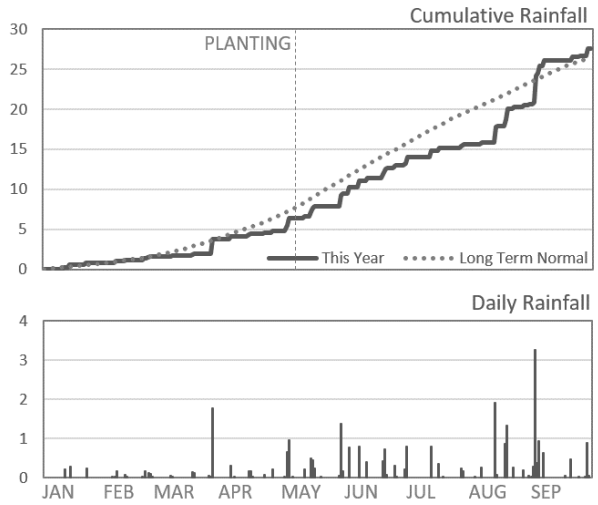
Soybeans Following Winter Terminated and Winter Hardy Cover Crops

Study ID: 0656127201801
County: Nemaha
Soil Type: Judson silt loam 0-2% slope; Judson silt loam 2-6% slopes
Planting Date: 5/7/18
Harvest Date: 9/17/18
Row Spacing (in): 15
Variety: Pioneer® 24T19R
Reps: 7
Previous Crop: Corn
Tillage: No-Till
Herbicides: ***Pre:*** 6 oz/ac Sonic®, 16 oz/ac generic Dual, 16 oz/ac 2,4-D 6#, 8 oz/ac Absorb 100, and 16 oz/ac Buccaneer 5 Extra® on 4/17/18 ***Post:*** 16 oz/ac Shafen Star, 8 oz/ac Clethodim 2EC, 32 oz/ac Buccaneer 5 Extra®, 8 oz/ac Absorb 100, and 4 oz/ac N-Tense™ on 6/16/18
Seed Treatment: PPST 2030
Foliar Insecticides: 3.84 oz/ac Lambda-Cy 1 EC aerial applied on 7/26/18
Foliar Fungicides: 10.5 oz/ac Azoxyprop Xtra aerial applied on 7/26/18

Fertilizer: 1 gal/ac NResponse™ on 6/16/18; 1 gal/ac Kugler KS2075 (20% N, 7.5% P, 5% S) aerial applied on 7/26/18
Irrigation: None
Rainfall (in) as measured at field:



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. The two treatments, the use of winter terminated cover crops and the use of winter hardy cover crops, will be used in this five-year study (2016-2021). This is the second year of this study. The cover crops were drilled August 1, 2017. The winter terminated treatment was a mix of 30 lb/ac oats, 1.5 lb/ac canola/rapeseed, and 1 lb/ac turnip. The winter hardy treatment consisted of 30 lb/ac cereal rye, 1.5 lb/ac canola/rapeseed, and 1 lb/ac turnip. This study did not have a no cover crop control. For uniformity, both cover crop mixes were sprayed with herbicide to terminate the cover crops on April 17, 2018. Baseline soil health measures (one per treatment) were collected on 10/19/16 (Table 1).

Table 1. Baseline soil quality measurements for winter terminated and winter hardy treatments from 2016.

	Bulk Density (g/cm^3)	Total Pore Space (%)	Water Holding Capacity if all pores filled (inch H_2O/ft)	Solvita at 24 hr	Estimated Solvita Microbial Activity Rating	Average Soil Health Indicator Score
Sample Site 2 (Winter Terminated)	1.25	52.8	6.3	2.0	Low	2.44
Sample Site 1 (Winter Hardy)	1.22	53.9	6.5	2.0	Low	2.59

Table 2. 2018 soybean stand counts, test weight, moisture, yield, and net return for winter hardy and winter terminated cover crop treatments.

	Stand Count (plants/ac)	Test Weight	Moisture (%)	Soybean Yield† (bu/ac)	Marginal Net Return‡ ($/ac)
Winter Terminated	120,744 A*	56 B	11.3 A	65 A	452.80 A
Winter Hardy	120,246 A	56 A	11.2 A	59 B	410.75 B
P-Value	0.872	0.096	0.200	0.002	0.002

*Values with the same letter are not significantly different at a 90% confidence level.
†Bushels per acre corrected to 13% moisture for soybeans.
‡Marginal net return based on $7.40/bu soybean, $12.48/ac winter terminated cover crop seed mix, $12.45/ac winter hardy cover crop seed mix, and $14.40/ac drilling cost.

Figure 1. True color drone imagery from July 24, 2018 of soybeans planted after winter-hardy and winter-killed cover crops.

Summary:

- In 2018, soybeans planted after winter terminated cover crops had a higher yield, lower test weight, and higher net return than the winter hardy cover crops. There were visible differences between the winter terminated and winter hardy cover crops, with the winter terminated having a darker green appearance (Figure 1).

Summary of Previous Year (Year 1 of 5)

In year one, cover crops were drilled on September 29, 2016. The winter terminated treatment was a mix of oats, turnips, and common rapeseed, whereas the winter hardy treatment consisted of cereal rye, turnips, and common rapeseed. For uniformity, both cover crop mixes were sprayed with glyphosate on April 12, 2017. This terminated the winter hardy treatment and controlled weeds and brassicas, which had overwintered in the winter terminated cover crop treatment.

Table 3. 2017 corn stand counts, test weight, yield, and net return for winter hardy and winter terminated cover crop treatments.

	Stand Count (plants/acre)	Test Weight (lb/bu)	Moisture (%)	Corn Yield (bu/acre) †	Marginal Net Return‡ ($/ac)
Winter Terminated	30,355 A*	54 A	18.0 B	183 A	546.97 A
Winter Hardy	30,023 A	52 B	19.1 A	168 B	498.00 B
P-Value	0.802	0.0209	0.0034	0.0003	0.0003

*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 $3.15/bu corn and $30.07 cost for cover crop seed and drilling in both treatments.

In 2017, corn planted after winter terminated cover crops had a higher yield, higher test weight, and was drier than the winter hardy cover crops. There were no differences in harvest stand counts for the corn following the winter terminated and winter hardy cover crops. The corn following the winter hardy mix was three days slower to tassel than the corn following the winter terminated mix.