# Nebraska Soybean Board

**Year-End Research Findings Report**

11/7/2017

*Please use this form to summarize the practical benefits of your research project and what has been accomplished.*

*Your answers need to convey why the project is important and how the results impact soybean production.*

Project Title: Implementation of Cover Crops in Nebraska Corn and Soybean Cropping Systems Contractor & Principal Investigator: Roger Elmore & Humberto Blanco

Please check/fill in appropriate box: Continuation research project

Year 2 of 3 research project (for example: Year 1 of 2)

x

1. What was the focus of the research project or educational activity?

Our main objective is to provide baseline research and recommendations on cover crop establishment in corn and soybean rotations, both in irrigated and rain-fed conditions. Specific objectives are a) to

determine how to establish cover crops (time of planting, choice of cover crop species), and b) to determine if cover crops are beneficial for soil quality, crop yields and profits.

1. What are the major findings of the research or educational activity?

Cover crops were most productive in the spring of 2016, with rye reaching 4,800 lb/a. In 2017, cover crop biomass was intermediate between 2015 and 2016. In each year, rye was the most productive cover crop, followed by the mixes. Rye was effective in lowering soil nitrate, thus preventing nitrate

leaching loss in the spring. However, rye also lowered corn and soybean yields at Concord, Clay Center and Mead in some instances. Rye soil water use and nitrogen tie-up are possible explanations for the

yield reductions.

Legumes had less than 400 lb/a of dry matter in most situations, except at Clay Center in 2017 where they reached 700 lb/a. The available growing season for legumes cover crops in our corn-soybean

systems was not long enough for them to reach their full biomass potential. No significant addition of N can be expected. Radishes winterkilled and were replaced in our protocols by forage collards, a

hardier brassica. However, collards also winterkilled in our harsh winters. For these reasons, legumes and brassicas are not advisable as cover crops in corn-soybean systems like those we tested in

Nebraska.

The 4-species (rye, vetch, pea, radish) and 7-species (rye, vetch, pea, radish, collards, oats, clover) mixes were over 98% rye in the spring and can be thought of as rye planted at a lower seeding rate than rye planted alone. There were 30 lb/a of rye in the 4-species mix and 20 lb/a of rye in the 7-

species mix compared to rye planted alone (60 lb/a).

For farmers in northeast or eastern Nebraska wishing to maximize cover crop biomass, plant rye early (broadcast into stands of corn and soybean) in early to mid-September, when crops start to senesce. In south-central Nebraska, drill after cover crop harvest for highest cover crop productivity. Planting rye

before soybean extends the rye growing period by about 2 weeks, and often doubles biomass compared to rye growing before corn.

However, highly productive rye may lower corn and soybean yields. Controlling the amount of cover

crop biomass, for example by planting after harvest or by selecting a lower seeding rate, is one way to avoid yield penalties. In future research, we want to explore how extra irrigation, starter fertilizer, and variable termination dates could affect crop yields after a rye cover crop.

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1. Briefly summarize, in lay terms, the impact your findings have had, or will have, on improving the productivity of soybeans.

Rye cover crops can greatly improve nutrient cycling and reduce nutrient loss. In our study, rye

growing before soybeans had significantly reduced soil nitrate and contained up to 40 lb/a of N in its above-ground biomass. This N will be recycled back into the soil system upon rye decomposition and will likely be re-used by soybeans or the following corn. Continuous cover cropping may increase soil organic matter which improves soil water holding capacity, water infiltration, and nutrient retention, all of which improve fertility and reduce the needs for fertilizers, especially N. Winter cover cropping

reduces erosion because it puts living roots in the soil at a time when it is exposed and vulnerable. The rye canopy reduces the impact of wind and water on the soil, preventing it from being washed out or

blown away. This is especially important after soybean, since they leave little residue, even under no- till management.

1. Describe how your findings have been distributed to (a) farmers and (b) public researchers. List specific publications, websites, press releases. etc.

 Distribution to farmers

Talk at Successful Farmer Series, Lancaster County Extension. “Cover crops in corn-soybean systems”, December 2016.

***Interview with Harvest Public Media, aired January 31, 2017. “How farmers are trying to protect the soil”. Available at*** https://youtu.be/wdtzcXZQPIQ

Crop Production Clinics, statewide, in January 2017. “Cover crops – An update”

CropWatch stories: Student Research “Carbon and nitrogen content of winter cover crop biomass”. (October 5, 2016). Student Research “What are the remnant effects of rye and oat cover crops on

corn” (November 2, 2016).

Cover crop productivity in corn and soybean systems. September 7, 2017.

 **https ://cropwatch.unl.edu/2017/cover -crop-productivity-corn-and-soybean-systems-spring-2017**

Presentation field day at SCAL on June 28, 2017.

Plot tour at Concord trials for annual VIP tour, August 17, 2017.

***NebGuide “Cover crops: A primer” (Joshua Miller, Katja Koehler-Cole, Rodrigo Werle, Daren Redfearn). July 11, 2017.*** [**http://exte**](http://exte/)**nsionpubs.unl.edu/publication/9000018975116/cover -crops/**

Presentation to Bazille Groundwater Management Area Group (NRD), on potential of cover crops to reduce soil nitrate losses in north-east Nebraska. September 13, 2017.

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 Distribution to public researchers

Poster at the Agronomy Society annual meeting in Phoenix, AZ “Productivity of cover crops and primary crops in Nebraska corn-soybean systems”, November 2016.

Poster at Soil Health Conference, Ames, IA (updated version). Second place winner in poster competition.

Midwest Cover Crop Council Annual meeting – our results were presented along with other cover crop research and farmer experiences in Nebraska, March 2017.

1. Did the checkoff funding for your project leverage any additional state or Federal funding? Please list sources and dollars approved.

We did not have additional funding.