Soil Quality Enhancement Activity – SQL12 – Intensive cover cropping in annual crops

Enhancement Description
Grow and manage *seasonal* cover crops of grasses, legumes or forbs to maintain soil coverage and other conservation benefits during all the non-crop production periods in an annual crop rotation. Intensive cover cropping is applicable to conventional, specialty and organic crop production systems.

Landuse Applicability
Cropland

Benefits
Using seasonal cover crops during all non-production periods between annually produced crops reduces wind and water erosion. When managed appropriately for local conditions, cover crops can restore and maintain soil productivity and soil quality over a wide range of climates and crop species. Cover crops restore and maintain soil properties by increasing organic matter, relieving compaction, improving soil tilth and fertility, fixing nitrogen (legumes), recycling nutrients in the soil profile, breaking pest cycles and providing habitat for soil biota, such as beneficial bacteria, mycorrhizal fungi and earthworms.

Conditions Where Enhancement Applies
This enhancement applies to all acres of annually planted cropland. These acres can be organic, transitioning to organic, or non-organic.

Criteria
Implementation of this enhancement requires the use of cover crops to provide soil coverage during the non-crop production periods of the rotation. To minimize periods of soil exposure, plant cover crops as soon as practical after harvest of each production crop. Use cover crop species appropriate to the season and seeding as well as seeding rates and methods that will yield a uniform stand and rapid ground coverage. Cover crops may be seeded into standing production crops provided seeding rates and methods, soil moisture levels and other environmental conditions are adequate to yield a satisfactory cover crop stand.

For the purposes of this enhancement, the cover crop shall not be harvested or grazed.

Each cover crop in the rotation shall meet the criteria for a least one of the following purposes. Over the duration of the crop rotation, cover crops shall be utilized to meet two or more of the criteria.

1. High bio-mass cover crops for erosion control and increased soil organic matter improvement.

   a. Plant a cover crop with a growth potential to produce a minimum of 3,000 lbs/acre (dry weight) above ground bio-mass when terminated by seasonal temperature changes (frost or heat), mechanical action (mowing, tillage, crimping, etc.) and/or herbicides in preparation for the following crop. Use seeding rates and row spacing (for drilled cover crop) that will provide rapid canopy closure and adequate ground coverage to prevent erosion between production crops, with a minimum of 90% cover by the time of cover crop termination.
   b. Leave the entire biomass in the field (i.e., do not harvest or graze the cover crop)
   c. Growth potential lists and recommended seeding rates and methods for selected cover crops are available in "Managing Cover Crops Profitably, 3rd Edition" (Clark, 2007).
2. Legume cover crops for biological nitrogen fixation.
   a. Plant a leguminous cover crop between two primary crops in the rotation. This option does not apply to legumes that are normally part of the crop rotation. The legume shall be seeded at a rate recommended by the NRCS Field Office Technical Guide. Estimate nitrogen credits from the leguminous crop and base any additional N applications according to the guidelines of the Land Grant University, as approved by the NRCS State Agronomist.
   b. Manage legume N to minimize N loss. In climates and soils where rapid N mineralization and/or leaching are likely, plant a legume-grass mixture to increase the biomass C: N ratio. This will decrease the N release rate.
3. Non-leguminous cover crops to capture and recycle residual nitrogen.
   a. Plant a cover crop with a growth rate and rooting depth sufficient to scavenge excess/unused nitrogen remaining in the upper soil profile. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.
   b. Consider reducing the N recommendation for the following crop by an estimated amount based on the site conditions both before and during the cover crop's growing period, the cover crop species, and the termination phase of the cover crop.

   Note: This option does not apply to the same acres on which a leguminous cover crop is applied.
4. Cover crops for weed suppression.
   a. Plant a cover crop with the chemical and physical characteristics necessary to suppress or compete with the identified target weed species. Leave cover crop residues on the soil surface to maximize the allelopathic (chemical) and mulching (physical) effects. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.
5. Biodiversity improvement with cover crops.
   a. Plant cover crop species with the characteristics to attract beneficial insects such as pollinators and/or predator insects, serve as trap crops for damaging insects, and/or provide natural bio-fumigation for soil dwelling pests. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.

