

## **Influence of Interseeding Cover Crops on Nitrogen Fertilizer Rate Requirement for Optimal Corn Grain Yield in a No-till System**

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### **Summary:**

Moving from conventional to no-till with the inclusion of cover crops can improve soil organic matter, soil structure, and greater water and nutrient holding capacity that may reduce environmental degradation from the loss of fertilizers. Interseeding cover crops may change the amount and timing of nitrogen (N) provided to the crop from decomposition (mineralization), which may increase or decrease needed N fertilizer to optimize corn grain yield. Cover crops may also affect the uptake of other essential nutrients (i.e. P, K, and S) by corn and soybean. The objectives of this project are: 1) compare the effect of N fertilizer on corn grain yield with no cover crop versus single- and multiple-species cover crops, 2) determine the effect of cover crops on N mineralization and soil health indicators throughout the growing season, 3) measure the effect of cover crops on plant available soil nutrients (i.e. N, P, K, and S) and their uptake by the corn and soybean crop, and 4) determine the effect of single- and multiple-species cover crops on soybean yield. This study will be the bases for an extension publication regarding the influence of cover crops on N fertilizer required to optimize corn grain yield, uptake of essential nutrients in corn and the following years soybean yield, and soil health. This study will also contribute to an update of the N fertilizer guidelines for corn in South Dakota. The update will help growers optimize their grain yield and economic profit while reducing the potential of over-applying N fertilizer that is associated with environmental degradation from N fertilizer loss.

### **Goals and Objectives:**

The goal of this project is to update N fertilizer recommendations in South Dakota when different cover crop combinations are utilized. The specific objectives of this project are 1) compare the effect of N fertilizer on corn grain yield with no cover crop versus single- and multiple-species cover crops, 2) determine the effect of cover crops on N mineralization and soil health indicators throughout the growing season, 3) measure the effect of cover crops on plant available soil nutrients (i.e. N, P, K, and S) and their uptake by the corn and soybean crop, and 4) determine the effect of single- and multiple-species cover crops on soybean yield.

### **Results:**

- Long-term study locations have been established at the Southeast Research Farm in Beresford and the USDA Research facility in Brookings.
- The fifth year interseeding rotation has been established with both corn and soybean being successfully planted.
- Collection of preplant soil samples have been completed in both soybean and corn plots.
- V6 corn and soybean plant and soil samples have been collected and are currently being processed to be sent to a commercial lab for testing.

**Impacts:**

- Corn and soybean plots were and will continue to be used as demonstration plots showing the potential for planting cover crops into a standing corn and soybean field at the Southeast farm field day in July each year.
- Knowledge that in the four years of interseeded single or mixed cover crops into soybean does not impact soybean yield.
- Knowledge that in the first through fourth year interseeded single or mixed cover crops into corn did not substantially effect corn grain yield and N rate requirement varies from year-to-year.
- Knowledge that after four years of interseeded cover crops that N fertilizer requirements increased for mixed cover crops compared to single grass or no cover crop. Yield were similar at the respective optimal N rates.
- Training of a graduate and several undergraduate students in soil fertility.

**Products:**

- Five Abstract and poster presentation of study results at the ASA/CSSA/SSSA annual International Conference
- Proceedings paper and poster presentation at the North Central Soil Fertility Conference in Des Moines, IA
- Proceedings paper and poster presentation at the Great Plains Soil Fertility Conference in Denver, CO
- Extension article regarding the interseeding cover crops into corn and soybean
- Four Research reports published in the annual Southeast Research Farm’s annual research report.

**Budget:****Project Budget (As of June. 1, 2023):**

<b>Budget Category</b>	<b>Budget</b>	<b>Total Expenses</b>	<b>Available</b>
Salaries	\$35,888.00	\$0.00	\$35,888.00
Benefits	\$2,355.00	\$0.00	\$2,355.00
Travel	\$1,000.00	\$0.00	\$1,000.00
Contractual	\$31,753.00	\$0.00	\$31,753.00
Supplies	\$5,000.00	\$1,343.21	\$3,656.79
Tuition remission	\$7,678.00	\$0.00	\$7,678.00
Capital Equipment	\$0.00	\$0.00	\$0.00
Non-Capital Equipment	\$0.00	\$0.00	\$0.00
F&A (Indirect) Charges	\$0.00	\$0.00	\$0.00
<b>Total</b>	<b>\$83,674.00</b>	<b>\$1,343.21</b>	<b>\$82,330.79</b>