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Cover Crops Produce Benefits in Wet and Dry Times

BY LYNN LAWS

Sustainable Corn Project scientists are field testing a winter rye cover crop at 10 sites in six Midwestern states, measuring their potential to add resiliency to corn-based cropping systems by holding nutrients and moisture on Midwestern farm fields during extreme rain events and drought. (See Project Participant and Field Site Locations map on page 4.)

"In a corn/soybean system, in the more eastern and southern parts of the studied states, a large part of the drainage flow and nitrogen losses leave from the bottom of the root zone and occur precisely during the fallow season, when nothing is growing. In the more northern and western states — in Minnesota and Iowa — a substantial part of the flow is during the fallow season, but there is also significant flow in May and June, at the beginning of the growing season," says Eileen Kladivko, a professor of agronomy at Purdue University and a principal investigator for the Sustainable Corn Project. "Whether you have a tile drain or whether the excess water is going towards ground water or flowing laterally to nearby streams, a large portion of what is lost from the root zone is lost at these times."

Ray Gaesser, an Iowa corn and soybean producer and 2014 president of the American Soybean Association, started testing cover crops in his operation in the fall of 2010.

"Our biggest reason is erosion control because of the extreme weather events that we've had the last several years. When we get four inches of rain in an hour, or six or eight or so inches of rain in a day, our no-till fields, terraces, waterways and turn areas — all those things that were adequate for 20 years — just can't handle those kinds of events. So we're adding cover crops," Gaesser says.

Gaesser says all his fields had a lot of crop residue from 20 straight years of no-till. But in the spring of 2012, when his fields with no cover crops received four inches of rain in an hour, "most of the residue floated away, water ran over the terraces and outside the waterways, and it created a few small ditches where it took all of the residue away. But where we had the cover crops, we had no erosion."

Matthew Helmers, a professor of Agricultural and Biosystems Engineering at Iowa State University and a principal investigator with the Sustainable Corn Project, says studies have shown that during wet seasons cover crops can reduce sediment and nitrate transport to downstream water bodies by up to 60 percent, depending on soil type, amount of biomass produced by the cover crop in any given year, and how and when the cover crop is terminated. In addition, adaptive management of the cover crop in wet springs may be needed to prevent the cover crop from keeping the soil too wet to plant. Farmers and researchers are developing experience and recommendations regarding this issue.

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Researching the effects of cover crops during times of drought also is important.

"I think farmers may have concerns that if they have a cover crop and it ends up being dry, that they might have used up soil moisture that would have otherwise been available for the cash crop. Our research indicates that would not be the case and that, in fact, it might provide some help just because it provides a mulching effect and shading after that cover crop is terminated," says Helmers.

^ Cereal rye cover crop (left in each photo) at Sustainable Corn Project research site in Ames, Iowa. The photo on the left was taken on March 29, 2012. The crop helped to hold soil in place over the winter. The photo on the right was taken on April 17, 2012, after terminating the rye. Once the rye is dead, it has a mulching effect — which increases soil drying time. This can be beneficial in times of drought, but can delay spring planting during wet times.

During the drought of 2012 the Sustainable Corn Project cover crop team gathered soil moisture data from Iowa and southeastern Indiana plots that had terminated a rye cover crop and plots that had not had a cover crop. They looked at soil moisture at five different depths in the soil profile continuously prior to the cash crops of corn and soybeans and throughout the growing season of the cash crops.

At one of two Iowa sites the team saw a statistically significant difference; the plot that had once had a cover crop had held more moisture. No statistically significant differences were seen at the other site in Iowa and the Indiana site, including a plot where the cover crop produced very little biomass.

"While this is just one year of data, to me it's still important because the 2012 summer was extremely dry and because farmers have been concerned that a cover crop in spring might dry out the soil. Our work is showing that's not the case," says Helmers.

The cover crop group will continue their study into 2015 and publish results soon after. They will be watching to see if cover crops make corn/soybean systems more resilient and sustainable by doing the following things:

> improving soil quality (soil C, soil aggregation, water infiltration) to reduce year-to-year variability in yield and increase crop yield over the long-term;
> reducing nitrate export to tile drainage;
> conserving soil water, which results in reducing year-to-year variability in yield; and
> increasing crop yield in dry years.

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