

Twenty Species Cover Crop Variety Trial Over-seeded into Cash Crops

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Cooperators:

- Art Behrens – Carroll
- Jerry Depew – Laurens
- Jeremy Gustafson – Boone
- Stephanie Hyde – Marshalltown
- Paul Kassel & Morgan McCarty – Linn Grove
- Greg King – DeWitt
- Steve McGrew – Emerson
- Michael Fields Ag Institute – East Troy, WI
- Myron Rees – Crawfordsville
- Mike VerSteeg – Inwood

Funding By:

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In a Nutshell

- Nearly 100,000 acres of cover crops were planted in the fall of 2012.
- Cover crops protect soil from wind and water erosion and capture nitrogen that can otherwise leach from the soil and pollute nearby water sources.
- Nine cooperators from across Iowa and one cooperator in central Wisconsin participated in this cover crop variety trial.
- Farmers collected percentage ground cover in the fall for each plot using a cover crop measurement kit developed by PFI staff.
- Grass winter cover crop species, the winter small grains, had the greatest percent fall coverage of all types following corn or soybean.
- Some legume species provided % fall coverage comparable to the winter small grains.

Project Timeline:

August 2012 - December 2012

About the Cooperators

Nine cooperators from across Iowa and one cooperator in central Wisconsin participated in this cover crop variety trial. Farm production included traditional row-crop corn and soybean production, organic grain production, wheat production, horticulture crop production and one Iowa State University research farm (**Table 1**).



Cover crops - clockwise from upper left: Hairy Vetch, Oats and Winter Pea, Lentil, and Common Vetch

Background

The Demand

Nearly 100,000 acres of cover crops were planted in the fall of 2012 according to seed sales from major cover crop seed companies (Burns communication, 2012; Ehrhardt communication, 2012) plus the acres cost-shared through the federal government's NRCS Environmental Quality Incentives Program and the state's IDALS State Cost Share fund. In addition many farmers who didn't take advantage of cost share funds continued to add cover crops to their farming system. A large majority of these acres were seeded with airplanes or helicopters.

The Science

Cover crops protect soil from wind and water erosion and capture nitrogen that can otherwise leach from the soil and pollute nearby water sources. According to the Nutrient Reduction Strategy Science Assessment, cover crops on average can reduce nitrogen loading by 28% and phosphorus loading by 50% (Iowa Department of Agriculture and Land Stewardship et al., 2012). However a winter small grain cover crop, although immensely beneficial to soil and nutrient protection, can have a negative impact on corn yields (Carlson, 2012). In 2010 six locations measured an average 12 bu/A reduction in corn yield following a winter rye cover

Table 1

Cooperator	Cooperators				
	Town	Farming System	Previous Crop	Planting Date	Fall Measurement Date
Art Behrens	Carroll	Organic Row-Crop	Soybean & Corn	9/09/2012	11/16/2012
Jerry Depew	Laurens	Conventional Row-Crop	Corn	8/28/2012	11/19/2012
Jeremy Gustafson	Boone	Conventional Row-Crop	Soybean	9/04/2012	11/13/2012
Stephanie Hyde	Marshalltown	Horticulture	Horticulture	9/23/2012	12/18/2012
Paul Kassel & Morgan McCarty	Linn Grove	Conventional Row-Crop	Soybean	8/31/2012	11/20/2012
Greg King	DeWitt	Horticulture	Wheat	9/12/2012	12/06/2012
Steve McGrew	Emerson	Conventional Row-Crop	Soybean	9/15/2012	no germination
Michael Fields Ag Institute	East Troy, Wisc	Biodynamic Row-Crop & Horticulture	Soybean	8/28/2012	11/29/2012
Myron Rees	Crawfordsville	Conventional Row-Crop	Soybean	9/20/2012	12/03/2012
Mike VerSteeg	Inwood	Conventional Row-Crop	Soybean	9/11/2012	11/29/2012

crop. However in 2009, 2011 and 2012 no reductions were measured due to a winter rye cover crop. A potential negative effect can discourage farmers from wanting to add this conservation practice to their farms. Legume cover crops have not been studied and used as extensively in Iowa, but these nitrogen-fixing plants have the potential to lessen a cover crop's negative impact on corn yield. However, there is a lack of information about establishing a legume or grass-legume mix cover crop by over-seeding. This study screened 20 cover crop species, some grasses, some legumes and some in a mixture, to determine which species would have the greatest success if established by over-seeding with an airplane.

