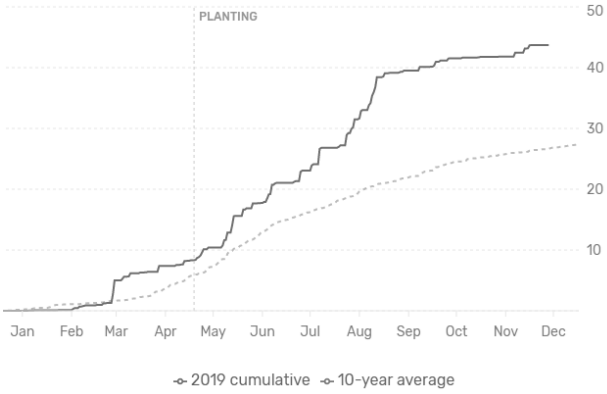
Irrigated Soybeans Planted Following Dormant and Interseeded Cover Crop, Dormant Seeded Cover Crop, and No Cover Crop Check

Study ID: 0815079201901
County: Hall
Soil Type: Kenesaw silt loam, 1-6% slopes; Valentine-Thurman, 0-17% slopes; Thurman loamy fine sand, 0-2% slope; Thurman loamy fine sand, 2-6% slopes; Kenesaw silt loam, 0-1% slope
Planting Date: 5/3/19
Harvest Date: 10/8/19
Seeding Rate: 174,000
Row Spacing (in): 30
Variety: Pioneer® P24A99X
Reps: 6
Previous Crop: Corn
Tillage: Strip-Till
Herbicides: ***Pre:*** 32 oz/ac Buccaneer® 5 Extra, and 8 oz/ac Outlook® on 5/5/19 ***Post:*** 6 oz/ac clethodim, 18 oz/ac Buccaneer® 5 Extra, and 4 oz/ac Outlook® on 6/4/19; 48 oz/ac Buccaneer® 5 Extra, and 10 oz/ac Outlook® on 6/24/19

Seed Treatment: Lumisena™ and EverGol® Energy SB
Foliar Insecticides: 2 oz/ac Serpent™ and 2 oz/ac Fanfare™ through pivot on 7/19/19; 2 oz/ac Serpent™ and 2 oz/ac Fanfare™ through pivot on 8/2/19
Fertilizer: 5 gal/ac 10-34-0 and 1 pt/ac Zn on 5/3/19
Irrigation: Pivot, Total: 3.92"
Rainfall (in):



Baseline Soil Health Soil Test (Jan. 2017 – 18 samples, averaged over study area):

CO_2-C	Total Nitrogen	Organic Nitrogen	Total Organic Carbon	Nitrate	Ammonium	Organic C:N	Soil Health Score
ppm							
19.51	11.83	9.47	129.50	1.71	0.56	13.84	5.49

Baseline Standard Soil Test (Jan. 2017 - 31 samples, averaged over study area):

OM%	pH	CEC (meq/100 g)	Nitrate	Phosphorus	Potassium	Magnesium	Sulfur	Sodium	Sol Salts (S/m)
			ppm						
1.094	5.57	9.41	7.07	34.55	207.1	121.03	17.1	21.77	0.11

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. This study is examining three treatments: 1) dormant (post-harvest) seeded cover crops and interseeded cover crops, 2) dormant (post-harvest) seeded cover crops, and 3) a no cover crop check. This is the second year of the study.

During the 2018 growing season, when the field was planted to corn, cover crops were interseeded using a Hiniker interseeder. The interseeding mix consisted of 6 lb/ac cowpea, 6 lb/ac soybean, 0.5 lb/ac crimson clover, 5 lb/ac sunn hemp, 2 lb/ac hairy vetch, 3 lb/ac buckwheat, 0.5 lb/ac chicory, 0.5 lb/ac flax, 0.5 lb/ac rapeseed/canola, 6 lb/ac Elbon cereal rye, and 6 lb/ac spring oats. The farm was in soybeans this year, so there was not any interseeding of cover crops during the 2019 growing season.

In the fall of 2018, the dormant seeded cover crop strips were seeded with a cover crop mix of Elbon cereal rye, winter wheat, triticale, annual ryegrass, winter oats, hairy vetch, camelina, and winter lentil. Soybeans were planted on May 3, 2019 in 30" row spacing. The cover crop mix was terminated May 5, 2019 by herbicide. Cover crops were 8 to 10" tall at the time of termination. Thistle caterpillars caused a large amount of defoliation in the field in June 2019.

Results:

Table 1. Soil physical, chemical, and biological properties for dormant and interseeded cover crop and no cover crop treatments. Samples were collected on 10/29/19 (1 sample per treatment replication, 6 samples per treatment).

