

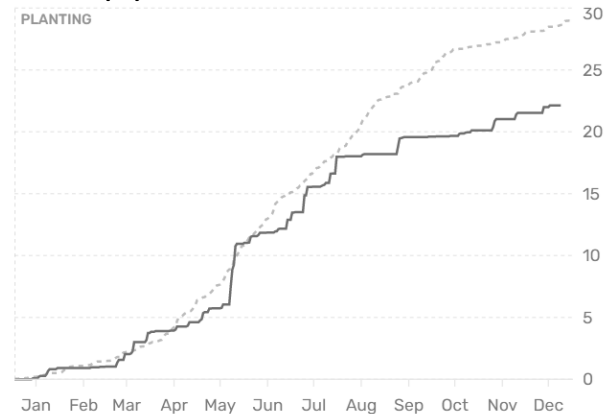
Rye Planted Following Cover Crop Mix and No Cover Crop, NRCS Demo Farm

Study ID: 0914093202001
County: Howard
Soil Type: Holdrege silty clay loam
Planting Date: 10/9/19
Harvest Date: 7/23/20
Seeding Rate: 72 lb/ac
Row Spacing (in): 7.5
Hybrid: Rye
Reps: 7
Previous Crop: Soybean
Tillage: No-Till
Herbicides: *Pre:* None *Post:* None
Seed Treatment: Inoculant
Foliar Insecticides: None
Foliar Fungicides: None

Fertilizer: 117 lb/ac 11-52-0, 86 lb/ac lb K-mag, 27 lb/ac pell lime, 2 lb/ac 36% zinc.

Irrigation: Pivot, Total: 6" on cover crops

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 are being evaluated in this five-year study: cover crop mix and no-cover crop check. These plots will be maintained throughout the project (2017-2021). This is the fourth year of this study. In 2019, following soybean harvest, rye was drilled across both cover crop and no cover crop treatments on October 9, 2019, and harvested on July 23, 2020. 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=7 per treatment; samples collected on Nov. 16, 2017)						
Check	7.07 A*	24.1 A	1.08 A	48.3 A	5.04 A	12.8 A
Cover Crop Mix	13.11 A	26.7 A	1.11 A	48.6 A	4.79 A	12.9 A
P-Value	0.446	0.525	0.457	0.724	0.391	0.750
2018 (1 sample per treatment replication, n=7 per treatment; samples collected on Oct. 28, 2018)						
Check	-	30.1 A	1.19 A	48.5 A	-	13.8 A
Cover Crop Mix	-	31.3 A	1.21 A	48.8 A	-	14.5 A
P-Value	-	0.422	0.654	0.799	-	0.286
2019 (1 sample per treatment replication, n=7 per treatment; samples collected on Oct. 29, 2019)						
Check	0.59 A	21.51 A	1.16 A	47.71 A	3.64 A	14.1 B
Cover Crop Mix	0.62 A	23.33 A	1.15 A	46.69 A	4.43 A	16.0 A
P-Value	0.781	0.616	0.817	0.521	0.297	0.00205
2020 (1 sample per treatment replication, n=7 per treatment; samples collected on Oct. 8, 2020)						
Check	36.1 A	10.1 A	1.04 A	54.3 A	3.83 A	18.6 B
Cover Crop Mix	33.7 A	11.6 A	1.09 A	53.3 A	3.42 A	20.3 A
P-Value	0.886	0.138	0.396	0.497	0.259	0.0212

¹Soil respiration (Solvita® burst).