Method

Locations

In 2012, nine cooperators from different areas of Iowa and one from Wisconsin over-seeded 20 packets of cover crop seed (Table 2) by hand into a cash crop in two randomized, replicated tiers. Six farmers planted into standing soybeans, two into

standing corn, one into both standing corn and soybeans and two following shorter season crops: horticulture and wheat. Art Behrens, at Carroll, planted the experiment into standing soybeans and corn, allowing us to analyze the previous crop effect on cover crop establishment by over-seeding. Prior to planting, all legume seeds were inoculated. Plots were 7.5 ft wide and generally 25 ft long.

Planting Date

Seeds were planted on the date corresponding with the first yellow leaves of the soybean plants, corn black layer, or when the horticulture crops had been harvested and removed from the field (Table 1). At DeWitt and Marshalltown the seeds were broadcasted and not incorporated into the soil. Cash crops were harvested at the time appropriate for each farm and cover crops were left undisturbed.

Data Collection

Farmers collected percentage ground cover in the fall for each plot using a cover crop measurement kit developed by PFI staff.

Data was collected within a few days of the first predicted snowfall. Farmers placed a pre-marked 16 ft long rope diagonally across the cover crop plots securing one end with a screwdriver. Farmers counted how many marks lay on top of cover crop biomass or not. These counts were then calculated into a percent coverage measurement. Spring percent coverage will be measured again near 03/01/2013. Measuring the fall and spring coverage ratings allows us to determine which cover crops will and will not overwinter and produce significant amounts of soil coverage at each location. If the cover crops overwinter then a final aboveground biomass sample will be collected in each plot to determine the pounds of dry matter/A.

Seed Source

Cover crop seeds used in this study were supplied by: Timeless Natural Foods, Green Cover Seeds, USDA-ARS, Handcock Seed Company, Seed Land, Paramount Seed Farms and Albert Lea Seed Farm.



Table 2

Legume	Cover crop seed types and seeding rate (lb/A)	
	Grass	Mix
Lentil (50)	Winter Triticale-NE426GT (100-120)	Oats/Legume Mix
Legume Mix (15)	Winter Triticale-Trical 815 (100-120)	Oats/Winter Pea
Hairy Vetch (25-40)	Winter Triticale-VNS (100-120)	Oats/Crimson Clover
Common Vetch (50-75)	Winter Barley-Tambar 501 (80-126)	
Alfalfa (12-20)	Winter Barley-Pennbar 66 (80-127)	
Winter Pea (25-35)	Winter Barley-P954 (80-128)	
Deer Vetch (10-15)	Winter Barley-P919 (80-125)	
Sunn Hemp (30-50)	Cereal Rye (90-160)	
Crimson Clover (22-30)		

