



Project Objective: The objective of this project is to quantify the effects of cover crops on soybean and corn yields.

- Project Insights:**
1. Most sites resulted in a negative yield response with a cover crop in 2024.
 2. Spring conditions were favorable for significant cover crop growth.
 3. Increased cover crop growth negatively impacted cash crop yield.
 4. Having backup termination and management options can be beneficial.

2024 Yield Results

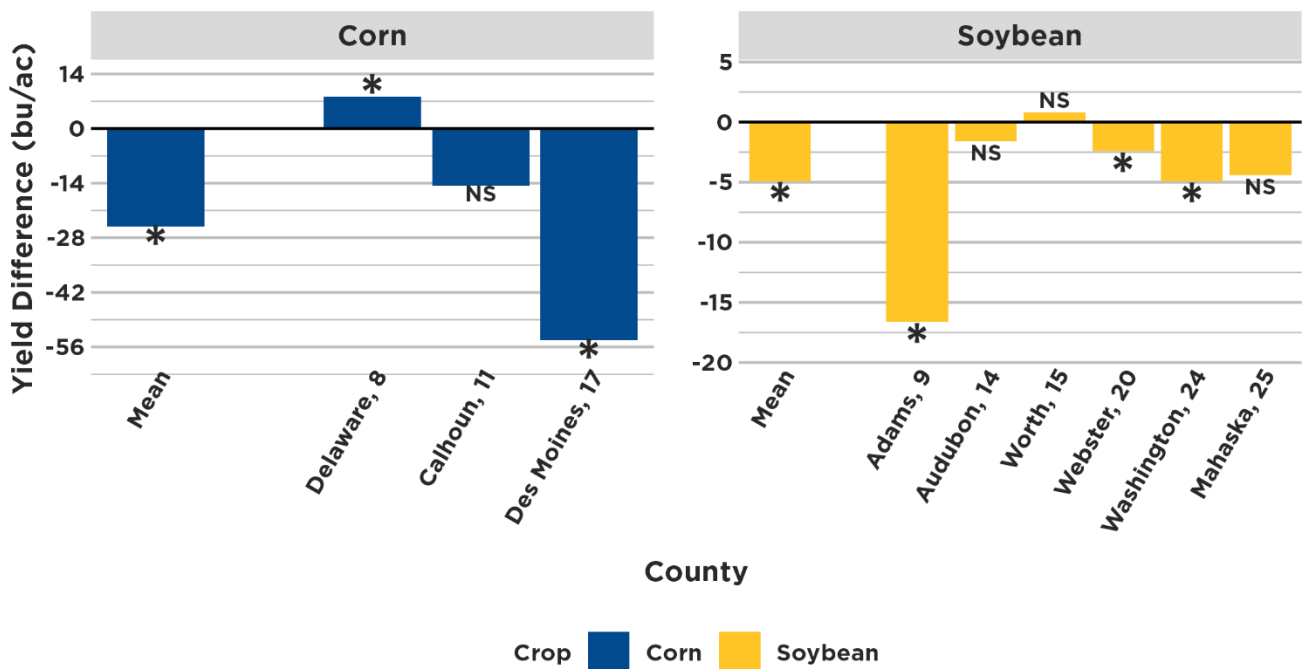


Figure 1 The X-axis is the county and Site ID for each trial, and the Y-axis is the yield difference. A negative value indicates a yield loss in the cover crop treatment. * Indicates statistically significant yield differences, NS indicates a statistically insignificant yield difference.

2024 Project Discussion

The multi-year cover crop project has been ongoing with initial sites established between 2014 and 2019. In 2024, soybean sites were in years 6 to 9 of the project, while the corn locations were all in year 8. The yield response to the cover crop was mainly negative in 2024 with 78% of the sites having a yield loss with the cover crop treatment. Yield differences between the cover crop and no cover crop strips are shown in Figure 1, with the differences ranging from -54.2 to +8.2 bu/ac on corn (average -25.1 bu/ac) and -16.6 to +0.8 bu/ac on soybean (average -4.6 bu/ac). Nine sites were reported (locations shown in Figure 2), with five sites showing a significant response to the use of a cover crop.



