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Comparison of cover crop establishment methods

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Abstract

Cover crops have recently become more popular. Iowa's unreliable weather can pose challenges for establishment and effectiveness of these potentially soil and nutrient preserving crops. In 2010, earlier aerial seeding of a cover crop mix led to higher average biomass weight by spring in spite of high variability in stand.

A plane aerially seeds cover crops into yellowing soybeans in southwest Iowa on the farm of Steve McGrew.

About the Cooperator

Steve McGrew farms with his three brothers—Bill, David and Robert—in southwest Iowa near Emerson. They produce mainly corn and soybeans. They post regular updates about happenings around their farm on their website at http://showcase.netins.net/web/mcgrewbr/index.shtml#us

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 improving soil quality by protecting soil from erosion (Lal et al, 1991, Karlen and Cambardella, 1996), increasing soil microbial activity and cycling nutrients (Karlen and Cambardella, 1996), decreasing excess nitrogen (Kaspar et al., 2007), or adding to soil carbon. Additionally, the cover 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. 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 reported benefits of cover crops and are a potential way to stop soil loss.

To achieve enough cover crop growth to improve soil quality, cover crops need to be planted as early as possible in the fall—a busy time for farmers. During the harvest season, 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 and less-precise seed placement.

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 (see **Table 1**).*

Table 1 Seed Mix & Cost

	Seeded Mix (lbs./ac)	Seed (cost/lb.)
Hairy Vetch	15	$1.60
Tillage Radish	3	$3.20
Rapeseed	2	$1.00

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.

(Above) Aerial seeded test plot.

(Above) Picture taken mid-November 2010 of October drilled treatment.

Drill Establishment

After the soybean crop had been harvested, 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 quadrates 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.

Data Analysis

Data were analyzed using a fit model one-way analysis of variance (ANOVA) to determine treatment effects at each location. Steady-state infiltration rates were log-transformed for analyses. All reported means are the least-squares means. Comparisons of means were analyzed using the Student's t-test. All data analyses were performed using the JMP9 software (SAS Institute Inc., Cary, NC).

Results and Discussion

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

(Right) Picture taken mid-November 2010 of tuber from September hand-planted demonstration site.

Tuber growth and above-ground biomass

This photo shows growth samples of two different brassicas and the aerial versus drilled planting date and planting type comparison.

Table 2

Fall Biomass		
(lbs./acre dry matter)	**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

Table 3

Spring Biomass		
(lbs./acre dry matter)*	**Aerial**	**Drilled**
Plot 1	335.8	311.8
Plot 2	719.0	383.6
Mean	527.4	347.7

*Hairy vetch weight only, brassicas do not overwinter

Conclusions

In this study, aerial cover crop seeding allowed more time for crop establishment 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.

References

Edwards, W., A. Johanns, and A. Chamra. 2011. 2011 Iowa farm custom rate survey. Iowa State University Extension, Ames, IA.

Karlen, D.L., and C.A. Cambardella. 1996. Conservation strategies for improving soil quality and organic matter storage, p. 395-420, In M. R. Carter and B. A. B.A. Stewart eds. Advances in Soil Science. CRC Press Inc. New York, NY.

Kaspar, T.C., D.B. Jaynes, T.B. Parkin, and T.B. Moorman. 2007. Rye cover crop and gamagrass strip effects on NO3 concentration and load in tile drainage. Journal of Environmental Quality 36:1503-1511.

Lal, R., E. Regnier, D.J. Eckert, W.M. Edwards, and R. Hammond. 1991. Expectations of cover crops for sustainable agriculture, pp. 1-11, In W. L. Hargrove, (ed.) Cover crops for clean water. Soil and Water Conservation Society of America, Ankeny, IA, Jackson, TN.

Cox, Craig, A. Hug, and N. Bruzelius. 2011. Losing ground. Accessed 1/3/2012 at http://static.ewg.org/reports/2010/losingground/pdf/losingground_report.pdf. Environmental Working Group, Washington, DC.