COVER CROP DECISION TOOL AND ON-FARM NETWORK
{An update on UW Extension cover crops research and education programming}

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Background

Cover crops can be planted to provide soil cover during otherwise idle intervals, or fallow periods, in a given crop rotation – that is, between harvest and planting of commodity or feed crops. In Wisconsin, a cover crop might be planted after harvest of a short season crop such as a small grain or vegetable crop. Cover crops are grown to benefit the soil by preventing erosion, adding organic carbon, recycling or adding plant nutrients, and by enhancing microbiological communities associated with biological diversity. Some plant species used as cover crops provide pest management functions within a crop rotation. The term "cover crop" is really a catch-all phrase for numerous uses associated with soil improvement and conservation, nutrient management (green manure), pest management (weed and disease suppressors) and reduced reliance on purchased fertilizers and pesticides. Plant species best suited to use as cover crops tend to be fast, aggressive growers for which affordable seed is readily available. Other desirable traits depend on the desired function, such as erosion control, nitrogen fixation, nutrient scavenging, soil carbon addition (soil builder), weed suppression or disease suppression.

Examples of cover crops for use in Wisconsin

Legumes	**Non-legumes**
Hairy or chickling vetch	Oats, barley, Winter (cereal) rye
Red clovers	Annual ryegrass
Crimson clover	Buckwheat
Field pea, Austrian winter pea	Forage (oilseed) radish

Cover crops in grain and processing vegetable production are usually grown for short durations (less than a full season) and without intention of harvest. However, in organic and fresh market vegetable production, covers may have one or 2-year residence in a field for nutrient and pest management purposes. There are limited examples of living covers, or "living mulches," which are inter-planted to grow within the growing commodity crop itself. Also, what is known as a short season cover crop in a grain or processing vegetable rotation, may also be an important source of harvested or grazed forage (planned or contingent) if the farm includes livestock enterprises.

Interest in cover crops is growing among farmers for a variety of reasons. For example, planting winter cereal rye following corn silage harvest is often recommended by county conservation specialists to help farmers meet soil loss reduction and/or nutrient management goals in conservation planning. The rye will provide over-wintering ground cover that will be terminated in early spring as a cover crop. Or, it can be left to grow until boot stage and harvested as an early season forage crop prior to planting the season's main crop. Rye is also commonly planted after short season vegetable crops in Wisconsin's central sands region to curtail wind erosion. Seeding medium red clover into established winter wheat in early spring is done by some farmers to establish a nitrogen fixing, weed smothering cover following the wheat crop's harvest. These two are practices for which UW research and management guidelines exist.

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Other species and practices may have less of a research base behind them and have been pioneered more by farmers and seed companies themselves. For example, in recent years numerous articles have appeared in crop production magazines featuring the Tillage Radish®. Tillage Radish® is a selection of the large, white daikon radish, and is among the types referred to as forage radish, and oilseed radish. The Tillage Radish® is marketed with the claim that it can help to relieve soil compaction as its large tap root grows down into the soil profile, providing a sort of "bio-tillage" as well as other soil quality benefits. It has particular interest among no-till cash grain producers. One Wisconsin-based seed company reports selling Tillage Radish seed to plant over 8,000 acres in summer of 2011, mostly planted after wheat.

Also, forage-type radish, turnips and rape are gaining interest as cover crops among cattle grazers. These forage brassicas can be planted after short season crops, such as wheat, to fill a niche for late summer, fall and sometimes early winter grazing. Some advocates suggest planting these brassicas in a "salad" or "cocktail" mix that includes an annual legume, such as berseem clover, and a grass, such as annual ryegrass or a small grain like oats. This can help to establish a cover with a lower seeding cost and is thought to maximize soil ecological benefits by providing species diversity.