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

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

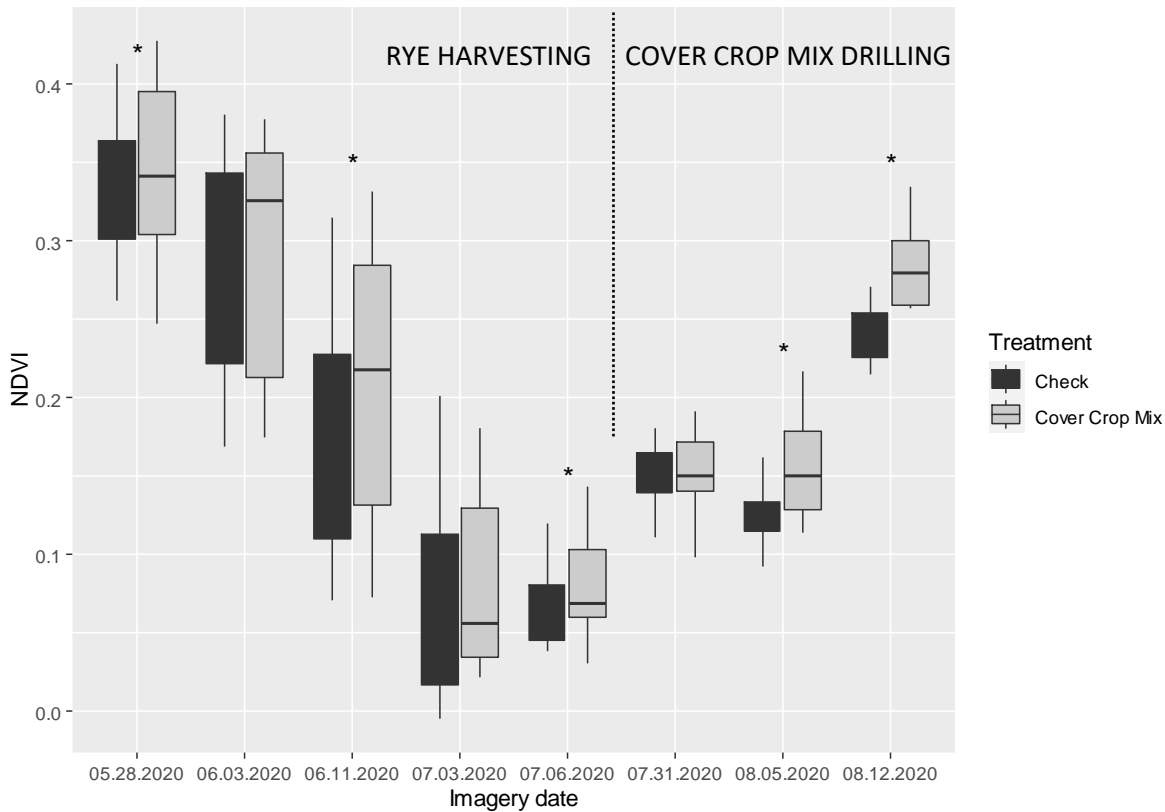


Figure 1. Normalized difference vegetation index (NDVI) values from aerial imagery for the rye crop following cover crop and no-cover crop mixture. Asterisk (*) within each date indicates significant difference ($p < 0.10$) between treatments at a 90% confidence level.

Table 1. 2020 rye test weight, moisture, yield, and net return for cover crop mix and no cover crop treatments.

	Moisture (%)	Rye Yield (bu/acre) [†]	Marginal Net Return [‡] (\$/ac)
Check	14.5 A	40.9 A	246 A
Cover Crop Mix	14.5 A	42.4 A	255 A
P-Value	0.965	0.35144	0.35144

*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 were not included on the analysis.

Summary:

- Total soil health score was lower for the no cover crop check in 2019 and 2020 (Table 1).
- Aerial imagery normalized difference vegetation index (NDVI) analysis before rye harvest showed higher values for rye following cover crop (May 26, June 11 and July 6). After cover crop drilling, NDVI showed higher values for the cover crop compared to check strips due to cover crop biomass growth. Check strips showed increases in NDVI after rye harvest due to volunteer rye.
- There were no differences in rye test weight, moisture, yield and marginal net return between the treatments. Results from previous years follow.

Summary of Previous Years

YEAR ONE | In year one, cover crops were drilled after corn harvest in 2016. The cover crop mix was kale, Trophy rapeseed, purple turnips, forage collards, hairy vetch and rye. Cover crop that did not winter terminate was terminated with herbicides on May 2017. Soybeans were planted in this area on May 26, 2017, and harvested on October 15, 2017. No yield measurements were made for cover crop and no cover crop strips.

YEAR TWO | In year two, following soybean harvest in October 2017, cover crop mix of 33 lbs/ac cereal rye, 0.8 lbs/ac turnip, 1.6 lbs/ac canola, 0.6 lbs/ac African cabbage, 0.5 lbs/ac Forage collards, 1.1 lbs/ac sunflower, 1.6 lbs/ac hairy vetch, 1.1 lbs/ac radish, 1 lbs/ac safflower and 1 lbs/ac winter lentil was drilled. Cover crop that did not winter terminate was terminated with herbicides on May 2018. Corn was planted in this area on May 7, 2018, and harvested on September 11, 2018. Corn experienced hail damage on August 16, 2018. No yield measurements were made for cover crop and no cover crop strips.

YEAR THREE | In year three, the cover crop mix was Barkant turnips, African cabbage, impact forage collards, Dwarf Essex rapeseed, Eco-Till radish, peredovik sunflowers, finish safflowers, VNS hairy vetch, Viceroy lentils, and rye. The cover crop was seeded after corn harvest on September 21, 2018. Cover crops that did not winter terminate were terminated with herbicides on May 14, 2019, at a height of 3". Soybeans were planted on May 16 in 30" row spacing and harvested on September 30, 2019. Soybeans experienced damage from heavy thistle caterpillar infestations. Due to visual differences observed in imagery and crop senescence, additional grain quality samples were collected. The treatments did not result in differences in soybean moisture, yield, or net return. Aerial imagery normalized difference vegetation index (NDVI) analysis showed soybeans following the no cover crop treatments had greater leaf senescence and were more mature.

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

	Pods/ plant	Grain/ plant	Linoleic (%)	Saturated fat (%)	Protein (%)	Oil (%)	Fiber (%)	Moisture (%)	Yield (bu/ac) [†]	Marginal Net Return [‡] (\$/ac)
Check	48.5 A	103 A	6.7 A	10.6 A	34.0 A	19.6 A	4.9 A	15.0 A	67.9 A	549.67 A
Cover Crop Mix	49.9 A	107 A	6.6 A	11.1 A	35.1 A	19.2 A	4.8 A	16.8 A	69.5 A	524.69 A
P-Value	0.897	0.771	0.880	0.397	0.385	0.175	0.178	0.210	0.779	0.605

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

[†]Yield values are from cleaned yield monitor data. Bushels per acre adjusted to 13% moisture.

[‡]Marginal net return based on \$8.10/bu soybean, \$24/ac cover crop seed, and \$14.40 drilling.

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