Work With Us

Multi-Year Cover Crop Trials 2024

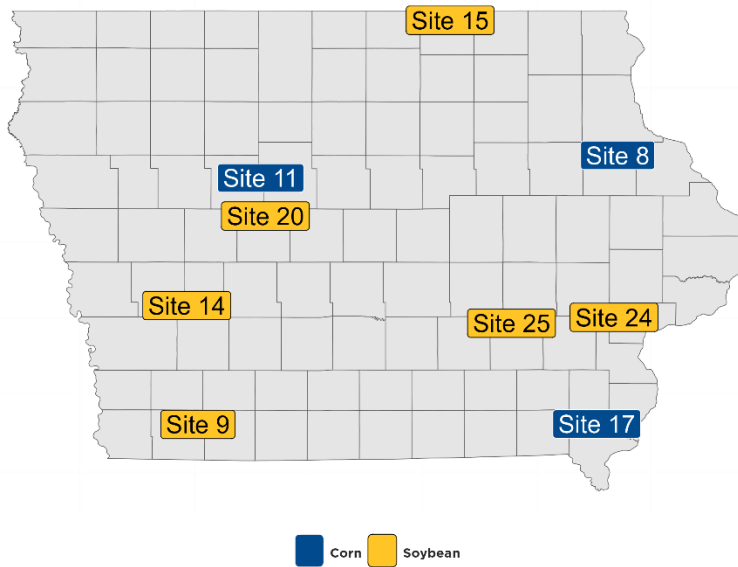


Figure 2 Site locations in 2024

Early rainfall led to favorable conditions for cover crop growth in the spring and prevented some farmers from terminating the cover crop in a timely manner. From April 1 to cover crop termination, sites ranged from 0.35 to 10.32 inches of rain, with the four highest amounts (7.55-10.32 inches) occurring on sites with significant yield losses (Table 1). These sites were also terminated in early- to mid-May, which was later than other sites. This delay in termination and favorable growing conditions allowed additional biomass and heavy residue to accumulate, which created unfavorable conditions for the cash crop to emerge into. Both corn and soybeans were negatively impacted from the start of the growing season and were not able to recover.

Corn				Soybean			
	Termination Date	Rainfall (inches) April 1 - Termination	Yield Difference (bu/acre)		Termination Date	Rainfall (inches) April 1 - Termination	Yield Difference (bu/acre)
Site 8*	4/14/2024	1.74	8.2	Site 9*	5/6/2024	8.27	-16.6
Site 11	4/12/2024	0.62	-14.7	Site 14	4/10/2024	0.35	-1.6
Site 17*	5/3/2024	7.55	-54.2	Site 15	5/19/2024	6.73	0.8
				Site 20*	5/13/2024	7.82	-2.4
				Site 24*	5/16/2024	10.32	-3.1
				Site 25	4/24/2024	2.09	-4.4

Table 1 Rainfall totals in 2024 from April 1 until the time of cover crop termination and yield difference. Sites with a significant yield response marked with *.

At the location in Des Moines County, corn had a significant yield reduction (-54.2 bu/acre) in strips with cover crops (Figure 4). Historically, this site experienced some yield reductions with the cover crop but not as severe as 2024. Discussions with the farmer and agronomist led to a few thoughts on what may have caused such a large response. Plans to terminate the cover crop were disrupted due to the weather in early spring which resulted in 7.55 inches of rain from April 1 to termination (Table 1). This led to additional growth beyond what the grower would normally allow. Planting



occurred 9 days after termination, but the corn emerged into thick residue, which impacted growing conditions in those strips. In addition, hybrid may have impacted results due to the selection having high-yield and early growth characteristics. Corn planted in the cover cropped strips had delayed growth and were not able to catch up to the corn in the uncovered areas. The grower and agronomist both discussed selecting a hybrid that was more stable for planting into cover crops.

Yield Differences by Year

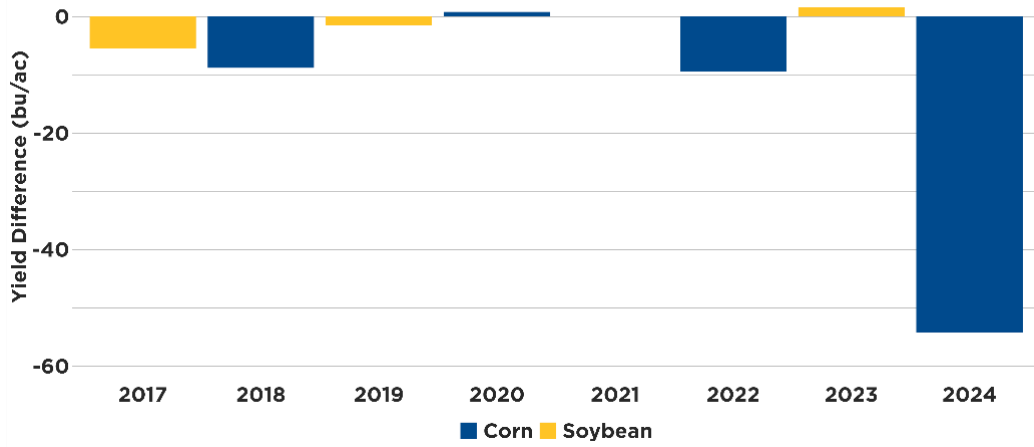


Figure 4 Yield differences at site 17 (Des Moines County) for each year involved in the cover crop project.