Treatment	Infiltration (in/hr)	Soil moisture (%)	Bulk density (g/cm^3)	Soil temp. (F)	Soil respiration[1]
Check	6.15 A*	16.50 A	1.24 A	37.33 A	2.42 A
Dormant	3.12 A	15.21 A	1.28 A	37.00 A	2.33 B
Dormant + Interseeded	8.81 A	13.33 A	1.24 A	37.17 A	3.42 A
P-Value	0.532	0.262	0.904	0.690	0.064

[1]Soil respiration (Modified Solvita burst).
*Values with the same letter are not significantly different at a 90% confidence level.

Table 2. NRCS field assessments of soil health. Samples were collected on 10/29/19 (1 sample per treatment replication, 6 samples per treatment).

	NRCS Field Assessment of Soil Health								
Treatment	Structure	Structure type	Surface condition	Mgmt	Soil pores	Earth worm	Biological activity	Soil smell	Overall indicator[2]
Check	2.08 A	2.08 A	1.92 A	1.50 B	2.17 A	1.58 A	1.91 A	2.00 A	1.91 A
Dormant	1.92 A	1.91 A	1.83 A	2.42 A	2.17 A	1.58 A	1.91 A	1.75 A	1.94 A
Dormant + Interseeded	1.92 A	1.91 A	1.75 A	2.50 A	1.87 B	1.67 A	2.00 A	1.89 A	1.86 A
P-Value	0.708	0.681	0.402	<.0001	0.018	0.900	0.808	0.195	0.715

[2]Score 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.

Table 3. Soybean yield, moisture, and marginal net return for dormant and interseeded cover crop and no cover crop treatments.

Treatment	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
Check	13.5 A	84 A	681.00 AB
Dormant Seeded	13.8 A	87 A	661.85 B
Dormant + Interseeded	13.5 A	89 A	724.21 A
P-Value	0.738	0.119	N/A

†Yield values are from cleaned yield monitor data. Bushels per acre adjusted to 13% moisture.
‡Marginal net return based on $8.10/bu soybean, $31.19/ac for seed mix for dormant seeded treatment, and $14.40/ac for drilling for dormant seeded treatment. Interseeded cover crop costs were accounted for in the previous year's report; therefore, they are not included in this analysis.

Summary:

- Of the soil physical, chemical, and biological properties measured, only soil respiration, management, and soil pores were different in the second year of the study. The dormant cover crop treatment had a reduced soil respiration score, the check had a lower management score, and the dormant and interseeded treatment had a lower soil pore score.

- There was no yield or grain moisture difference between the treatments.
- Net return was higher this year for the interseeded treatment than the dormant seeded treatment. This is because the cover crops interseeded in the summer of 2018 already had the cover crop seed and planting costs accounted for in the previous year's analysis; therefore, there were no additional costs of cover crop seed or planting in this analysis. A comprehensive profitability analysis will be completed at the conclusion of the project.

Summary of Previous Year (Year 1)

2018

In the fall of 2017, both the dormant seeded treatment strips and the dormant and interseeded treatment strips had a cover crop mix. The mix consisted of 40 lb/ac Elbon cereal rye, 1 lb/ac rapeseed/canola, 3 lb/ac winter oats, and 6 lb/ac hairy vetch. The cover crop was terminated on May 10 with glyphosate.

During the 2018 growing season, the interseeded cover crop treatment strips were planted with a cover crop mix on June 26 using a Hiniker interseeder (Figure 1). The interseeding mix consisted of 6 lb/ac cowpea, 6 lb/ac soybean, 0.5 lb/ac crimson clover, 5 lb/ac sunn hemp, 2 lb/ac hairy vetch, 3 lb/ac buckwheat, 0.5 lb/ac chicory, 0.5 lb/ac flax, 0.5 lb/ac rapeseed/canola, 6 lb/ac Elbon cereal rye, and 6 lb/ac spring oats.

The 2018 corn crop was harvested on October 6 and evaluated for yield and moisture.

Results:

	Moisture (%)	Yield† (bu/ac)	Marginal Net Return‡ ($/ac)
Check	19.1 A*	203 A	654.96 A
Cover Crop – Dormant Seeded	18.8 A	205 A	624.81 AB
Cover Crop – Dormant + Interseeded	18.8 A	209 A	586.09 B
P-Value	0.280	0.674	0.048

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 15.5% moisture.
‡Marginal net return based on $3.23/bu corn. Interseeded cover crop seed cost $37.50/ac. The dormant seeded cover crop seed in 2017 prior to this growing season cost $24/ac. A typical custom rate for the Hiniker interseeder is not available; therefore, both seeding methods (dormant drilled and interseeded) are estimated to be $14.40/ac. The interseeded cover crop treatment this year also was preceded by a dormant seeded cover crop; therefore, both the dormant and interseeded seed and seeding costs were incurred by this treatment this year.

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