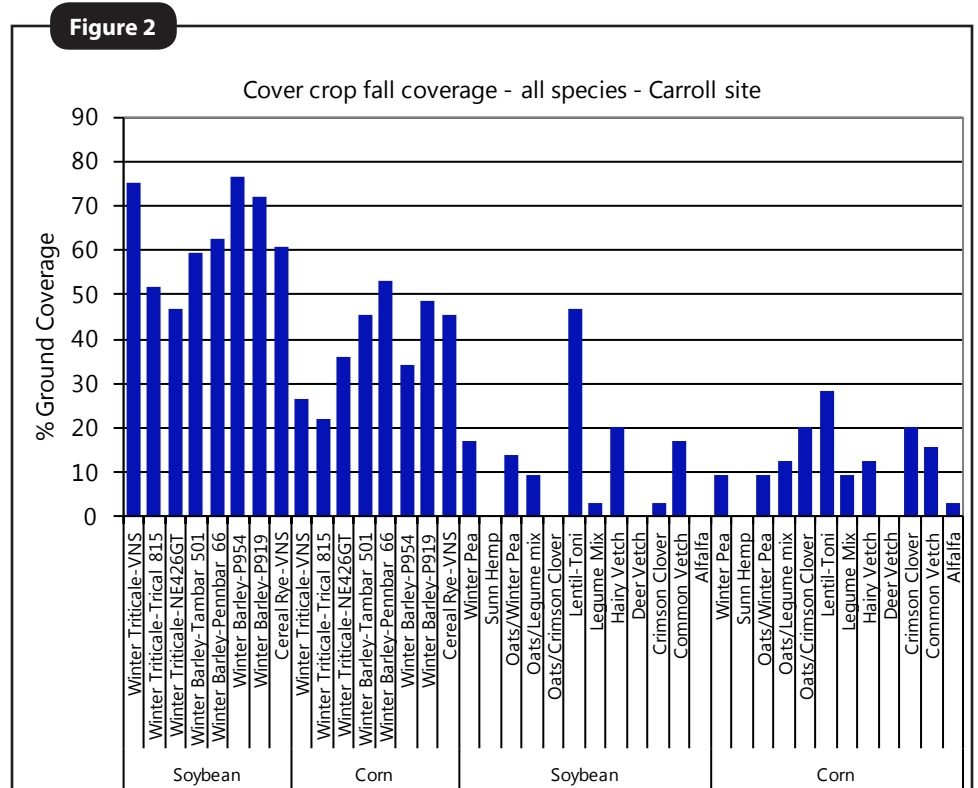
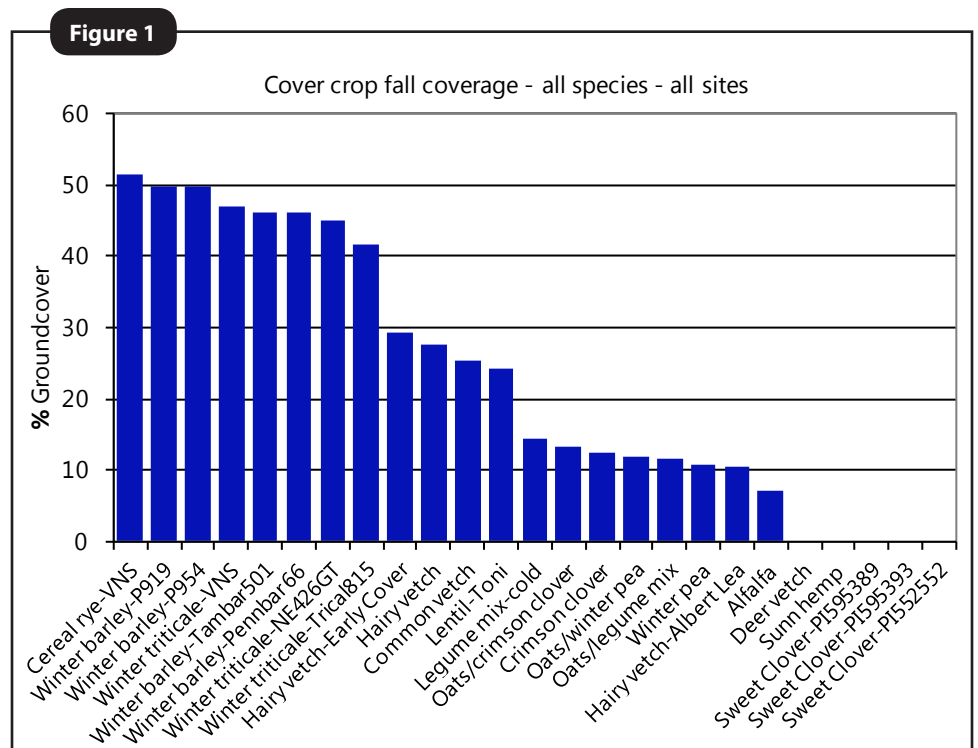
Results

All Sites and All Cover Crop Species

The fall coverage for individual cover crop species is presented in **Figure 1**. Across all locations, the winter small grains had the greatest amount of fall coverage of all the cover crop species tested, ranging from just above 40% to 50% fall coverage. However several legume species showed decent growth including: Hairy Vetch-‘Early Cover’, Hairy Vetch, Common Vetch and Lentil-‘Toni’. The percent fall coverage of these legumes ranged between 25% and nearly 30%. Three of these four legumes are currently available for purchase through seed companies but Hairy Vetch-‘Early Cover’ is only available for screening at this time. Two warm season legumes, Sunn Hemp and Deer Vetch, were included but they did not produce enough growth to be measured in the cover crop plots. Finally, three sweet clover varieties from the Plant Introduction Station were evaluated at the Boone location only. Extremely poor germination was observed and no aboveground coverage was measured in these plots.

