

Impact of Cover Crop on Subsequent Irrigated Crop Yield and Soil Quality Indicators, NRCS Demo Farm

Study ID: 0708077202001

County: Greeley

Soil Type: Hersh fine sandy loam 3-6% slopes;
Gates silt loam 6-11% slopes; Gates silt loam 11-17% slopes.

Planting Date: 11/1/19

Harvest Date: 7/25/20

Seeding Rate: 110 lb/ac

Row Spacing (in): 7.5

Hybrid: Rye

Reps: 6

Previous Crop: Rye (fall/winter)

Tillage: No-Till

Herbicides: *Pre:* None *Post:* None

Seed Treatment: None

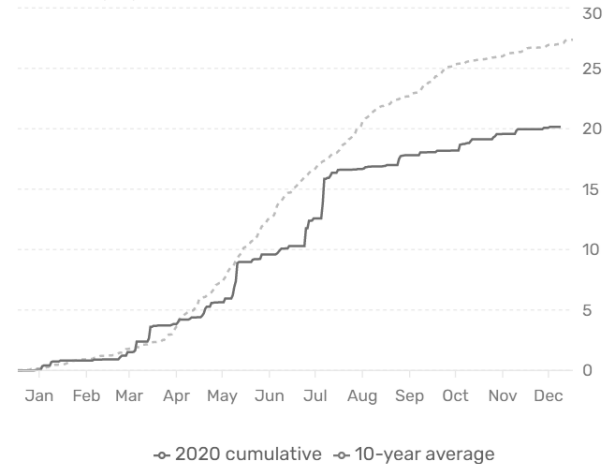
Foliar Insecticides: None

Foliar Fungicides: None

Fertilizer: 20 lb/ac N as 32% UAN and 10 lb/ac S as thiosulfate through the pivot

Irrigation: Pivot, Total: 6"

Rainfall (in):



Introduction: This study is being conducted on a soil health demonstration farm as part of the Nebraska USDA/Natural Resources Conservation Service's (NRCS) Soil Health Initiative, and involves the farmer, the Nebraska On-Farm Research Network, and the USDA/NRCS. Two treatments, a no cover crop check and a cover crop mix, will be used in this five-year study (2016-2021). This is the fourth year of this study. In 2019, following soybean harvest, cereal rye was drilled across both cover crop and no cover crop treatments on November 1, 2019, and harvested between July 13 and July 25, 2020. Following rye harvest, cover crops were drilled. Cover crop mix consisted of oats, sorghum, pearl millet, radish, forage collards, rapeseed, buckwheat, mustard, sunn hemp, mung bean, winter pea, and soybean. Baseline and soil health measures were collected in 2017, 2018, 2019, and 2020 (Table 1).

Results:

Table 1. Soil physical, chemical, and biological properties for cover crop and no cover crop treatments.

Treatment	Infiltration (in/hr)	Soil moisture (%)	Bulk density (g/cm ³)	Soil temp. (F)	Soil respiration ¹	Total soil health score ²
2017 (1 sample per treatment replication, n=6 per treatment; samples collected on Oct. 18, 2017)						
Check	5.19 A*	22.7 A	1.32 A	51.2 A	2.96 A	14.0 A
Cover Crop Mix	7.23 A	20.3 A	1.34 A	51.5 A	3.03 A	13.8 A
P-Value	0.682	0.374	0.726	0.352	0.854	0.6302
2019 (1 sample per treatment replication, n=6 per treatment; samples collected on Oct. 22, 2019)						
Check	2.03 A	13.25 A	1.41 A	44.16 B	2.44 A	12.9 A
Cover Crop Mix	6.45 A	14.56 A	1.27 A	46.06 A	2.86 A	13.3 A
P-Value	0.267	0.488	0.179	0.098	0.296	0.477

2020 (1 sample per treatment replication, n=6 per treatment; samples collected on Oct. 20, 2020)						
Check	6.32 A	20.1 A	1.28 A	47.0 A	2.57 A	13.9 B
Cover Crop Mix	5.19 A	18.2 A	1.34 A	47.1 A	2.64 A	16.8 A
P-Value	0.7222	0.4355	0.3813	0.8661	0.9255	0.0001

¹Soil respiration (Solvita® burst).

²Score based on field assessment. The overall indicator score is based on the sum of 8 indicators (averaged from 1-3; 1=degraded, 2=in transition, 3=healthy): soil structure, structure type, surface condition, soil management, soil pores, earthworms, biological activity, and smell.

Soil assessment was not completed in 2018 as it was originally planned for every other year interval.

*Values with the same letter are not significantly different at a 90% confidence level.

