

Impact of a Cover Crop Mix with One Cereal Grain versus Cover Crop Mix with Multiple Cereal Grains on Soil Quality, Moisture, and the Subsequent Crop Yield

Study ID: 0388131201801

County: Otoe

Soil Type: Wymore silty clay loam 2-6% slopes; Pawnee clay loam 4-8% slopes, eroded; Judson silt loam 2-6% slopes

Planting Date: 4/29/18

Harvest Date: 10/22/18

Population: 165,000

Row Spacing (in): 15

Variety: Channel® R2C3350

Reps: 4

Previous Crop: Corn

Tillage: No-Till

Herbicides: Pre: 3.25 oz/ac Fierce®, 40 oz/ac Roundup PowerMAX®, 5 lb/ac Array®, 1 qt/100 Choice Weather Master, and 9.6 oz/ac MSO on 5/6/18 **Post:** 3.25 oz/ac Fierce®, 32 oz/ac Roundup PowerMAX®, 5 lb/ac Array®, 1 qt/100 Choice Weather Master, and 9.6 oz/ac MSO on 6/12/18

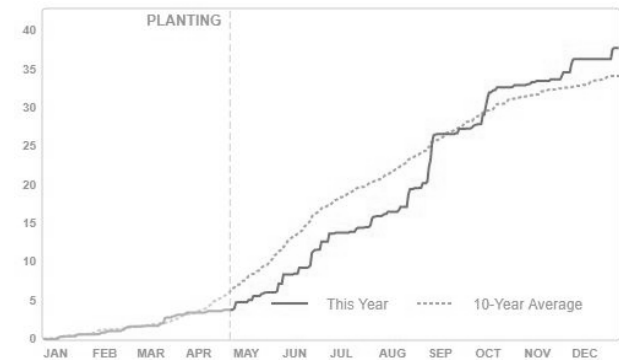
Seed Treatment: None

Foliar Fungicides/Insecticides: 10 oz/ac Aframe™ Plus fungicide, 1 qt/ac Brandt Smart Qualtro®, 3.5 oz/ac Endigo® ZC insecticide, 0.5 pt/ac Warhawk® insecticide, and 2 oz/ac of Wet applied to 30 acres of the field (edges of the field)

Fertilizer: 6 ton/ac of compost and nutrient solids from Prairieland Dairy consisting of 120 lb/ac N, 30 lb/ac P, 82 lb/ac K, 22 lb/ac S, 112 lb/ac Ca, 40 lb/ac Mg, 26 lb/ac Na, 1.2 lb/ac Zn, 79 lb/ac Fe, and 3 lb/ac Mn

Irrigation: None

Rainfall (in):



Introduction: This study is being conducted on a soil health demonstration farm as part of the Nebraska USDA/Natural Resource Conservation Service's (NRCS) Soil Health Initiative, and involves the farmer, the Nebraska On-Farm Research Network, and the USDA/NRCS. The purpose of this study is to compare the impact of a cover crop mixture with one cereal grain and a cover crop mixture with multiple cereal grains on soil quality, soil moisture, and subsequent crop yield. Cover crops were drilled in late October 2017. The one cereal grain mix included 56 lb/ac cereal rye, 2 lb/ac annual ryegrass, and 1.3 lb/ac canola. The cover crop mix with multiple cereal grains included 10 lb/ac cereal rye, 1.3 lb/ac annual ryegrass, 1.3 lb/ac canola, 10 lb/ac winter barley, 6.7 lb/ac triticale, 10 lb/ac oats, 6.7 lb/ac winter wheat, 8 lb/ac spring barley, and 1.3 lb/ac trunip. The cover crops were terminated with the pre-herbicide application on May 6, 2018. Cover crops were 12 to 18 inches tall at the time of termination.

A baseline Haney soil test is available from fall 2016. Haney soil tests were also taken from each treatment in fall 2017 and December 2018. Soybean yield was analyzed using yield monitor data. Aerial imagery was collected on August 11, 2018.

There were several challenges to soybean production. Dectes Stem Borer was evident. There was no rain from July 12 through August 22. Excessive rain after maturity delayed harvest and negatively impacted the crop quality and harvestability.

