

Aerial seeding versus drill seeding cover crops: Updated with corn yield observations

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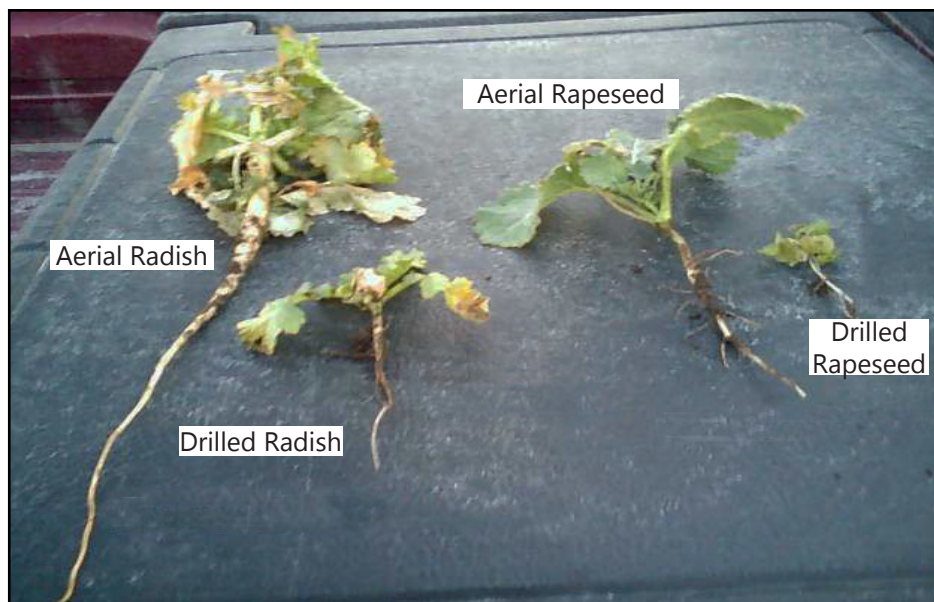
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In a Nutshell

- Cover crops are increasingly popular.
- Variable weather can pose challenges for establishment and effectiveness of cover crops.
- There are multiple options for seeding including aerial application, broadcast and drill seeding.
- In this study, earlier aerial seeding of a cover crop mix led to greater average biomass by spring in spite of high variability in stand.
- Regardless of seeding method, plots with cover crops resulted in greater corn yields in 2011.

Project Timeline:
Fall 2010 - Fall 2011



Fall cover crop comparison of radish and rapeseed: Aerial seeding was done in September and drill seeding was done in October.

Background

Cover crops are planted without the intention of a direct harvest. Instead, they provide alternative benefits to the farmer or environment. A few of these include soil quality benefits by protecting soil from erosion (Lal et al., 1991, Karlen and Cambardella, 1996), increasing soil microbial activity and cycling nutrients (Karlen and Cambardella, 1996), reducing loss of soil nitrogen (Kaspar et al., 2007), or adding to soil carbon. Additionally, the cover crop biomass can be a potential source of forage if a shortage exists.

Iowa's land has lost significant amounts of soil since annual crop farming began. Iowa's average erosion across the state was 5.2 tons/acre/year (Cox et al., 2011) with some areas losing significantly more. Keeping year-round cover and capturing

more sunlight to grow plants that build soil are both things cover crops do and are a potential way to stop soil loss.

To achieve enough growth to improve soil quality, cover crops need to be planted as early as possible in the fall - a busy time for farmers. Following soybean or corn harvest is when cover crops would generally be planted; however, if planting could occur earlier, the workload could be spread out for farmers and the crop would have more time to establish and grow. Aerial application is an option for earlier establishment, but comes with the drawbacks of cost, decreased seed to soil contact, less precise seed placement and increased moisture demand.

Steve McGrew farms with his three brothers—Bill, David and Robert—in southwest

Iowa near Emerson. They produce mainly corn and soybeans.

Method

A cover of hairy vetch, tillage radish, and rapeseed was established in strips by both aerial seeding into standing soybeans and drilling after soybean harvest. Check plots that did not include any cover crops were also established.

Aerial Establishment

Aerial test plots were seeded September 14, 2010. The pilot seeded strips, skipping areas in between to allow for the drilled cover crop treatment. The aerial seeding received almost an inch of rainfall within three days of seeding. This method of cover crop establishment cost \$10/A. Seed mix and cost shown in **Table 1**.

Table 1

Seed Mix & Cost

Plant Type	Seeding Mix (lb/A)	Seed Cost/lb	Cost to drill (ac)	Cost to aerial seed (ac)
Hairy Vetch	15	\$1.60	\$37.55	\$34.55
Tillage Radish	3	\$3.20	\$23.15	\$19.60
Rapeseed	2	\$1.00	\$15.55	\$12.00

Drill Establishment

After soybean harvest, Steve returned to drill strips of the same seed mix where no cover crop had been aerial seeded. This seeding took place on October 6, 2010. Rain did not occur immediately after planting but soil moisture was sufficient for establishment. Iowa State Extension estimates the cost of equipment, fuel and labor to drill small grains to be \$13.55/acre (Edwards et al., 2011).

Sampling

Samples for cover crop growth were collected December 5, 2010 and April 27, 2011. Multiple one by one foot quadrats were harvested per plot and averaged to obtain a dry-matter per acre weight. This trial was located in southwest Iowa, where the average first frost date is in early October. Corn was planted in spring 2011 following termination of the cover crops and bulk harvested by treatment in October.

Table 2

Fall biomass (lb/acre dry matter) on December 5, 2010

	Aerial	Drilled
Plot 1	4.3	53.6
Plot 2	56.4	16.8
Plot 3	68.4	15.3
Mean	43.0*	28.6

*Aerial and drilled means significantly different at $P \leq 0.05$.

Table 3

Spring biomass (lb/acre dry matter)* on April 27, 2011

	Aerial	Drilled
Plot 1	335.8	311.8
Plot 2	719.0	383.6
Mean	527.4**	347.7

*Hairy vetch biomass only, radish and rapeseed did not overwinter.

**Aerial and drilled means significantly different at $P \leq 0.05$.

Table 4

Corn yields in 2011

Treatment	Corn yield (bu/acre)
Control (no cover crop)	175.1
Drill	179.3
Aerial	178.5

Data Analysis

Fall and spring cover crop biomass data were analyzed using a fit model one-way analysis of variance (ANOVA) to determine treatment effects. All reported means are the least-squares means. Comparisons of means were analyzed using Student's t-test. All data analyses were performed using the JMP 9.0 software (SAS Institute, Inc., Cary, NC).

Because corn was not harvested by each individual plot, but instead by treatment, no statistical analysis on the effect of aerial seeded or drilled cover crop on ensuing corn yield could be performed.

Results and Discussion

The earlier, aerial seeded cover crop mix had greater mean fall and spring biomass accumulation per acre in spite of high variability in stand compared to the drilled mix (Tables 2 and 3).

In fall 2011, greatest corn yields were observed where cover crop mix had been drilled, followed by aerial seeding, with lowest yields observed in the check plots where no cover crop was grown (Table 4). No statistical difference in corn yields could be determined, however, as corn was bulk harvested by treatment.

Conclusions

In this study, aerial seeding of cover crop allowed more time for crop establishment and biomass accumulation in the fall and a stronger start in the spring. The fall-drilled cover crop produced less total biomass, but still established and overwintered acceptably. Though not determined statistically, corn yields in 2011 from plots that included cover crops, regardless of aerial seeding or drilling, were greater than corn yields from check plots that did not include cover crops.

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