

Benefits of Cover Crops in No-till Wheat Stubble

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Summary

- Use of cover crops has benefits for both the soil and the subsequent crop. Some of the main benefits of cover crops in no-till wheat stubble are:
 - Brassica cover crops like radishes, turnips, canola, and rape help increase microbial activity and degradation of excess wheat residue, resulting in warmer and drier seedbeds in the spring for corn planting.
 - Many cover crops reduce soil compaction and improve soil structure to enhance water infiltration in no-till systems. This allows corn to be planted with less excess moisture on the field surface.
 - Recycling nutrients and preventing N leaching
 - Reclaiming saline soils for crop productivity
 - Providing nitrogen if a legume cover crop is used
- No “one” cover crop can accomplish all field objectives, so a mixture of various cover crops is commonly used.
- Most cover crops are drilled (preferred) or broadcast-seeded into standing wheat stubble in late July or during August in South Dakota.
- Try to select a cover crop species (or the majority of a cover crop mix) that is an opposite crop type to next year’s cash crop. A good example is a broadleaf cover crop planted prior to a corn crop.
- Select appropriate residual herbicides to precede your cover crops. Brassicas can be very sensitive to carryover of some residual herbicides, especially wheat herbicides.
- Contact your NRCS office to see if you can qualify for EQIP programs to aid you in planting your cover crops.

Introduction

A cover crop is simply defined as **any crop** that is planted between periods of regular crop production. Cover crops help prevent soil erosion, increase organic matter, provide supplemental grazing opportunities, recycle nutrients, fix atmospheric nitrogen, reduce compaction, and improve water

infiltration. In central South Dakota, cover crops would fit in the time period between winter wheat harvest and the planting of corn, sunflower or grain sorghum. Even in central South Dakota, enough moisture is historically received to enable a cover crop to meet one or more of your objectives for planting it.

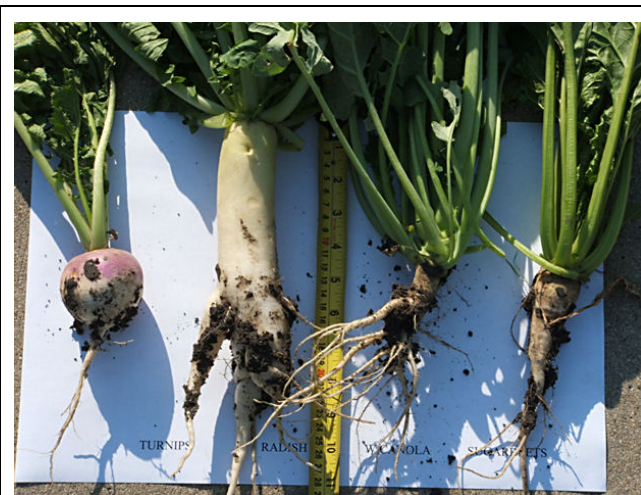


Figure 1. Some common cover crops. **Top:** turnip, radish, winter canola, and sugar beet. **Bottom:** a cover crop mixture of oats, turnips, radishes, lentils, and rape growing in wheat stubble. September 27, 2007 - Gettysburg, SD.

Top picture courtesy of James Millar, NRCS; bottom picture courtesy of Jason Miller, NRCS Agronomist.

Common Objectives for Planting Cover Crops

Before selecting a cover crop species, growers should clearly identify their objectives for growing the crop. This could include one or many of the possible objectives listed below:

