

Spring-Seeded Cover Crops Ahead of Soybeans

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In a Nutshell

- Cover crops are typically either aerially seeded into standing crops around the time of physiological maturity in late summer or drilled immediately following crop harvest in the fall.
- In this study, two farmer-cooperators evaluated spring cover crops seeded in March approximately 50 days before planting soybeans later in the spring.

Key Findings

- Cover crops seeded in late March and terminated in late May grew up to between 6 to 10 inches in height.
- Cover crops did not affect soybean yields compared to where no cover crop was seeded.

Project Timeline
 2017



Strips of cover and no-cover at Jeremy Gustafson's on May 12, 2017. The cover crop strips (oats) were seeded on March 20.

Background

In Iowa, cover crops are typically either aerially seeded into standing crops around the time of physiological maturity in late summer or drilled immediately following crop harvest in the fall. However, on occasion time does not permit one to get a cover crop seeded in the fall or the cover crop fails to establish. Recent research in Nebraska has investigated several cover crop species seeded in late March and terminated in late May prior to cash crop planting. Such "60-day" spring-seeded covers produced up to 2,500 lb biomass per acre and had no negative effect on the ensuing corn, soybean or sunflower yields

(Wortman et al., 2012a; 2012b). Brassica species (mustard, rapeseed) appeared to be the most productive cover crops in those studies. PFI farmer-researchers are now interested in applying this technique to their own farms.

The objective of this research project was to evaluate sole- and mixed-species cover crops seeded in the spring prior to soybean planting. Both farmer-cooperators involved in this trial, Jeremy Gustafson and Chris Teachout, were interested in observing the effects of spring-seeded covers on soybean yields but also on the weed communities in their fields. Teachout also added: "If one did not have a fall cover

crop, this practice could be used and could also be a chance to broaden the diversity of cover crop species used."

Methods

This research project was conducted by Jeremy Gustafson near Boone in Boone County and Chris Teachout near Shenandoah in Fremont County.

Treatments at both farms included randomized and replicated paired strips of "cover" and "no-cover." Teachout conducted the study in two separate fields. Treatment descriptions and field operations for both farms are listed in **Table 1**.

Cover crop aboveground biomass near the time of termination was collected by clipping shoot material from randomly placed quadrats (one ft x one ft) in each strip on May 27 at Gustafson's. Samples were air-dried and weighed.

By farm and field, soybeans were planted on the same date into the cover and no-cover treatment strips. Gustafson planted soybeans the after terminating the cover while Teachout planted soybeans 10-30 days before terminating the cover crops in his two fields (**Table 1**).

Soybeans in each strip were harvested on the same date and yields were corrected to 13% moisture and recorded for each individual strip.

Data were analyzed using JMP Pro 12 (SAS Institute Inc., Cary, NC). Means separations between treatments are reported using the least significant difference (LSD) generated by a t-test. Statistical significance was determined at the $P \leq 0.05$ level.

Results

Mean monthly temperature and total monthly rainfall near Gustafson's and Teachout's farms compared to the 50-year averages is presented in **Figure 1**. Temperatures in 2017 did not deviate from the long-term normal. Rainfall at Gustafson's was below average for June-September while at Teachout's rainfall was near normal for much of the growing season.

Table 1

Treatment descriptions and field operations at Jeremy Gustafson's and Chris Teachout's in 2017			
Farm	Gustafson (Boone)	Teachout (Shenandoah)	
Field	1	1	2
No. replications	8	4	5
Cover crop(s)	Oats	Common vetch, lentils, crimson clover, oats, barley, rapeseed, peas, flax, sunflower	Oats, barley
Cover crop seeding date	March 20	March 23	March 23
Cover crop seeding rates(lb/ac)	Oats (48)	Common vetch (3), lentils (3), crimson clover (2), oats (15), barley (15), rapeseed (1), peas (7) flax (3), sunflower (1)	Oats (33), barley (12)
Cover crop seeding method	Planter, 15-in. centers	Salford vertical tillage with on-board air seeder	Salford vertical tillage with onboard air seeder
Cover crop termination date	May 28	May 19	May 19
Cover crop termination method	Glyphosate	Glyphosate	Glyphosate
Soybean seeding date	May 29	May 9	Apr. 20
Weed control	June 10: Flexstar Gt	June 12: Glyphosate and Warrant	June 12: Glyphosate and Warrant
Soybean harvest date	Oct. 19	Oct. 18	Oct. 20