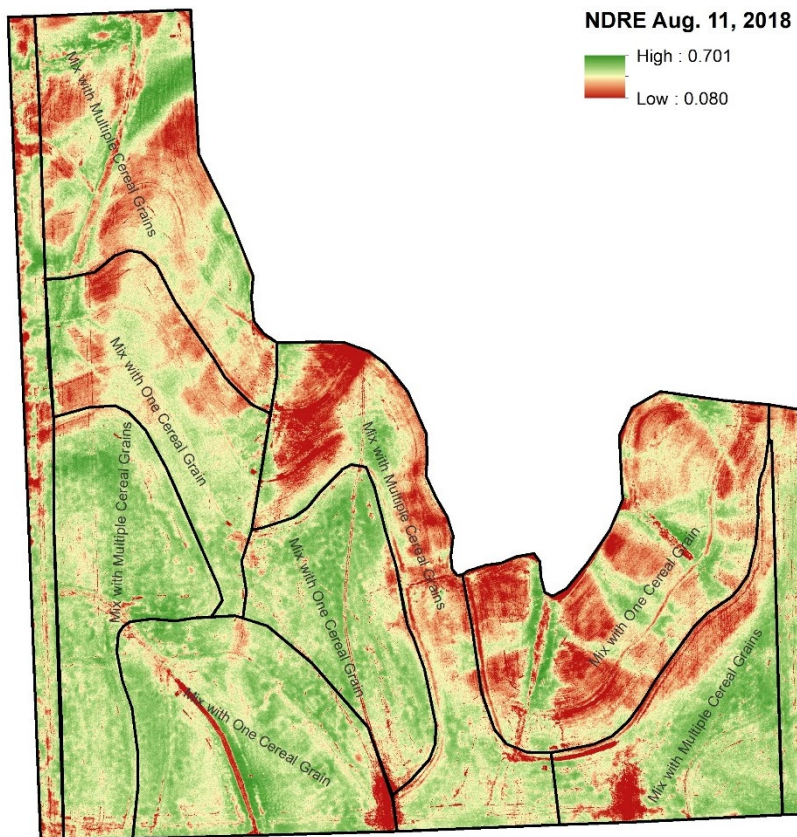


Figure 1. True color imagery (top) and normalized difference red edge index (NDRE) (bottom) from August 11, 2018.

Table 1. Soil health samples from 2016, 2017, and 2018.

Treatment	Solvita CO2 Burst (ppm)	Total Nitrogen (ppm)	Organic Nitrogen (ppm)	Total Organic Carbon (ppm)	Nitrate (ppm)	Ammonium (ppm)	Inorganic Nitrogen (ppm)	Organic C : N	Organic Nitrogen Release (ppm)	Soil Health Score
2016 Baseline	118.0	27.3	17.9	184	9.3	1.0	10.2	10.3	17.9	15.05
2017 Cover Crop Mix with One Cereal Grain	71.8	16.3	12.5	180	2.7	0.1	2.8	14.4	12.5	12.02
2017 Cover Crop Mix with Multiple Cereal Grains	119.2	20.1	13.5	194	4.7	1.5	6.2	14.4	13.5	15.17
2018 Cover Crop Mix with One Cereal Grain	136.3	21.7	12.3	199	9.0	2.5	11.5	16.2	12.3	16.57
2018 Cover Crop Mix with Multiple Cereal Grains	74.5	23.7	14.1	202	8.7	2.9	11.6	14.3	14.1	12.90

Table 2. 2018 yield, moisture, and net return for soybeans following cover crops with one cereal grain and with multiple cereal grains.

	Moisture (%)	Soybean Yield [†] (bu/ac)	Marginal Net Return [‡] (\$/ac)
Cover Crop Mix with One Cereal Grain	7.0 A*	34 A	199.82 A
Cover Crop Mix with Multiple Cereal Grains	7.6 A	36 A	216.46 A
P-Value	0.613	0.425	0.324

*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 corrected to 13% moisture.

[‡]Marginal net return based on \$7.40/bu soybean, \$53.84/ac for the one cereal grain mix, and \$50.21/ac for the multiple cereal grain mix.

Summary: There was no difference in moisture, soybean yield, or net return for the two treatments.

Summary of Previous Year (Year 1 of 5)

In year one, cover crops were drilled in the fall of 2016. Both mixtures included annual rye, canola, balansa clover, camelina, vetch, crimson clover, winter lentils, alfalfa, and northern annual field peas. The cover crop mix with one cereal grain included cereal rye as a base while the cover crop mix with multiple cereal grains included winter oats, spring barley, winter barley, triticale, wheat, and cereal rye. The cover crops were terminated with glyphosate herbicide on April 16, 2017. This is an early termination date relative to the corn planting date of May 7 for the area (NRCS Zone 3).

Table 3. 2017 yield, moisture, and net return for corn following cover crops with one cereal grain and with multiple cereal grains.

	Corn Moisture (%)	Corn Yield (bu/acre) [†]	Marginal Net Return [‡] (\$/ac)
Cover Crop Mix with One Cereal Grain	14.6 A*	157 A	421.56 A
Cover Crop Mix with Multiple Cereal Grains	14.8 A	159 A	432.92 A
P-Value	0.209	0.708	0.588

*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 corrected to 15.5% moisture.

[‡]Marginal net return based on \$3.15/bu corn, \$53.84/acre for cover crop mix with one cereal grain, \$50.21/acre for cover crop mix with multiple cereal grains.

A complete year 1 report is available online at: <http://resultsfinder.unl.edu/>.