- **Provide nitrogen** – For this purpose, include a legume crop.
- **Addition of organic matter** – This is key to improving overall soil health.
- **Improve soil structure** – This will enhance water infiltration and decrease water runoff.
- **Reduce soil erosion** – Saving the topsoil will enhance overall soil productivity.
- **Reduce soil compaction** – Some cover crop species contain excellent tap roots that will help alleviate soil compaction.
- **Increase residue cycling** – Brassica cover crops such as canola, rape, turnips, radishes, and mustards accelerate the breakdown of residue such as wheat stubble. This can help reduce C:N ratios of residue in the soil and allow for a warmer and drier seedbed for earlier planting of corn the following spring.
- **Manage nutrients** – A number of cover crop species will utilize nutrients (especially nitrogen) that would otherwise be lost to leaching or soil erosion before the next ‘cash’ crop could capture them.
- **Provide weed control** – A cover crop canopy growing in the field will provide competition against weeds.
- **Provide livestock grazing/forage** – Most if not all cover crop species can be utilized for livestock grazing.
- **Reduce soil salinity** – Cover crops will utilize any extra moisture that is received, which reduces the potential for soil salinity problems.
- **Increase crop and soil organism diversity** – One of the less appreciated soil benefits of cover crops is an increase in the total number and diversity of soil organisms. Diversity is the key to a healthy, well-functioning soil.
- **Enhances Wildlife Habitat** – Both cover and habitat diversity are important for area wildlife.

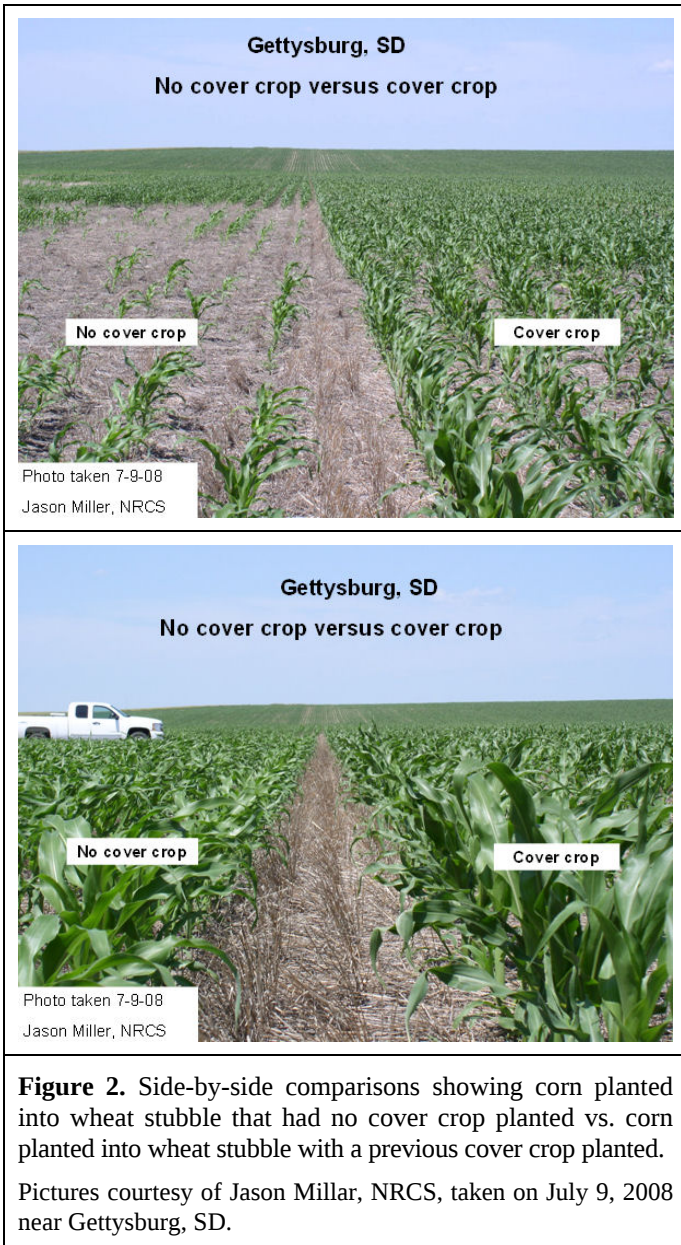
Because a single “wonder” crop is unlikely to address all of these objectives, a mixture or “cocktail” should be considered to meet multiple cover crop objectives. The following tables identify plant species that can be used to achieve various cover crop objectives (Table 1) and cool and warm season cover crop options (Table 2).