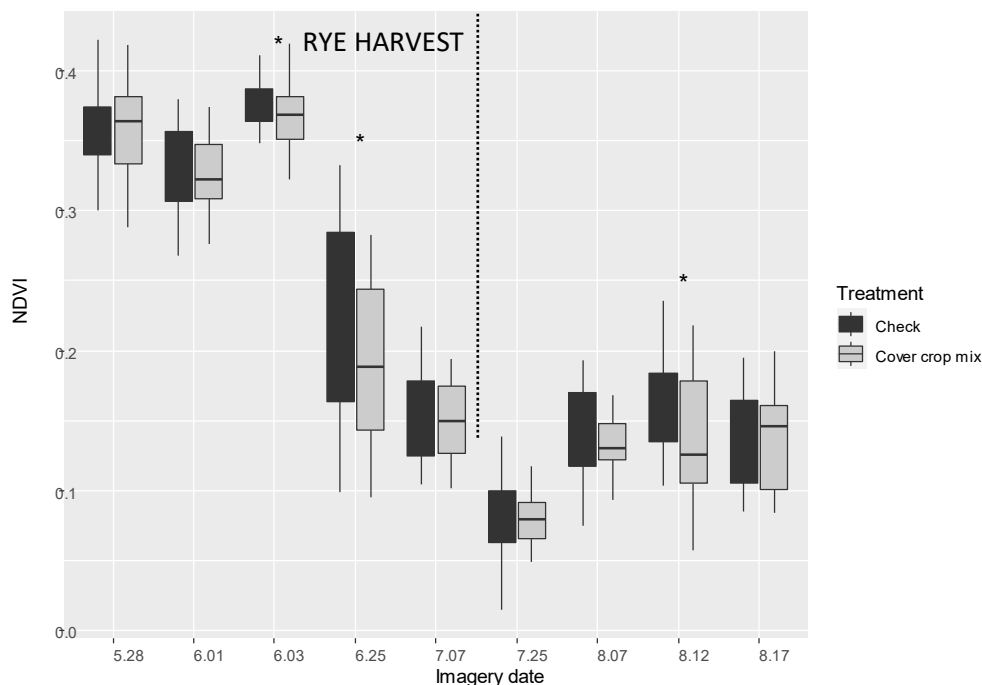


Figure 1. Normalized difference vegetation index (NDVI) values from aerial imagery for the rye and cover crop in check and cover crop mix strips from May 28 to August 17. Asterisk (*) within each date indicates significant differences at a 90% confidence level.

Table 2. 2020 rye test weight, moisture, yield, and net return for cover crop mix and no cover crop treatments.

	Test Weight (lb/bu)	Moisture (%)	Rye Yield (bu/acre) [†]	Marginal Net Return [‡] (\$/ac)
Check	53.70 A*	12.4 A	42.2 A	253 A
Cover Crop Mix	53.77 A	12.4 A	40.0 A	240 A
P-Value	0.7538	1.0000	0.1993	0.1993

*Values with the same letter are not significantly different at a 90% confidence level.

[†]Bushels per acre corrected to 15% moisture.

[‡]Marginal net return based on \$6.01/bu cereal rye. Costs of cover crop drilled after rye harvest (\$20/ac) were not included on the analysis.

Summary:

- Total soil health score was lower for the no cover crop check in 2020 (Table 1).
- Multiple rain and wind events in late July delayed/interrupted harvest, and the last wind storm flattened the rye on the east half of the field. Farmer had to combine one way going east to west. This destroyed the yield sampling process. Farmer was only able to collect yield data on 3 of the 6 reps.
- There were no differences in rye test weight, moisture, yield and marginal net return between the treatments (Table 2). Results from previous years follow.

Summary of Previous Years

YEAR ONE | In year one, following cover crop termination corn was planted in this area. No yield measurements were made for the check and cover crop mix treatments

YEAR TWO | In year two, the cover crop was drilled following corn harvest on November 17, 2018. Cover crop mixture was composed of 50 lbs/ac cereal rye, 1 lbs/ac forage collards, 1 lbs/ac turnips, 1 lbs/ac rapeseed, and 1 lbs/ac kale. Soybeans were planted into the cover crop on May 15, 2019. The cover crop was terminated on June 1, 2019, with a herbicide application. Cover crops were 10" tall at the time of termination. Soybeans were harvested in November 2019. The year was very wet with 21" of rain from planting to August 26, 2019. There were no differences in soybean yield, moisture, or test weight between the cover crop treatment and no cover crop check. Marginal net return was lower for the cover crop treatment due to the additional cost of cover crop seed and drilling.

Table 3. 2019 soybean yield, moisture, and marginal net return for cover crop mix and no cover crop treatments.

	Test Weight (lb/bu)	Moisture (%)	Soybean Yield (bu/ac) [†]	Marginal Net Return [‡] (\$/ac)
No Cover Crop	57 A	10.0 A	55 A	444.82 A
Cover Crop Mix	57 A	9.9 A	54 A	397.26 B
P-Value	0.180	0.530	0.514	0.010

[†]Bushels per acre adjusted to 13% moisture.

[‡]Marginal net return based on \$8.10/bu soybean, \$25/ac cover crop seed cost, and \$14.40/ac for drilling.

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