

**Water Quality Enhancement Activity – WQL16 – Use of legume cover crops as a nitrogen source**



**Enhancement Description**

This enhancement is for the use of legume cover crops as a primary source of nitrogen in a cropping system. Use of legume cover crops is applicable to conventional, specialty and organic crop production systems.

**Land Use Applicability**

Cropland.

**Benefits**

Approximately 35,000 cu ft natural gas is required to produce one ton of nitrogen fertilizer. Legume cover crops can provide 50 to 100 lbs of plant available nitrogen per acre to reduce off-farm energy requirements.

**Criteria**

1. Plant and manage legume cover crops prior to all field or specialty crops raised that require the use of commercial nitrogen.
2. Estimate nitrogen credits from the leguminous crop. The legume cover crop must be selected and managed to supply a significant amount of N for the following crop. Nitrogen credit estimate should consider:
  - a. The amount of biomass produced (plant height and maturity)
  - b. The nutrient composition of the cover crop (for example, clover vs. vetch)
  - c. The decomposition rate of the cover crop during the cash crop growing season based on incorporation of the residue or being left on the soil surface after planting. Note: An example procedure is outlined in *“Managing Cover Crops Profitably, 3<sup>rd</sup> Edition”* (Sarrantonio, 1998)
3. NRCS State Offices should work with their state Land Grant Universities to establish the minimum N credit that will be required from legume cover crops.
4. Base additional nitrogen application rates for crops following the cover crop on guidelines of the state Land Grant University. Reduce nitrogen application rates by at least the amount credited in #3 above to account for the nitrogen available from the legume cover crop.

**Documentation Requirements**

Written documentation for each year of this enhancement describing the following items:

1. A map showing where the enhancement is applied
2. Type of legume cover crop planted



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3. Calculations for estimating available nitrogen
4. Application rates of additional nitrogen by field
5. Realistic yield goals for field or specialty crop grown



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**Reference:**

- **340 – Cover Crop**
- **590 – Nutrient Management**
- **Managing Cover Crops Profitably, 3<sup>rd</sup> Edition**

Species	Seeding Rate	Seeding Depth (inches)	Seeding Date	Comments
Berseem Clover	10 – 15 lbs/ac	¼ to ½	Early spring into small grain.	Summer annual. Often mixed with ryegrass or small grains. Heavy N producer, establishes well with an oat nurse crop – excellent cover for sg-c-sb rotations. Winter kills.
Cowpeas	30 – 90 lbs/Ac	1 to 2	May 15 - July 1	Summer annual adapted to southern MN. Often mixed with sorghum-sudangrass or interseeded with corn.
Crimson Clover	10 – 15 lbs/ac	¼ to ½	Early spring into small grain OR Aug 1 - Sept 15	Adapted to southern MN; rapid summer or fall growth; use as a winter killed annual like oats. Provides good groundcover and weed control.
Hairy Vetch	20 – 30 lbs/ac	½ to 1 ½	Aug 1 - Sept 15	Adapted to southern MN; produces plenty of residues to condition soil and supply N. It can provide sufficient N for many vegetable and late planted crops and partially replace N for corn. Smothers spring weeds. Commonly planted with winter cereals.
Medium Red Clover	8 – 10 lbs/ac	¼ to ½	April 15 - June 15 OR Aug 1 - Sept 15	Good on somewhat poorly drained sites and potato fields with moderate pH. Prefers drilling to broadcast.

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Sweet Clover	8 – 10 lbs/ac	¼ to ½	Early spring into small grain OR Aug 1 - Sept 15	Advantageous to use on well drained and droughty sites. Prefers drilling to broadcast. May become invasive if allowed to seed out. Hard seed will remain viable in soil for many years.
White Clover	5 – 7 lbs/ac	¼ to ½	Aug 1 - Sept 15	Often mixed with annual rye or red clover. Good when planted between rows of irrigated vegetables or trees.

**Please Note:**

- Care is advised when determining the amount of N that will be available to the crop following the legume cover crop. As a general rule, full season clovers can supply up to 75 lbs. N/acre to the succeeding crop (more for unharvested sweet clover). But per acre yield in Minnesota will not be substantial if legumes are seeded in late summer-early fall and destroyed the following spring. A procedure to determine N available to the following crop from the above ground portion of the legume is:
  - Determine lbs. per acre yield (dried).
  - Determine percent N in plants just before death. Typically, the range is from 3 to 4%. Sending a tissue sample to a lab gives more precise information.
  - Determine the percentage of N in the plant that can become available to the upcoming crop. Assume that 50% of the N in the cover crop will be available to the upcoming crop in a plow down or incorporation system and 25% will be available in a system where the cover crop residues are left on the soil surface.
  - Do the math: (Yield X %N X % available = available N).

The above procedure is described in more detail in the referenced "Managing Cover Crops Profitably" book (pages 22-23). Chart 2 (pages 67-68) in that book shows ranges of per acre dry matter for respective grasses and legumes.

<http://www.mn.nrcs.usda.gov/technical/ecs/agron/Cover%20Crop/Managing%20Cover%20Crops%20Profitably.pdf>

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2. Nutrient application rates shall be consistent with University of Minnesota or contiguous land grant university recommendations.

<http://www.extension.umn.edu/CommodityCrops/>

<http://www.extension.umn.edu/distribution/cropsystems/DC5886.html>

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