Table 1. Cover crop objective and appropriate crop species.

Objective	Primary Cover Crop Species
Grazing	turnips, lentils, rape, radish, rye, oat, triticale, sorghum-sudan
Reducing Compaction	radish, canola, sugarbeet, sunflower, sorghum-sudan, turnip (and hybrids)
Moisture	rape, clovers, winter wheat, rye, triticale
N-fixation	clovers, vetches, lentils, cowpeas, soybean, field pea, chickling vetch
Residue Cycling	Brassicas (canola, rape, radishes, turnips, and mustards)
Nutrient Cycling	sunflower, sugarbeets, brassicas, small grains
Salinity	sugarbeets, barley, winter canola, rape

Table 2. Cool- and warm-season cover crop options.

Cover Crop Options			
Cool Season Broadleaves	Warm Season Broadleaves	Cool Season Grasses	Warm Season Grasses
Alfalfa*	Cowpeas*	Barley	Grain and forage sorghum
Clover (red, sweet, alsike, white)*	Soybeans*	Oats	Sudangrass
Vetch (hairy, common, chickling)*	Sunflower	Spring wheat / Rye	Millet
Winter Canola / Rape		Winter Wheat / Rye	Teff grass
Lentils (red berry or Indianhead)*		Spring / Winter Triticale	
Radishes (fodder, oilseed)		Tall Wheatgrass	
Turnips		Annual Oregon Ryegrass	
Sugar beets			
Crambe			
Field Peas*			
Flax			
Camelina			
* Legume species that can fix atmospheric nitrogen			



The Benefits of Cover Crops Planted into Wheat Stubble for Spring Corn Planting

Some of the major challenges in trying to plant corn into the previous year's wheat stubble are waiting for the no-till seedbed to be warm and dry enough to plant and trying to reduce the harmful effects often associated with sidewall compaction. Wheat straw can cause serious complications for stand establishment and uniform emergence of corn (Figure 2, top), especially when residue levels are high. Also, many growers in South Dakota are farming larger and larger acreages. The opportunity to maximize corn yields by planting at optimum planting dates and to continue planting progress despite challenging weather conditions is critical to

the success of these farming operations. This is especially true at the record high commodity prices seen recently for most crops.

Some growers have been able to address these issues in no-till wheat stubble by planting brassica cover crops like turnips, radishes, canola, rape, and mustard. These brassica cover crops have helped increase the rate of microbial activity and decomposition of wheat straw residue as shown in Figure 3, resulting in faster residue cycling as well as warmer and drier soils during spring corn planting.



Figure 3. Winter wheat stubble with no cover crop (top) vs. winter wheat stubble that has brassica cover crops planted into it the previous year prior to the corn crop (bottom).

Pictures courtesy of Jason Miller, NRCS Agronomist on July 9, 2008 at the SDSU Dakota Lakes Research Farm – Pierre, SD.

Winter cover crops with large taproots (like many of the brassicas) can also alleviate the effects of soil compaction by penetrating the compacted layer when the soil is wet and relatively soft during the winter. These crops leave channels that enable water, air and cash crop roots to penetrate the soil profile more easily during the summer when the soil is dry and hard. This action has been dubbed “*biological drilling*.” These winter cover crops can catch more snow

during the winter and the large tap roots are able to improve water infiltration of the captured moisture and allow it to replenish the soil profile below for utilization by the following year's cash crop.