UW Extension Cover Crops Workgroup

In 2010, UW Extension (UWEX) educators formed a workgroup,* partnering with colleagues from other agencies, to provide Wisconsin farmers, crop production advisors and conservation specialists with research-based information about opportunities for using cover crops and their potential benefits. In 2011, the group's main activities included: professional development training for soil and water conservation agency staff on cover crop uses in Wisconsin; initiation of on-farm data collection (on-farm network); and, collaborative development of an on-line decision tool for selecting cover crop species for a given farm's situation.

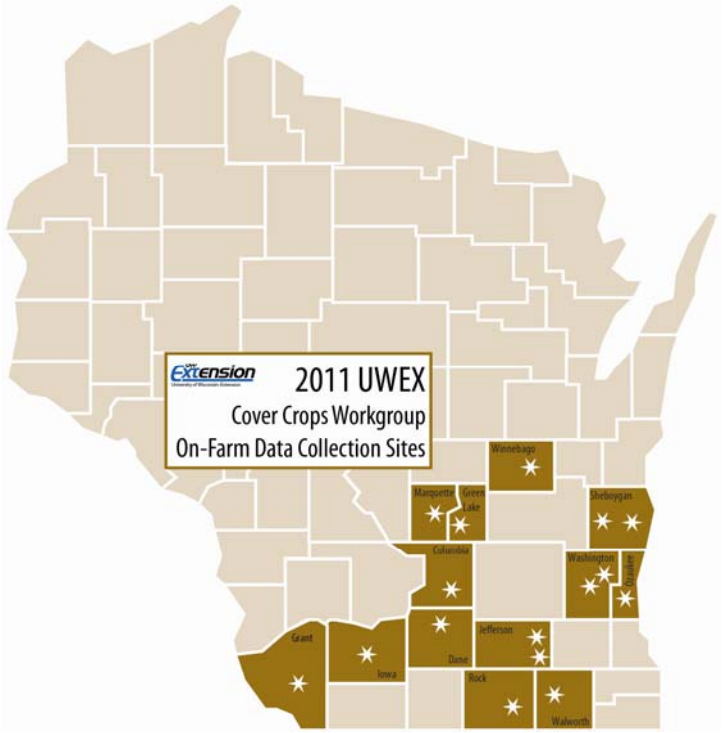
On-farm Network

In 2011, several UWEX workgroup members teamed up with Wisconsin farmers to establish on-farm cover crop research and demonstration trials. The purpose is to jointly learn more about how to manage various cover crop species and evaluate their potential utility and economic value. Specific objectives include:

- Learn more about how to establish, grow, harvest and/or terminate cover crops of interest - particularly with species of more recent interest;
- Evaluate the extent to which various cover crops provide benefits (agronomic/economic) relative to their cost of establishment, harvest and termination;
- Begin to quantify environmental and conservation functions associated with the cover crop;
- Identify needs for more rigorous research (laboratory, greenhouse, and research station);
- Refine county-specific recommendations generated by the Midwest Cover Crops Council Cover Crops Decision Tool.

Most of the 2011 on-farm fields were planted to tillage or forage radish, radish mixed with other grass and legume species, or other forage brassica mixtures. Most of the cover crops were planted in early August following wheat harvest. Some were planted in late August or early September following oats or fresh market vegetable crops. One site focuses on medium red

clover following winter wheat and another on winter rye after corn silage. In fall of 2011, data was collected on biomass production and nitrogen assimilation by the cover crops at 15 sites where the covers will winter kill or are fall-terminated. Some of the forage and tillage radish



2011 On-farm data collectors:
Nick Schneider
Heidi Johnson
Richard Proost
Mike Ballweg
Jim Stute
Gene Schriefer
Keith Van der Velde
Rhonda Gildersleeve
Tim Wood
Kevin Shelley
Matt Ruark

With cooperating farmers

trials are measuring the effect of N fertilizer and/or manure applications on biomass production and N recovery. Similar data will be collected from the rye trial (Columbia County) in spring 2012. The fall data collection protocol and laboratory analyses are provided by Dr. Matt Ruark at UW-Madison Soil Science Extension.

