from the field plots in all three years compared with conventional treatment, which had no cover crop. The rye cover crop reduced the nitrate lost in the tile drainage by 54% to 74% over the three years. More N was lost in 2003 than was lost in 2002 or 2004. This probably occurred because corn was grown in 2002 and fertilizer applied in May 2002 and so the N remaining in the soil when the corn was harvested leached out before the soybean crop could take it up in 2003. The results of this study are very similar to a previous study done by our group, which showed that a rye cover crop following soybean could reduce N leaching by up to 95%. Thus, rye cover crops have the potential to reduce N losses from tile drained fields in corn-soybean rotations. Using cover crops to reduce N losses in drainage waters from agricultural fields should have a positive effect on the water quality of nearby streams and lakes.