Adoption Requirements

This enhancement is considered adopted when two or more of the criteria are met on land use acreage.

Documentation Requirements

1. Crop rotation records, including rotation length in years, crops and cover crops planted,
2. Sequence and description of operations for each crop and cover crop including harvest, tillage, nutrient placement and planting/seeding,
3. Photographs of representative fields showing cover crops added to the rotation, timing and method of cover crop establishment, and extent of cover crop growth just before termination, and
4. Seed and legume inoculant tags and receipts.

References

A. Clark (ed.). 2007. Managing cover crops profitably. 3rd ed. Sustainable Agriculture Network Handbook Series; bk 9.

Magdoff, F. and H. van Es. Cover Crops. 2000. *In* Building soils for better crops. 2nd ed. Sustainable Agriculture Network Handbook Series. National Agriculture Library. Beltsville, MD. pp 87-96.

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Reference:

- ***340 – Cover Crop***
- ***590 – Nutrient Management***
- ***Midwest Cover Crops Council Decision Tool***
- ***Managing Cover Crops Profitably, 3rd Edition***

Minnesota Supplemental Criteria:
For all options see the Cover Crop (340) Practice Standard and supporting documents for more information and recommendations. Consult the References listed above for more cover crop options.

1. Cover crops that can be used for erosion control and soil improvement include: Barley (Spring/Winter), Foxtail millet, Japanese millet, Pearl millet, Proso millet, Oats, Cereal Rye (Winter), Annual Ryegrass, Sorghum-Sudangrass, Sudangrass, Triticale (Winter), Wheat (Spring/Winter), Radish (Oilseed/Forage), Alfalfa, Berseem Clover, Crimson Clover, Red Clover, White Clover, Sweetclover, or other species as approved by the NRCS Area Resource Conservationist and/or the State Agronomist. Consult the "Managing Cover Crops Profitably" book Chart 2, (page 67) to show ranges of per acre dry matter for respective grasses and legumes.
2. Cover crops that can be used for nitrogen fixation include: Alfalfa, Berseem clover, Crimson clover, Red clover, Cowpea, Sweetclover, Hairy vetch or other species as approved by the NRCS Area Resource Conservationist and/or the State Agronomist.
3. Cover crops that can be used for Nitrogen Scavenging include: Barley (Spring/Winter), Buckwheat, Foxtail millet, Japanese millet, Pearl millet, Proso millet, Oats, Cereal Rye (Winter), Annual Ryegrass, Sorghum-Sundangrass, Sudangrass, Triticale (Winter), Wheat (Spring/Winter), Yellow Mustard, Radish (oilseed/forage), Rapeseed/Canola, Forage-Type Turnip or other species as approved by the NRCS Area Resource Conservationist and/or the State Agronomist. Nutrient application rates

shall be consistent with University of Minnesota or contiguous land grant university recommendations.

4. Cover crops that can be used for weed suppression include: Barley (Spring/Winter), Buckwheat, Foxtail millet, Japanese millet, Pearl millet, Proso millet, Cereal Rye (Winter), Sorghum-sudangrass, Sudangrass, Triticale (Winter), Wheat (Winter), Yellow Mustard, Radish (oilseed/forage), Red Clover or other species as approved by the NRCS Area Resource Conservationist and/or the State Agronomist.
5. Cover crops that can be used for biodiversity improvement include: Barley (Spring/Winter), Buckwheat, Sorghum-sudangrass, Yellow Mustard, Rapeseed/Canola, Alfalfa, Berseem clover, Crimson clover, Red clover, White clover, Cowpea, Field/Winter Pea, Soybeans, Sweetclover, Hairy Vetch or other species as approved by the NRCS Area Resource Conservationist and/or the State Agronomist.

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