

Conservation Crop Rotations for Soil Quality and Soil Health

Background: Conservation Crop Rotations are an important part of a Conservation Cropping System. They may be used to increase soil organic matter, capture and recycle nutrients, promote biological fixation of nitrogen, increase soil biodiversity, break pest and disease cycles, increase water infiltration, increase available water holding capacity, and minimize soil erosion and compaction. All of these benefits are important for improving soil quality and health.

Criteria to Improve Soil Quality and Health

Soil Quality - functional ability of soil to support optimal biological activity and diversity for plant and animal productivity, to regulate water flow and storage, and to provide an environmental buffer

Soil Health - continued capacity of soil as a vital living system whereby plant and animal growth and environmental quality is sustained; a holistic approach in which plant, animal, and human health is promoted

To provide for both of the above, a Crop Rotation must contain:

1. **High Residue Crops**, that produce a positive Organic Matter (OM) subfactor value over the life of the rotation, as determined by the Soil Conditioning Index (SCI), with appropriate adjustments for additions to or subtractions from biomass.

Crops that have a higher C:N ratio generally will have a greater affect on increasing the OM subfactor. High residue grass crops such as Corn and Wheat also require a significant amount of nitrogen for optimum production so alternating or combining high residue crops with legume or low C:N ratio crops will usually provide a yield advantage.

2. **Increased Cropping System Diversity** with a planned crop sequence that contains different crop types such as: [crop types are: warm season grass (WSG); warm season broadleaf (WSB); cool season grass (CSG); cool season broadleaf (CSB)]:

The planned crop and/or cover crop sequence will contain different crop types as specified under the options below:

- A two-crop sequence containing a warm season and a cool season crop; (i.e. Corn - Wheat or Corn - Winter Cover Crop - Corn)
- A three-crop sequence containing a warm season and cool season crop types, neither of which with crop species grown consecutively (i.e. Corn – Soybean - Wheat for 3 different crops in 3 different years; or Corn – Soybean - winter cover crop for 3 different crops in 2 years)
- A four-crop sequence containing two different crop types, neither of which may occupy more than half of the sequence. (i.e. Corn – Soybean – Wheat - Clover)
- Longer crop sequences may have more than two consecutive years of the same crop type, as long as that crop type does not occupy more than $\frac{2}{3}$ of the crop rotation. (i.e. Corn – Corn – Soybean – Soybean – Wheat - Cover Crop)

Additional Cropping System Diversity can be gained by alternating grass and broadleaf species and/or combining both in a mix which would be more typical in a Cover Crop or Perennial blend.

Minimal disturbance of the crop residues will greatly enhance the above benefits.

Table 1. Typical Crop Types- Warm Season Broadleaf (WSB), Warm Season Grass (WSG), Cool Season Broadleaf (CSB), Cool Season Grass (CSG). Additional similar crops may also be used.

Perennial Cover ^{1/}	Type	High Residue Crops ^{2/}	Type	Cover Crops ^{3/}	Type
Alfalfa	WSB	Barley	CSG	Radish, forage, daikon	CSB
Alsike Clover	CSB	Corn (grain)	WSG	Alsike Clover	CSB
Birdsfoot Trefoil	WSB	Millet	WSG	Annual Ryegrass	CSG
Kentucky Bluegrass	CSG	Milo	WSG	Barley	CSG
Lespedeza, Korean, common	WSB	Oats	CSG	Buckwheat	WSB
Orchardgrass	CSG	Popcorn	WSG	Canola/rape	CSB
Perennial Ryegrass	CSG	Rye	CSG	Cowpeas	WSB
Red Clover	WSB	Sorghum	WSG	Crabgrass (red river)	WSG
Redtop	CSG	Sorghum-	WSG	Crimson Clover	CSB
Smooth Brome	CSG	Sudangrass Hybrids	WSG	Field Peas/winter peas	CSB
Tall Fescue	CSG	Triticale	CSG	Hairy Vetch	CSB
Timothy	CSG	Wheat	CSG	Oats	CSG
White Clover	CSB	Low Residue Crops <u>2/</u>		Red Clover	WSB
Canada Wildrye	CSG	Soybean	WSB	Rye	CSG
Riverbank Wildrye	CSG	Tomatoes	WSB	Sorghum-Sudangrass Hybrids	WSG
Virginia Wildrye	CSG	Melons	WSB	Kale	CSB
Big Bluestem	WSG	Corn (silage)	WSG	Triticale	CSG
Prairie Dropseed	WSG	Vegetables	WSB	turnips	CSB
Eastern Gamagrass	WSG	Potatoes	WSB	Wheat	CSG
Indiangrass	WSG	1/ Grown for two years or more. 2/ Full-season crops managed to leave 50 percent or more residue cover. Not harvested for silage or biomass.		3/ Cover to be established early enough in growing season to provide adequate root growth, biomass and/or cover.	
Little Bluestem	WSG				
Sideoats Grama	WSG				
Switchgrass	WSG				
Native Forbs and Legumes	WSB				