Plans for 2012 data collection vary across sites. Some will measure pre-plant soil nitrate levels in early spring and compare different N application rates applied to corn following the cover crop. At the Winnebago County site soil water infiltration rates will be measured and compared between the cover vs. no-cover treatment from 2011. Others will compare the 2012 crop's yield between the 2011 cover vs. no cover treatments and may include N fertilizer rate treatments. The Sheboygan, Ozaukee and Washington County project will conduct an in-depth economic analysis. Others, such as those sites producing fresh market vegetables, will make only qualitative observations as to the effect of the 2011 cover crop on the 2012 commodity crops.

On-line decision tool for selecting cover crops in Wisconsin

The Midwest Cover Crop Council (MCCC) Cover Crop Decision Tool is a web-based system designed to assist farmers in identifying cover crop options for their farm. Current versions support identifying cover crop options applicable to row crop rotations. Cover crop options provided by the tool are based on the following criteria:

1. County frost/freeze data
2. Cash crop planting and harvest dates
3. Field drainage, tile and flooding information
4. Desired cover crop attributes (reason for cover crop use):

Nitrogen source,	Nitrogen scavenger,
Soil builder,	Erosion fighter,
Weed fighter,	Good grazing,
Quick growth,	Lasting residue,
Forage value,	Seed/grain value,
Ability to be inter-seeded with the cash crop	

The program provides technical information and guidance on planting and managing the cover crops of interest. These fact sheets are based on regional and state specific research papers and educational publications. The foundation of information within the tool comes from the Sustainable Agriculture Research and Education (SARE) publication Managing Cover Crops Profitably, 3rd edition (http://www.sare.org/publications/covercrops/covercrops.pdf). The current version of the tool has been completed for Indiana, Michigan, Minnesota, Ohio, and Wisconsin. County specific information and ratings provided by the tool are based in input from a local team of experts who use a combination of research literature, on-farm experience and practical knowledge. For the Wisconsin version, this team was comprised of a sub-group of the UWEX cover crops workgroup.

The Cover Crop Decision Tool is a project of the MCCC. The MCCC is a diverse group from academia, production agriculture, non-governmental organizations, commodity interests, private sector, and representatives from federal and state agencies. The MCCC collaborates to promote the use of cover crops to address soil, water, air, and agricultural quality concerns in the Great Lakes and Mississippi river basins. MCCC member states/provinces include Indiana, Michigan, Ohio, Manitoba, Ontario, Illinois, Wisconsin, Minnesota, Iowa, and North Dakota. Learn more about the MCCC at http://www.mccc.msu.edu. The cover crops selector tool can be accessed at: http://www.mccc.msu.edu/selectorINTRO.html.

***UWEX cover crops workgroup members**

Diane Mayerfeld, UWEX/USDA SARE; Ken Albrecht, UW Agronomy; Nick Schneider, UWEX Winnebago County; Pat Murphy, WI NRCS; Kevin Erb, UWEX Conservation Training; AJ Bussan, UWEX Horticulture; Jed Colquhoun, UWEX Horticulture; Keith Vander Velde, UWEX Marquette County; Jim Stute, UWEX Rock County; Richard Proost, UW NPM Program; Josh Posner, UW Agronomy; Jean Stramel, WI NRCS; John Hall, Michael Fields Institute; Ken Schroeder, UWEX Portage County; Kevin Shelley, UWEX NPM Program; Paul Mitchell, UWEX Agricultural and Applied Economics; Ken Barnett, UWEX; Matthew Ruark, UWEX Soil Science; John Hendrickson, UW CIAS; Terry Kelly, WI NRCS; Gene Schriefer, UWEX Iowa County; Rhonda Gildersleeve, UWEX Grazing; Peg Reedy, UWEX Walworth County.