PROGRESS REPORT

PROJECT TITLE: Impact of Cover Crop Strategies on Productivity of Corn
PROJECT NUMBER: 4123-16SP
REPORTING PERIOD: Oct 1 – Dec 31, 2018
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan*)

The objectives of the project are to a) assess the viability of cover crop strategies on corn-soybean rotation under different tillage practices and b) determine the effect of cover crop strategies on growth and yield of corn and soybean produced across multiple environments. Experiments for objective (a) are conducted within the Long-Term Tillage Trial platform (LTTT) located in Lamberton and Waseca. Experiments for objective (b) are conducted within the Long-Term Agricultural Research Network (LTARN) located in Grand Rapids, Lamberton, and Waseca.

Both graduate students finished processing remaining samples from 2018, and prepared and presented (poster or oral) at the meeting of the American Society of Agronomy in Baltimore, MD. Our group actively participated in extension and outreach activities.

Cover crops and tillage practices (objective a)

Significant activities during the reporting period involved primary crops and cover crop biomass sample processing, primary crop yield quantification, data collection of soil moisture, lab analysis of crops grain and soil samples for N mineralization.

Results from Waseca are shown as example of our findings. Yield of corn and soybean in 2018 was lower as compared to 2017. This may be attributed to damage in corn during R3 stage caused by heavy winds. However, the decrease in corn yield was consistent with the state wide decrease of 3 bu/A in 2018 as compared to 2017 (Fig. 1). Cover crop establishment was significantly higher in 2018 as compared to 2017 (Fig. 2). This could be attributed to relatively early seeding in 2018 as compared to 2017, followed by rainfall immediately after seeding of cover crops in 2018.

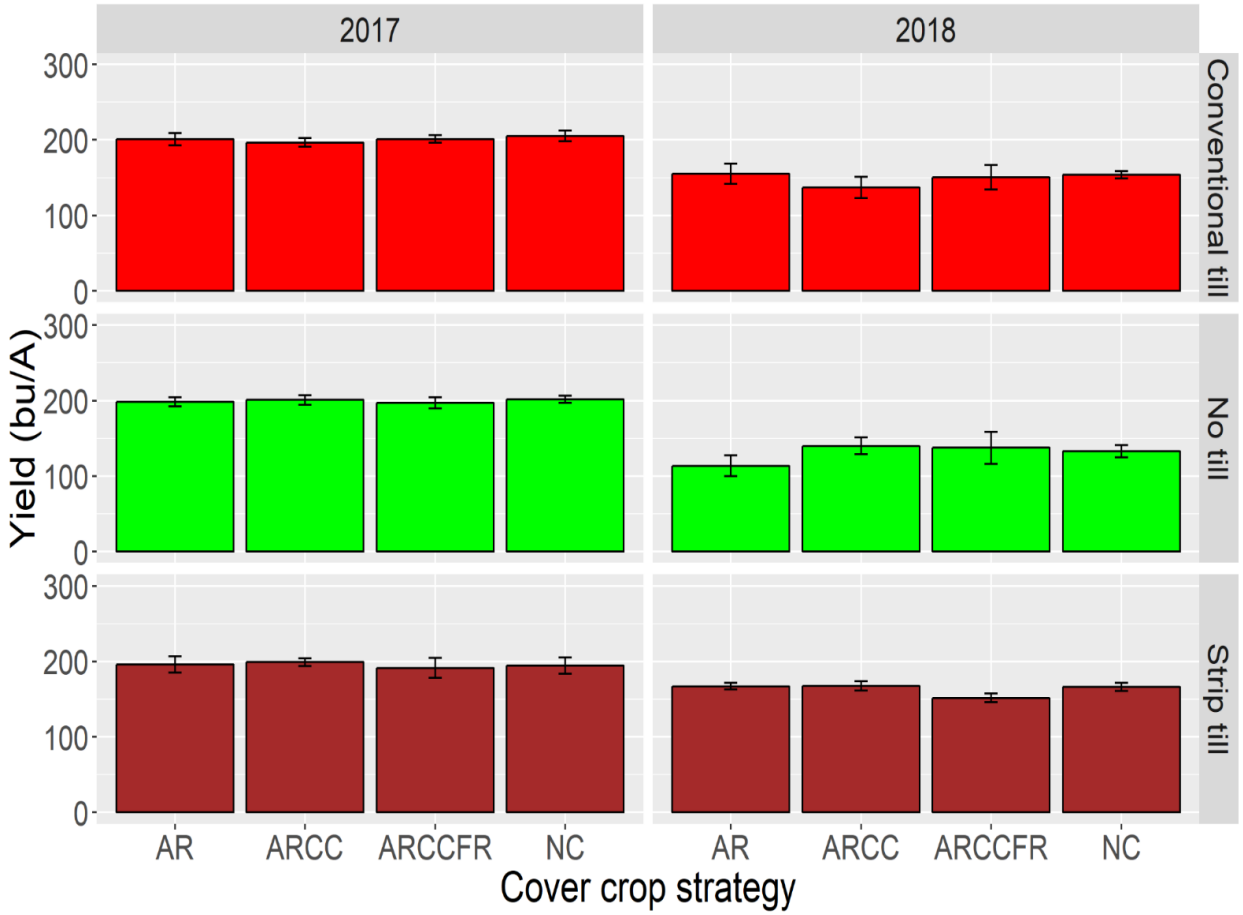

Figure 1 – Corn grain yield in Waseca, MN in 2017 and 2018. Values are treatment means ± SE (n=4).