Figure 1

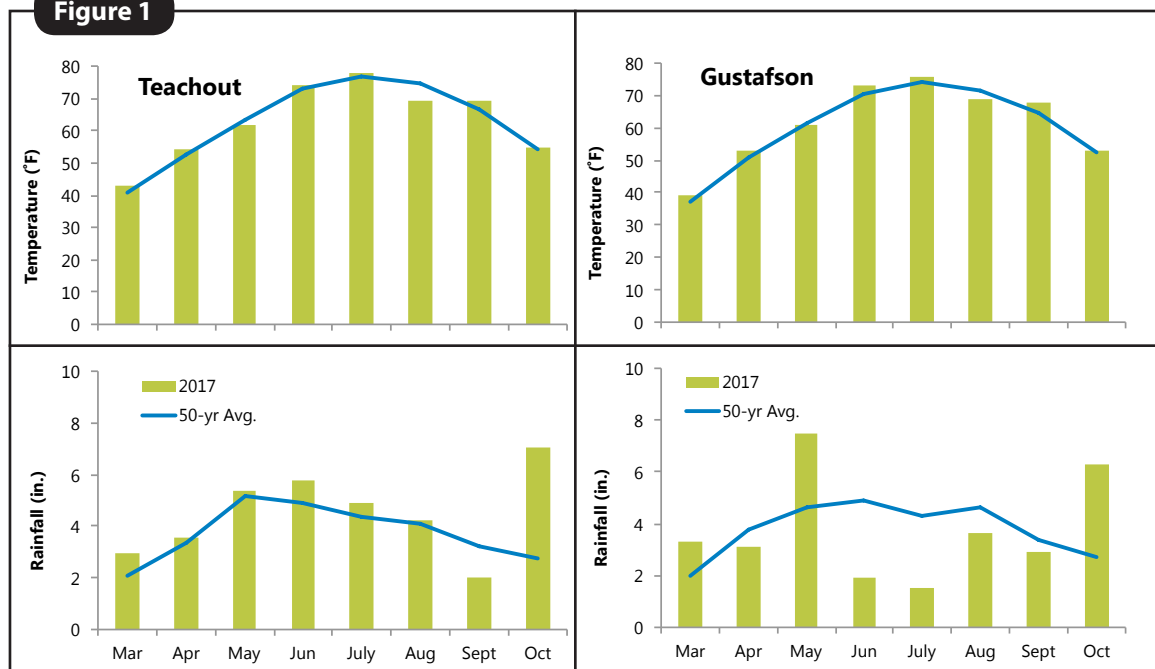


Figure 1. Mean monthly temperature and rainfall for 2017 and the long-term averages at the Ames weather station (approx. 4 mi from Gustafson's) and at the Shenandoah weather station (approx. 3 mi. from Teachout's) (Iowa Environmental Mesonet, 2017).

Cover crop biomass

Aboveground biomass of the cover crop mixes was sampled the day before termination on May 27 at Gustafson's and amounted to 1,537 lb/ac. Teachout did not collect biomass samples but reported that the mix in Field 1 was 6-10 in. tall at termination on May 19 and the oats+barley in Field 2 was 8-10 in. tall at termination on May 19. He also noted far less weed growth in the cover crop strips compared to the no-cover strips in both fields (weed biomass or weed counts were not collected, though).



Oat cover crop at Jeremy Gustafson's on May 27, 2017, the day before termination.

Table 2

Soybean yields as affected by spring cover crops at Jeremy Gustafson's and Chris Teachout's in 2017.

Farm	Gustafson (Boone)	Teachout (Shenandoah)	
Field	1 ^w	1 ^x	2 ^y
Cover	53	78	71
No-cover	54	77	70
Diff.	1	1	1
LSD (0.05) ^z	1	6	10

^w Cover crop = oats.

^x Cover crop = common vetch, lentils, crimson clover, oats, barley, rapeseed, peas, flax, sunflower.

^y Cover crop = oats, barley.

^z By farm and field, if the difference between the two treatments is greater than the least significant difference (LSD), the treatments are considered significantly different with 95% certainty.

Soybean yields

Soybean yields for both farms are presented in **Table 2**. At both farms, there was no difference in soybean yield between the cover and no-cover treatments. Soybean yields at Gustafson's were near the 5-year average for Boone County of 50 bu/ac (USDA-NASS, 2017). Yields at Teachout's were well above the 5-year county average of 51 bu/ac for Fremont County (USDA-NASS, 2017). Recall that Teachout planted soybeans into living cover crops 10 days before terminating in Field 1 and 30 days before terminating in Field 2.

Conclusions and Next Steps

These on-farm research trials investigated the use of spring-seeded "50-day" cover crops ahead of soybeans. By the time of cover crop termination, the cover crops had reached more than six inches of growth in all fields involved. Among three fields across the two farms, the cover crops (seeded in late March) had no effect on soybean yields. Both Jeremy Gustafson and Chris Teachout were pleased to learn that a spring crop cover did not have a negative effect on soybean yield. Because they saw no reduction in yield, both farmers are considering using this practice in the future. "I will use this practice [in the future] in the case of no fall seeded cover crops," Teachout said. "The next steps are to see if spring-seeded covers can be grown with early planted soybeans as a beneficial nurse crop."



The cover crop mix of common vetch, lentils, crimson clover, oats, barley, rapeseed, peas, flax and sunflower at Chris Teachout's on May 16, 2017. Cover crops were seeded on March 23.

References

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- Wortman, S., C. Francis, and J. Lindquist. 2012a. Cover crop mixtures for the Western Corn Belt: Opportunities for increased productivity and stability. *Agron. J.* 104:699-705.
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