Cover Crop Establishment

Cereal rye has been used as the cover crop ahead of corn and soybean for most of the project due to quick and easy establishment in most conditions. While this is beneficial for simply having ground coverage, it has also been shown to cause issues ahead of corn and doesn't offer as many potential benefits as a multi-species blend. Starting in 2024 (fall seeded 2023), a blend of triticale (78.1%), hairy vetch (15.6%), and winter camelina (6.3%) were seeded ahead of corn. A blend of cereal rye (47.6%), triticale (47.6%), and winter camelina (4.8%) were seeded ahead of soybean at most sites. These species were selected to provide more diversity in the project and additional nutrient benefits through scavenging and fixation qualities. Early rains and good weather conditions for growth in the spring helped cover crops grow quickly and establish themselves prior to

2024 NDVI Results

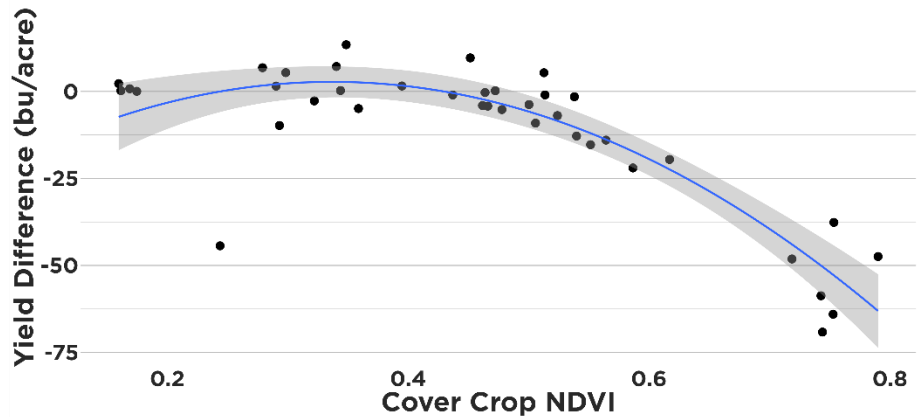


Figure 5 Calculated NDVI values for cover crop strips and yield differences compared to uncovered. As NDVI values quantifying biomass accumulation increase, yield decreases.



planting at many locations. Satellite imagery was used to help quantify ground coverage by calculating normalized difference vegetation index (NDVI) values for each of the sites during the spring. For this work, these values range from 0 (no vegetation or bare soil) to 1 (dense, healthy vegetation) but have historically been closer to 0.2 for no cover strips and 0.4 for the cover crop strips in the project. Across all sites in 2024, calculated NDVI values ranged from 0.16 to 0.79 and show a negative relationship between cover crop growth and yield response (Figure 5). This agrees with previous years’ work identifying spring cover crop growth as a leading indicator of yield loss potential. The yield loss described for Site 17, in Des Moines County, could be partially explained by the fact the site had the highest NDVI value of all locations. For comparison of field view and calculated NDVI values, images from several sites are shown in Figure 6. Site ID and NDVI value are included for comparison.



SITE ID: 8
NDVI Value: 0.32



SITE ID: 20
NDVI Value: 0.46



SITE ID: 17
NDVI Value: 0.75

Figure 6 Cover crop establishment can be variable. Three unique sites ranging from minimum (left) to maximum (right) cover crop biomass in 2024 with Site ID and calculated NDVI value.

Additional Information

Along with yield data collection, soil sampling and penetrometer readings were collected to identify changes in nutrient stratification and soil compaction with the use of a cover crop. Early-spring samples and readings were collected before planting in April of 2024, with additional in-season soil samples collected in June to identify changes in soil nitrogen. Full results from these early- and in-season investigations can be found in the [“2024 Cover Crop Impact on Nutrient Stratification and Soil Compaction”](#) report on the Iowa Soybean Association website. In summary:

- Nitrate levels were significantly reduced with a cover crop in early-spring sampling.
- Nutrient stratification did not appear to be impacted with the use of cover crops.
- Cover crops reduced soil compaction in top 12 inches, but no site had yield-limiting compaction in either treatment.