Yields of primary crops and [NO_3-N] content in the leachate in the Spring of 2019 will be of interest given the increased cover crop establishment in Fall, 2018.

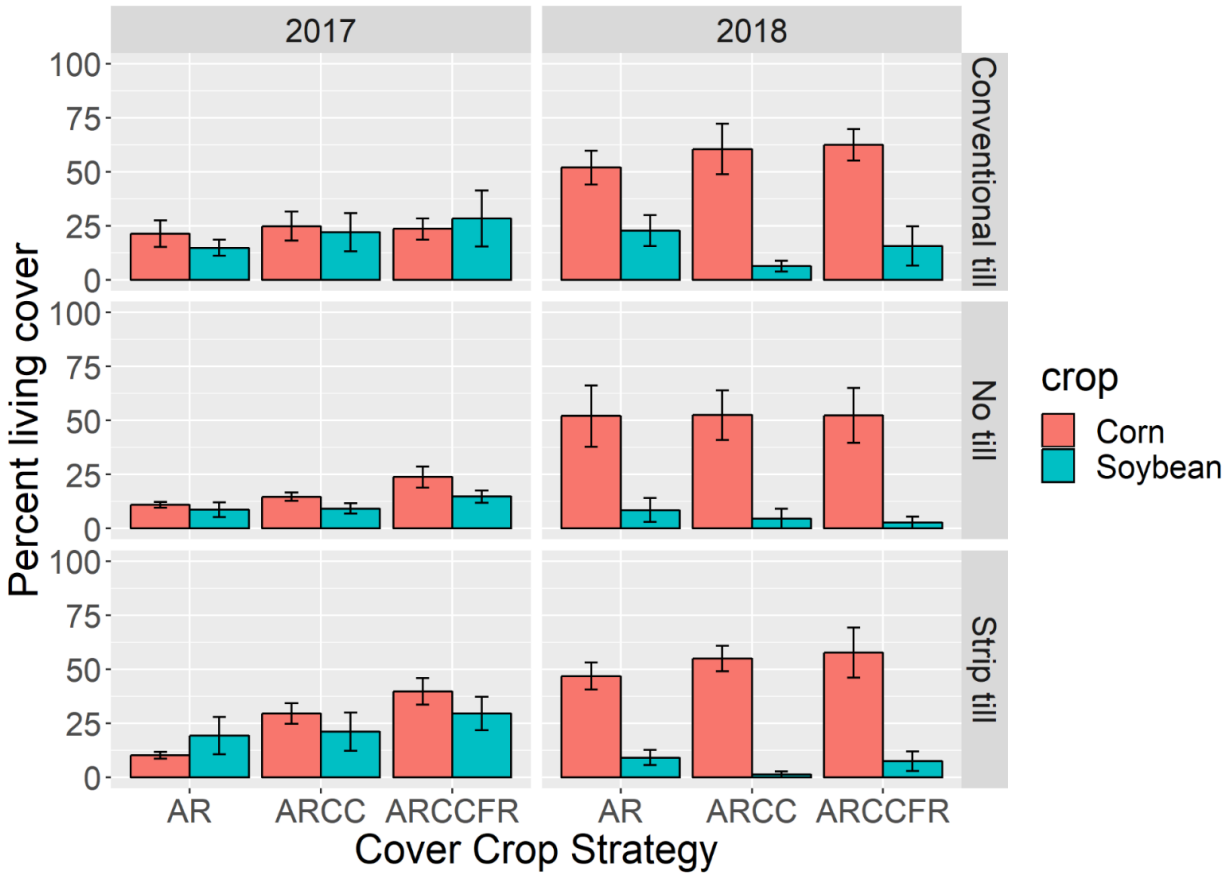

Figure 2 – Cover crop establishment in Waseca, MN in 2017 and 2018. Values are treatment means ± SE (n=4).

Cover crops in multiple locations (objective b)

Field activities for the reporting period concluded end of October in Lamberton and Waseca, and beginning of November in Grand Rapids (Table 1).

Table 1 – Field activities performed during the reporting period.

