Laws, L. "Winter Rye Cover Cropping System: A Long-term Investment." *Resilient Agriculture.* Aug. 2014: 36-37. Print.

Winter Rye Cover Cropping System: A Long-term Investment

BY LYNN LAWS

While it's known that cover crops improve soil health by increasing soil aggregation, water infiltration, organic carbon, and soil biological activity, project scientists want to know if those improvements lead to improved crop yields over time as well as less year-to-year variability in crop yields.

John Sawyer, professor of agronomy at Iowa State University and a principal investigator on the Sustainable Corn Project, has been studying the effects of cereal rye winter cover crops at five Iowa field sites for the Sustainable Corn Project and the Iowa Department of Agriculture and Land Stewardship.

"A lot of people expect really big benefits for yield and reductions in N [nitrogen] fertilization need. But from 2009 to 2013 we have found a slight yield decline in corn, no yield effect in soybean, and little difference in economic optimum N fertilization rate," says Sawyer.

The five sites are in a corn-soybean rotation, with and without winter cereal rye cover crop each year, early sidedress fertilizer nitrogen, and all are no-till. At the sites, six N rates are studied: zero to 200 lb. of N per acre. Using several N-rates allows researchers to look at where an economic optimum rate is reached and the yield of the corn at the economic optimum.

"So we hone in across a wide range of environments—soils and climatic conditions—and study them to see if there is a net difference in fertilization requirement in a system with rye cover crops. We conduct rye crop biomass sampling, soil nitrate sampling in the spring and fall, and corn canopy sensing to look at the effects of the cover crop on the corn canopy. We also look at total N uptake by the corn at the end of the season," says Sawyer.

"What's the economic value of a 31 percent reduction in nutrient loss?"

Sawyer says the results have shown "almost no difference in N-fertilization rate requirement. It averages out about 10 pounds more when there was a rye cover crop preceding corn. It's so small that I wouldn't even suggest a change."

He says his findings are consistent with what some earlier N-rate studies on corn in the Midwest have shown. "An N-fertilization rate reduction was found in coarse textured, sandy soils, with a rye cover crop, but we don't have many sandy soils in Iowa or in the other study states. In finer soils like we have in Iowa, the cover crop was not found to change the needed N application rate."

^ Does not always occur, but sometimes an early corn growth difference is found between with and without rye. The corn on the right in this photo was preceded by a rye cover crop; the corn on the left was not. Photo taken at a Sustainable Corn Project field test site in Ames, Iowa.

Regarding corn yields in Iowa, Sawyer says, "At best it's the same with and without the rye, but once in a while yield will decrease and that has averaged about 5 percent across the sites and years of the study." Results show no yield difference in soybean with or without the rye cover crop.

Sawyer says a 5 percent average corn yield loss could result in a loss of $40 to $50 an acre. "When you add on the cost of the cover crop seed, and associated seeding and labor costs, it adds up to a competitive disadvantage for the corn producer in the short-term."

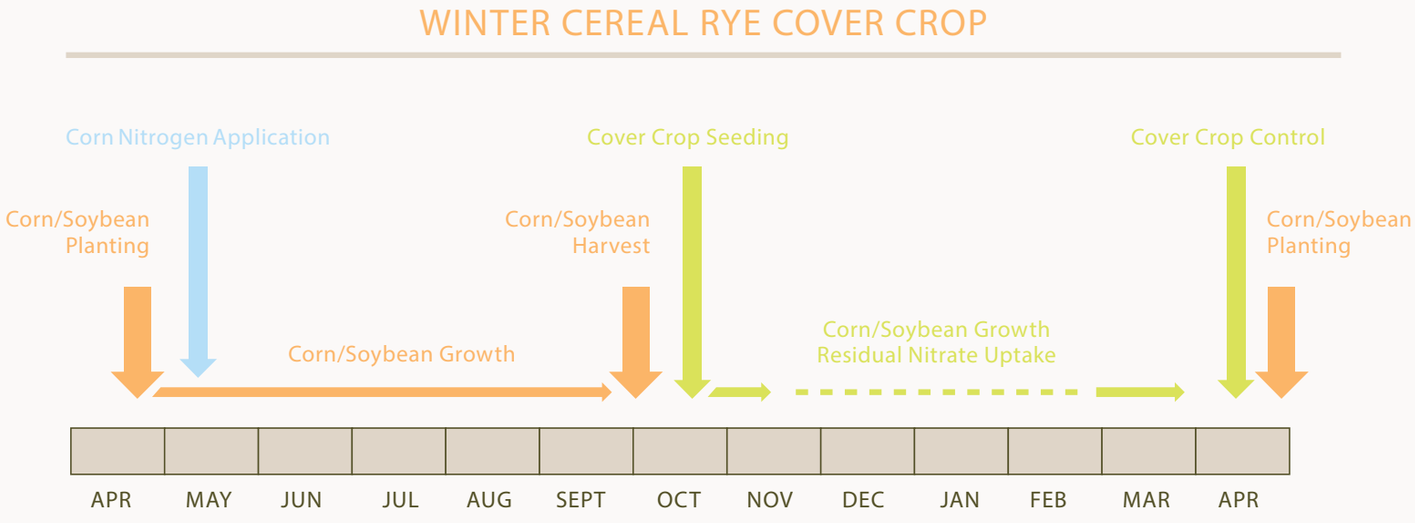
But he is quick to point out that Sustainable Corn Project studies and others have shown erosion control and soil benefits that pay off in the long term do not currently have an annual economic value assigned to them, which producers could use to weigh the benefits and disadvantages of cover crops and make on-farm management decisions. "What's the economic value of a 31 percent reduction in nutrient loss during a heavy rain? We don't yet have a value for farmers on that."

Using a different cover crop, other than cereal rye, could reap different results. The Sustainable Corn Project team opted to include the cereal rye cover crop in their research as it is the most widely-adapted cover crop across the 8-state project.

Lynn Laws is a communications specialist for the Sustainable Corn Project and for Iowa State University, College of Agriculture and Life Sciences.

FIGURE 1 | COVER CROP CONTROL

Timeline for incorporating rye into a corn/soybean rotation.



^ At the Ames Sustainable Corn Project field sites, the rye cover crop is drilled after harvest, typically in late September to mid-October. Some farmers are aerial seeding rye before harvest, often in early in September.

^ Optimal nitrogen fertilizer rate varies widely within a field. Using equipment to sense the nitrogen needs in the corn canopy while applying N fertilizer is a promising approach to diagnose and treat the variation in real time. Two sensors are mounted on either side of the tractor, in front. A computer in the cab reads the sensors, calculates N rate and directs the controller to apply a particular rate of fertilizer.