Other Cover Crop Management Tips in No-till Wheat Stubble

- Most cover crops are drilled (preferred seeding method) or broadcast-seeded into standing wheat stubble in late July or during August in South Dakota.
- The selected cover crop species should have a minimal potential to act as a host in pest cycles for adjacent crops, as well as for the next crop in the rotation. Therefore, the cover crop species or majority of the cover crop species in the mixture should be the opposite crop type of the next year's cash crop. For example, a broadleaf cover crop is planted prior to a corn crop (warm season grass).
- Select appropriate residual herbicides to precede your cover crops. Brassicas can be very sensitive to carryover of some residual herbicides, especially wheat herbicides.
- If you are interested in wheat residue cycling and breakdown, use the brassica cover crop species.
- It can be difficult to find an aggressive legume to compete with winter canola and radishes in a cover crop mix. Be sure to account for such competitive effects when creating or choosing a mix, including shading effects, etc.
- Saline soils can often be reclaimed or improved by planting a tall wheatgrass, barley and sugar beet cover crop mix on those fields.
- Cover crops can utilize free moisture in the fall and most cover crops utilize water from the top 18-24" of soil.
- Turnips and radishes are 80% water and degrade rapidly.
- It is preferred that most cover crops are drilled for good stands. Although some species of cover crops can be broadcast or blown on, less desirable stands often result.
- Some legume cover crops like lentils (Type C) and cow peas (peanut type) require a different inoculant than soybeans.
- Avoid planting glyphosate-tolerant canola as a cover crop because it or its volunteer plants may prove difficult to control later.
- If using any brassica as a cover crop, realize brassicas require high sulfur. So, if you are planting corn following a brassica cover crop, add sulfur to your fertilizer plans; otherwise, sulfur deficiency in your corn crop may result.
- Many cover crops such as turnips, radishes, lentils, and oats provide additional grazing benefits to cattle producers.

- Cover crops can also reduce the impacts of "fallow syndrome" on prevented-plant acres.
- Many cover crops vary in seed size (Figure 4). Careful planning may be necessary to ensure that the appropriate percentages of seed are contained in the cover crop mix, and that the various seed sizes are handled effectively by the planter.
- The benefits of cover crops accrue over several years. Growers should see improvements in crop yield, pest management, and soil tilth if they commit to cover crop use whenever and wherever possible in cropping systems.

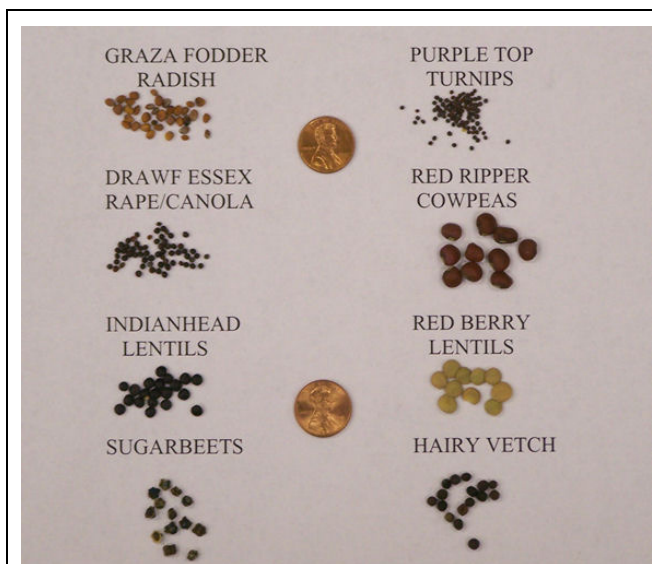


Figure 4. Seed sizes of various cover crop seeds. Picture courtesy of James Millar, NRCS.

Additional Resources

For more information on cover crops visit the South Dakota NRCS home page at:

<http://www.sd.nrcs.usda.gov/technical/CoverCrops.html> and the SD No-Till Association web site at www.sdnottill.com.

These websites contain numerous links to valuable cover crop information.

Potential cover crop seed suppliers may be found at:

<http://www.sdnottill.com/Potential%20Cover%20Crop%20Seed%20Suppliers.pdf>

References

Managing Cover Crops Profitably, Third Edition, June 2007. Sustainable Agriculture Network (SAN), Beltsville, MD. <http://www.sare.org/publications/covercrops/covercrops.pdf>