Location	**Corn harvest date**	**Average bushels/acre (15.5% moisture)**	**Soybean harvest date**	**Average bushels/acre (13% moisture)**
Grand Rapids	November 5	158	October 22	43
Lamberton	October 20	215	October 17	*
Waseca	October 27	162	October 24	58

*Being processed

Yield of corn was highest at Lamberton and similar between Waseca and Grand Rapids. Short-season varieties are planted at Grand Rapids, but excess rainfall in Waseca during the growing

season affected yield at that location. Cover crop treatment did not affect corn yield at any location.

Weather conditions in all locations

The beginning of the reporting period was already cold (Fig. 3). At the time of the first frost days, cereal rye has established at all locations.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

i. Due to weather conditions, cover crop establishment in both the spring and fall of 2018 was poor.

ii. Cover crops were seeded earlier in August 2018. This, however, did not improve establishment, probably due to shading or predation.

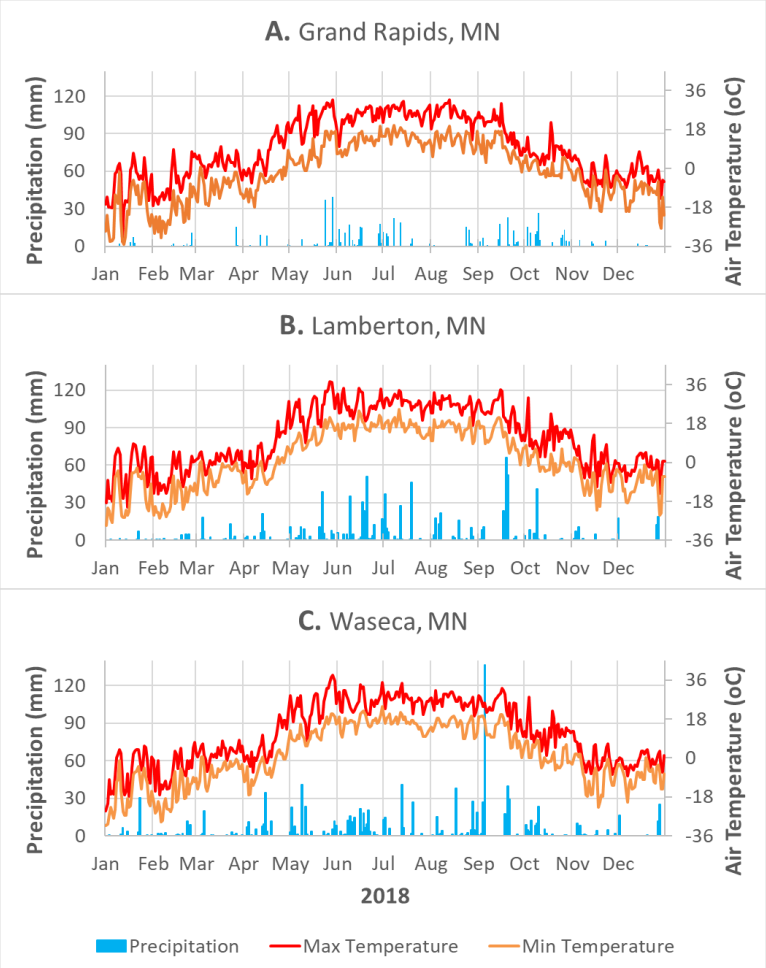

Fig. 3 – Weather conditions during the 2018 growing season at the experimental sites.

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

No significant challenges were experienced

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)

No budgetary challenges to report.

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

Rusch, HL, JA Coulter, and A **Garcia y Garcia**. 2018. Advancing sustainable corn production with cover crops. Crop Pest Management short course meeting. December 11-13, Minneapolis, MN. Attended: no count

Garcia y Garcia, A. 2018. Demystifying the benefits and limitations of cover crops use in corn-soybean rotations in MN. Crop Pest Management Short Course and Minnesota Crop Production Retailers Trade Show. Convention Center, Minneapolis, MN. Dec. 11-13. Attended: 60

KC, R, GA Johnson, JS Strock, NR Jordan, A **Garcia y Garcia**. 2018. Cover Crops Performance in Corn-Soybean Rotation Under Different Tillage Practices. ASA-CSSA Meeting, Nov. 4-7, Baltimore, MD. [poster] Attended: no count

Rusch, HL, JA Coulter, JM Grossman, GA Johnson, PM Porter, and A **Garcia y Garcia**. 2018. Cover crops reduce nitrate leaching in corn in the Upper Midwest. ASA-CSSA Meeting, Nov. 4-7, Baltimore, MD. [poster] Attended: no count.

Rusch, HL, JA Coulter, JM Grossman, GA Johnson, PM Porter, and A **Garcia y Garcia**. 2018. Does Cover Crop Nitrogen and Water Use Reduce Corn Yield in the U.S. Upper Midwest? ASA-CSSA Meeting, Nov. 4-7, Baltimore, MD. [oral] Attended: 21.