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Natural Resources Conservation Service
South Dakota

Cover Crops to Improve Soil in Prevented Planting Fields

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Prolonged rain and flooding has resulted in many fields that will go unplanted this year. Farmers in this situation need to weigh not only their program and insurance options ("prevented planting"), but should also assess agronomic options to ensure long-term productivity from this difficult situation.

Producers should explore the benefits of planting a cover crop that has the potential to use excess water, fix nitrogen, control weeds, reduce compaction, control erosion, and/or improve soil health and biology during the remainder of the season.

These together can build considerable yield potential for following crops. With the potential "prevented planting" payment and the improved yield potential following a full season "green manure" crop, their economic potential for the whole rotation could be considerable.

Producers are advised to check with USDA's Farm Service Agency (FSA) and Risk Management Agency (RMA) on prevented planting requirements and harvest restrictions for cover crops.

A key soil health concept is to ensure that there is vegetation green and growing during all times of the year.

Building vs. Losing Topsoil

As excessive rainfall runoff or flood waters cut across unprotected fields, the top soil may have been lost from erosion and scouring. With the productive topsoil lost, so too are the nutrients, organic matter, and soil biology. If tillage is applied to these water-damaged fields to control weeds or smooth them out, even relatively flat soils will lose carbon, nitrogen and biomass.

Above-ground biomass of cover crops helps protect the soil from further sun, wind and water damage.

Selecting high bio-mass cover crop mixes will rebuild topsoil. Cover crops, especially if no-tilled, will add organic biomass both above and below ground to rebuild topsoil quicker than if left to grow weeds or especially if left with no cover.

Avoid removing biomass from the field by harvesting for forage or tillage, which will reduce the organic matter benefits. Instead consider seeding a frost-kill mix, using herbicide or mowing prior to seed-head formation, particularly if reseeding could be incompatible with subsequent crops. This will also ensure rapid decomposition and leave more nutrients in the roots that are available to soil organisms and subsequent crops. Grazing is not a concern because biomass and nutrients are returned to the soil.

Soil Biology, Structure and Compaction

Many fields saturated for long periods lose soil organisms that create soil macro-pores and cycle nutrients and lose beneficial soil biology, such as arbuscular mycorrhizal fungi and rhizobia bacteria that build structure and tilth. Without these organisms, the soils are very subject to compaction, crusting, and high bulk density problems.

Some fields may be so compacted that remediation activities are needed. However, cover crops, whether used alone or in conjunction with other compaction remediation activities, are essential to rebuild healthy soil structure. The roots of cover crops help to penetrate compacted zones, hold soil aggregates together, and sustain healthy organisms to restore soil structure. Growing roots are essential to re-establish the mycorrhizae in the soil and to create pathways for air and water to move through the soil profile, which are key components to restoring the soil's functional properties and will keep the pathways more open to result in a quicker fix of the compacted layers.

Building vs. Losing Nitrogen
Cover crops can build organic nitrogen, and/or sequester residual Nitrogen in the soil.

A legume or legume mix planted in early summer can easily provide 60-100 percent of the needed Nitrogen of a following corn crop.

A brassica or grass, or brassica+grass mix can scavenge over 40 pounds of residual Nitrogen from the soil, and even more in situations where manure or pre-plant nutrients have been recently applied. Additionally, this results in a more rapid gain in total soil biomass and a higher total nutrient availability for subsequent crops.

Herbicide Concerns
A bioassey test is recommended to determine if a herbicide carry over is present. For amine herbicides, sorghum-sudangrass is the most tolerant of cover crop species.

Cover Crop Species Guidance
Cover crop selection and management should focus on maximizing both above and below-ground biomass and encouraging nutrient cycling as deep in the soil profile as possible. Choosing a mix of a grass with a fibrous root system and a legume or brassica with a tap root will usually provide the widest range of benefits.

Planting wildlife friendly cover crops such as buckwheat or brassicas and leaving the growth and/or the grain can be a very valuable winter food source for a wide variety of wildlife and pollinators.

Legumes alone or in combination with grasses can provide quicker soil biology/biota restoration and Nitrogen fixation. Nitrogen fixation is directly related to growth and development of the legume. An early summer planted legume such as cow peas, will grow rapidly and fix a good amount of N prior to a killing frost when it will be terminated. Make sure all legume seed is inoculated.

Brassicas provide excellent weed control and Nitrogen scavenging potential. The tap roots are excellent at penetrating tillage pans and dense soil layers.

Seeding and Establishment
One of the challenges of a mid-summer seeding is the timeliness of rainfall after seeding for germination. It is best if the seed is drilled. This will also address concern about crusted soil and seed-to-soil contact.

Additional References

Sustainable Agriculture Research and Education (SARE): Managing Cover Crops Profitably 3rd Edition: www.sare.org/publications

Natural Resources Conservation Service Soil Health web page: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/plantsanimals/plants/projects/?cid=stelprdb1077238

The table below lists some suggested cover crop mixes for a variety of purposes and their benefits. Additional resources can be found on the Cover Crops page under the "Technical Resources" section of the South Dakota NRCS web site: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/sd/technical/?cid=nrcs141p2_036589.

Resource Concern (Purpose)	Species	Variety	Full rate	% in mix	Seeding rate for mix
Soil Building	Oat		70.0	10%	7.0
	Flax		20.0	20%	4.0
	Millet	pearl	25.0	20%	5.0
	Rapeseed	Dwarf Essex	5.0	15%	0.8
	Radish	diakon	8.0	15%	1.2
	Sunflower		7.0	10%	0.7
	Cowpea		30.0	10%	3.0
Nitrogen Fixing	Lentil		30.0	20%	6.0
	Common vetch		25.0	25%	6.3
	Cowpea		30.0	15%	4.5
	Radish		8.0	10%	0.8
	Turnip		4.0	15%	0.6
	Pea	Field	70.0	15%	10.5
Compaction	Rapeseed	Dwarf Essex	5.0	40%	2.0
	Radish		8.0	40%	3.2
	Common vetch		25.0	20%	5.0
Erosion Control	Oat		70.0	20%	14.0
	Millet	pearl	25.0	25%	6.3
	Winter rye or wheat	cereal	100.0	15%	15.0
	Radish	oil seed	8.0	20%	1.6
	Alsike clover		3.0	10%	0.3
	Common vetch		25.0	10%	2.5
Water Use	Turnip		4.0	25%	1.0
	Radish		8.0	25%	2.0
	Winter rye or wheat	cereal	100.0	30%	30.0
	Grain or forage sorghum		10.0	20%	2.0
Nutrient Scavenger	Radish		8.0	30%	2.4
	Rapeseed	Dwarf Essex	5.0	30%	1.5
	Lentil		30.0	15%	4.5
	Pea	Field	70.0	15%	10.5
	Chickling vetch		50.0	10%	5.0