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.

CSP 2013-1
State Supplement
SQL12

MS-ECS-340-01 (JS)
Cover and Green Manure Crop (Ac.)

Species	Seeding Date	Seed/lb (x 1000)	Pure Stand Seeding Rates (seeds/ft)	Pure Stand Seeding Rates (lb/A)	Proportional Seeding Rates for Mixtures 3/4 (lb/A)	1/2 (lb/A)	1/3 (lb/A)	1/4 (lb/A)	Planting Depth (Inches)	Fert (lbs/ac) N-P-K
Suggested Cover Crops for Recycling Nutrients										
Cover crop species will be selected for their ability to take up large amounts of nutrients from the rooting profile of the s										
Oats	Sept.-Nov.	15	20	60-120	49	33	22	16	1	80-40-80
Oilseed Radish	Sept.-Nov.	140	19	6	4.5	3	2	1.5	1/2	60-40-60
Sorghum/Sudan Grass	April-June	28	13	20	15	10	7	5	1	120-40-80
Cereal Rye	Sept.-Nov.	18	18	60-120	49	33	22	16	1	80-40-80
Winter Wheat	Sept.-Nov.	15	40	60-120	60	40	27	15	1	80-40-80
Pearl Millet	April-June	82	30	25	19	13	8	6	1/2	120-40-80
Suggested Cover Crops for Fixing Nitrogen										
1. Only Legume or Legume-grass mixtures will be established as cover crops										
2. Legume seed will be inoculated with the approperate rhizobium bacteria										
Alfalfa (annual)	Sept.-Nov.	227	80	15	12	8	5	4	1/2	0-80-200
Alsike Clover - Ladino Clover	Sept.-Nov.	700-800	50	4	3	2	1.3	1	1/2	0-80-200
Austrian Winter Pea	Sept.-Nov.	18	14	35	26	17	11.5	9	1	0-80-80
Hairy Vetch	Sept.-Nov.	20	6	25	9	6	4	3	1	0-80-80
Red Clover	Sept.-Nov.	275	51	8	6	4	2.5	2	1/4	0-80-200
Soybeans	April-June	4	5	45	34	4	15	11	1	0-80-80
Arrowleaf Clover	Sept.-Nov.	400	50	8	6	4	2.5	2	1/2	0-80-200
Crimson Clover	Sept.-Nov.	150	50	25	19	13	8	6	1/4	0-80-200
Suggested Cover Crops for High Residue										
1. Termination of high residue crops shall be accomplished by chemical methods, non-chemical methods (such as flail mower or										
) a combimation of both.										
Sorghum/Sudan Grass	April-June	28	13	20	15	10	7	5	1	120-40-80
Cereal Rye	Sept.-Nov.	18	18	60-120	49	33	22	16	1	80-40-80
Winter Wheat	Sept.-Nov.	15	40	60-120	60	40	27	15	1	80-40-80
Pearl Millet	April-June	82	30	30	19	13	8	6	1/2	120-40-80
Suggested Deep Rooted Cover Crops for Soil Compaction										
1. Legume seed will be inoculated with the approperate rhizobium bacteria										
Alfalfa (annual)	Sept.-Nov.	227	80	15	12	8	5	4	1/2	0-80-200
Alsike Clover - Ladino Clover	Sept.-Nov.	700-800	50	4	3	2	1.3	1	1/2	0-80-80
Austrian Winter Pea	Sept.-Nov.	18	14	35	26	17	11.5	9	1	0-80-80
Hairy Vetch	Sept.-Nov.	20	6	12	9	6	4	3	1	0-80-80
Red Clover	Sept.-Nov.	275	51	8	6	4	2.5	2	1/4	0-80-80
Soybeans	April-June	4	5	45	34	4	15	11	1	0-80-80
Arrowleaf Clover	Sept.-Nov.	400	50	8	6	4	2.5	2	1/2	0-80-80
Crimson Clover	Sept.-Nov.	150	50	25	19	13	8	6	1/4	0-80-80
Oilseed Radish	Sept.-Nov.	140	19	6	4.5	3	2	1.5	1/2	60-40-60
Brassicas	Sept.-Nov.	190	13	3	0	0	0	1	1/2	60-40-60
Ryegrass	Sept.-Nov.	228	84	25-40	15	10	7	5	1/2	180-80-20
Suggested Cover Crops for Additional Forage										
1. Species will have desired forage traits and not interfere with production of subsequent crop.										
2. Forage provided by cover crop may be hayed or grazed as long as saufficent biomass is left for resource protection.										
Oats	Sept.-Nov.	15	20	60-120	49	33	22	16	1	80-40-80
Oilseed Radish	Sept.-Nov.	140	19	6	4.5	3	2	1.5	1/2	60-40-60
Sorghum/Sudan Grass	April-June	28	13	35	0	0	0	0	1	120-40-80
Cereal Rye	Sept.-Nov.	18	18	60-120	0	0	0	0	1	80-40-80
Winter Wheat	Sept.-Nov.	15	40	60-120	0	0	0	0	1	80-40-80
Pearl Millet	April-June	82	30	30	0	0	0	0	1/2	120-40-80
Brassicas	Sept.-Nov.	190	13	3	0	0	0	1	1/2	60-40-60
Ryegrass	Sept.-Nov.	228	84	25-40	18	12	8	6	1/2	180-80-20