Previous Crop Effect

At Carroll, Iowa on Art Behrens’ farm, the effect of previous crop on cover crop species was analyzed. **Figure 2** shows the percent fall coverage of each cover crop species over-seeded into either corn or soybeans. The cover crop species are organized into two groups: grasses and legumes either following soybeans or corn. Grasses had a higher percentage of fall coverage following soybeans than corn. Specifically, Winter Barley-‘P954’; Winter Triticale-‘VNS’; Winter Barley-‘P919’; Winter Barley-‘Pennbar 66’; Cereal Rye-‘VNS’; Winter Barley-‘Tambar 501’ performed well when over-seeded into a standing soybean crop and were slightly lower after over-seeded into a corn crop. Winter lentil-‘Toni’, a legume was similar to most of the grasses following soybeans. In general, legumes had less fall coverage than grasses but some legumes did well over-seeded into standing corn or soybeans. Winter lentil-‘Toni’, Crimson Clover, Oats/Crimson Clover mix, Hairy Vetch in soybeans covered nearly 20% of the plot area. Common vetch following corn or soybeans covered about 15% of the plot. The warm season legumes, Sunn Hemp and Deer Vetch had poor growth. Alfalfa, Legume mix, Crimson Clover following soybeans, winter pea all had poor coverage measuring lower than 15% of the plot area.



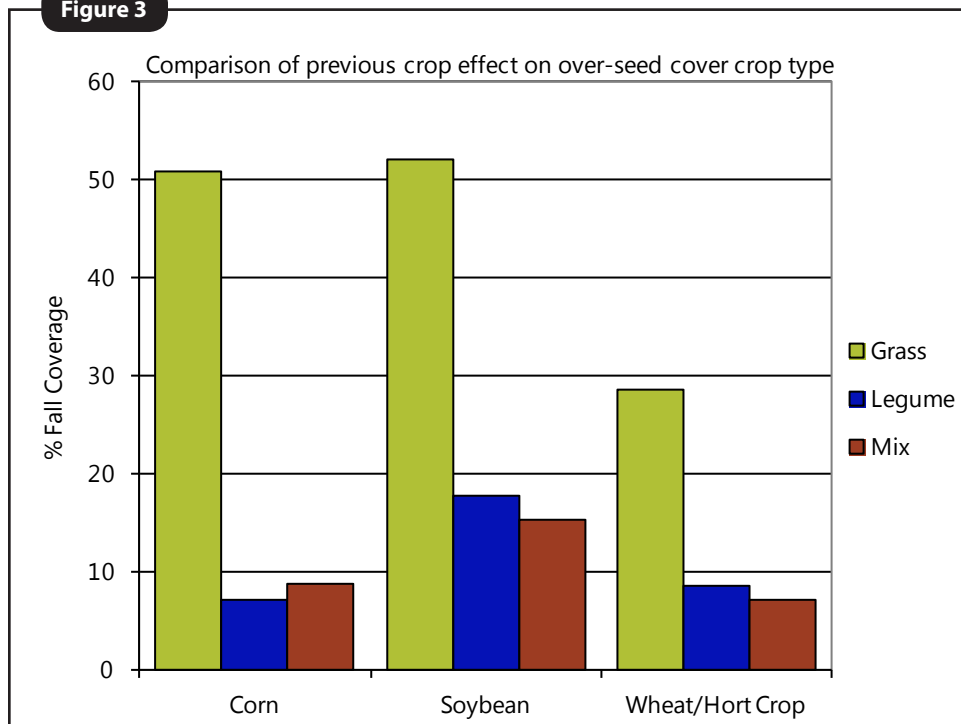
Previous Crop and Type of Cover Crop Species: All Sites

Grass winter cover crop species, the winter small grains, had the greatest percent fall coverage of all types following corn or soybean for the previous crop (Figure 3). Grass cover crops following the wheat/horticulture crop were similar to all the mixes following all of the previous crops and the legumes only following soybeans. Fall percent coverage of legume species was statistically lower following corn or the wheat/horticulture crops. Cover crop following the shorter season crops might have done poorly because soil was disturbed; because of decreasing soil moisture and seeds were not incorporated. Typically drilling a cover crop at an earlier planting date would improve fall coverage but other factors caused poorer than anticipated growth at these two locations.

Conclusion and Next Steps

Successfully establishing a legume cover crop species into standing corn or soybeans or following a horticulture crop is important to increasing the use of cover crops by more Iowa farmers. Some legume species provided % fall coverage comparable to the winter small grains, and could be potential entries in a future over-seeding experiment on a larger scale using airplanes or helicopters.

Figure 3



References

Carlson, S. 2012. Winter Rye Cover Crop Effect on Cash Crop Yields: Year 4. Practical Farmers of Iowa; Ames, IA.

Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and Iowa State University College of Agriculture and Life Sciences. 2012. Iowa nutrient reduction strategy. Iowa State University of Science and Technology, Ames, IA. <http://www.nutrientstrategy.iastate.edu/sites/default/files/documents/NRSfull.pdf>

PFI Cooperators' Program

PFI's Cooperators' Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs.