**Energy Enhancement Activity – ENR01 – Fuel use reduction for field operations**

**Enhancement Description**
This enhancement is for fuel savings of 20% or more achieved by a reduction in field operations when compared to existing management system.

**Land Use Applicability**
Cropland

**Benefits**
In addition to saving money the advantages of fossil fuel conservation include reducing air pollutants such as greenhouse gas emissions, and decreasing reliance on foreign oil.

**Conditions Where Enhancement Applies**
This enhancement applies to all crop land use acres.

**Criteria**
1. Implementation of this enhancement requires that the participant reduce their field operations to achieve fuel savings of 20% or greater over their present baseline use.
2. Reduced trips across the field, and reduced tillage intensity are documented by using RUSLE2 to compare the planned tillage operations with present baseline tillage operations. The RUSLE2 user must ensure the energy data in RUSLE2 is current.

**Adoption Requirements**
This enhancement is considered adopted when the present baseline fuel consumption for all field operations is calculated using RUSLE2, at the time of application, and the comparison of the baseline to the planned reduced field operations, also calculated with RUSLE2, is \( \geq 20\% \).

**Documentation Requirements**
Documentation of the fields where field operations have changed

**References**

Annual documentation shall include a map or aerial photo summarizing the tillage/planting method used for the most recently established crop.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Energy Enhancement Activity – ENR10 – Using nitrogen provided by legumes, animal manure and compost to supply 90 to 100% of the nitrogen needs

Enhancement Description
This enhancement involves using nitrogen (N) produced by legumes and/or available animal manure and compost to supply 90 to 100% of N nutrient needs for crops, hay and/or forages produced on the farm.

Land Use Applicability
Cropland, Pastureland

Benefits
Annually 12 million tons of N fertilizers are used to produce crops on over 90 million acres. It requires 35,000 to 40,000 cu. ft. of natural gas to produce one ton of N fertilizer accounting for 1/3 of the energy input to crop production. Managing legumes, manures and compost properly can replace the need for additional N fertilizer and reduce the energy footprint of the farming operation.

Conditions Where Enhancement Applies
This enhancement applies to all crop or pasture land use acres.

Criteria
1. Follow a nutrient management system that utilizes N from legumes, animal manures, composts and the mineralization of N from soil organic matter decomposition to supply 90 to100% of the N needs for production.
2. Follow recommendations from the Land Grant University (LGU) for legume N production when estimating available N for crop production. Note: For a more accurate estimate, utilize the guidance in “Northeast Cover Crop Handbook” chapter 2.
3. Utilize manure and compost nutrient analysis conducted by a LGU laboratory or a private commercial lab recognized by the state when estimating available nutrients for crop production.
4. Manure must be applied according NRCS Nutrient Management Conservation Practice Standard (590). Contact your local conservationist for assistance with Conservation Practice Standards.
5. Utilize cover crops to trap N where appropriate (e.g., following manure application on soils with low residue levels, on soils that have been tilled, or where the fall manure applications were made for a spring planted crop).
6. Manure from off farm sources can be used. The total amount of phosphorus applied shall not exceed the rate recommended by the LGU based on soil testing and established yield goals.
7. This enhancement does not include the removal of crops that require nitrogen from the rotation (e.g., eliminating corn to avoid use of nitrogen fertilizer). However, diversifying the crop rotation to alternate N-requiring with N-fixing crops to reduce the frequency of N-requiring crops in the rotation is acceptable.

Adoption Requirements
This enhancement is considered adopted when 90 to 100% of the nutrient N needs for the crops, hay or forages produced on the farm are from organic sources.

Documentation Requirements
Crop production records that include:
1. Source of organic nitrogen (e.g., cover crop, manure, and compost)
2. An estimate of available nitrogen and methods used to estimate N including:
   a. Lab analysis
   b. Biomass calculation
3. Soil test results for each treatment area
4. Amount of manure and/or compost applied per acre
5. Manure and compost nutrient analysis (if applicable)
6. Amount of nitrogen, phosphorus and potassium applied as manure and/or compost (if applicable)
7. List of fields where enhancement was applied each year
8. Estimate of legume biomass produce each year (if applicable)

References


Wisconsin Supplement 12/30/2013

Refer to "Using Legumes as a Nitrogen Source" for estimating Legume N credit

http://corn.agronomy.wisc.edu/Management/pdfs/A3517.pdf

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Energy Enhancement Activity - ENR11 – Improving energy feedstock production using alley cropping systems with short rotation woody crops

Enhancement Description
This enhancement involves the use of short rotation woody plants that produce energy feedstock planted in multiple rows with crops or forages produced in the alleyways between the woody rows.

Land Use Applicability
Cropland, Pastureland

Benefits
The strategic integration of woody biomass species within agricultural landscapes will assist in meeting society’s and on-farm energy demands while improving agro-ecosystem health and function. Woody feedstock can be harvested year round (with proper planning and design) and the resulting solid chips can be handled, stored and converted to energy. See Alley Cropping (311) conservation practice standard for further guidance.

Conditions Where Enhancement Applies
This enhancement applies to all acres of the selected land use.

Criteria
1. Identify short rotation woody crops to be planted. (Lists of woody plants suitable for energy feedstock production will be developed by NRCS at the state level.)
2. Account for potential local energy markets and personal needs when selecting species. Use native species wherever possible.
4. The alleyway distance between woody row sets will be determined by the following:
   a. Tree or shrub management objectives
   b. Type (s) of woody plant used
   c. Light requirements and growth period of the crops or forages in the alleyways
   d. Erosion control needs
   e. Machinery widths and turning areas
5. Maximum distance of the alleyways between woody row sets will be determined by states.

Adoption Requirements
This enhancement is considered adopted once the short rotation woody crops have been planted.

Documentation Requirements
1. List of short rotation woody crops planted.
2. Type of woody feedstock material (e.g. chips, pellets, rounds)
3. Brief written description of the activities (criteria) completed with dates of application and receipts for planting stock, herbicides, etc.
4. Acreage of the enhancement activity.
5. Delineations on a map or aerial photo of alley cropping layout and placement.

References


**Wisconsin Supplement 2/2/2015**

Woody tree species suitable for energy feedstock production: Jack Pine, Red Pine, White Pine, Bigtooth Aspen, Quaking Aspen, Eastern Cottonwood, Silver Maple, Black Willow, Tamarack; or other species as approved by NRCS State Biologist or Forester.

This is a ‘System’ type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Energy Enhancement Activity – ENR12 – 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 of natural gas is required to produce one ton of nitrogen fertilizer; or on average, 20,000 BTU’s are required to produce one pound of synthetic nitrogen; or approximately 140 BTU’s are required to produce one gallon of diesel fuel. Legume cover crops can provide 50 to 100 lbs of plant available nitrogen per acre to reduce synthetic nitrogen use and fossil fuel use.

Conditions Where Enhancement Applies
This enhancement applies to all crop land use acres.

Criteria
1. On all acreage where this enhancement will be applied, 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.
3. The legume cover crop must be selected and managed to supply a minimum of 40 lbs N/acre credit for the following crop.
4. 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, 3rd Edition” (Sarrantonio, 1998)
5. Seeding rates for the selected cover crop species shall be based on NRCS practice standards or the respective state Land Grant Universities recommendation.
6. Base additional nitrogen application rates for crops following the cover crop on guidelines from 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.
Adoption Requirements
This enhancement is considered adopted when the land use acreage has been planted to a leguminous cover crop that meets or exceeds the minimum nitrogen credit from the criteria above.

Documentation Requirements
Written documentation for each year of this enhancement describing the following items is required:
1. A map showing where the enhancement is applied
2. Type of legume cover crop planted
3. Calculations for estimating available nitrogen
4. Application rates of additional nitrogen by field
5. Realistic yield goals for field or specialty crop grown

References


Wisconsin Supplement 2/2/2015

Legume cover crop <6” growth and 25 stems/sq.ft. = 40 lbs/ac. N credit

Alfalfa, Red Clover, Hairy Vetch, Berseem Clover, and similar crops >6” growth = 60 lbs/ac. N credit

Document cover crop seeding rates, establishment and termination methods.

This is a ‘System’ type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Energy Enhancement Activity – ENR13 - Variable speed motor-drive systems

Enhancement Description
This enhancement activity is for upgrading of existing single speed motors through the addition of variable speed drives. A motor replacement may also be included in some cases. The primary use of this enhancement is for irrigation water pumping. This enhancement is not intended for farmstead or animal housing applications.

Land Use Applicability
Cropland, Pastureland

Benefits
Motor-drive systems are matched to the pump or other machinery which performs the work that needs to be done. Each motor-drive system must be sized to meet the maximum expected load even if that maximum load only occurs infrequently. This maximum output condition is rarely the most efficient operating point of the motor-drive system. A variable speed drive improves the system’s energy efficiency under most operating conditions by matching the motor speed to the load. In contrast, the output of a single speed motor-drive system will rarely match the actual demand and is controlled in some way that often wastes a large part of the power it produces. For example, single speed electric motor-drive systems use more electricity during startup and have operating requirements which vary during the run cycle. A variable speed drive can start a motor slowly and ramp up to full speed reducing wear and tear on the motor.

Variable speed drives achieve higher energy savings in applications with long annual run-times and when the system operates outside its best efficiency point for long periods of time. Equipment which operates with frequent on/off cycles or uses some kind of mechanical throttling (dampers on air systems or valves in liquid systems) are typically good candidates for a variable speed drive.

Motor-drive systems which generally operate under steady load conditions are not good candidates for variable speed drives.

Conditions Where Enhancement Applies
This enhancement applies to only the number of single speed motors without variable speed drives within the selected land use. This enhancement does not apply to single speed motors for farmstead or animal housing applications.
Criteria
1. Determine current and anticipated requirements in terms of peak and typical load conditions (as the load varies daily and by season, crop, or other appropriate activity).
2. Retrofit single speed motors with a variable speed drive or replace single speed motors with an efficient motor and variable speed drive.

Adoption Requirements
This enhancement is considered adopted when the selected single speed motor has been retrofitted or replaced with a variable speed motor-drive system.

Documentation Requirements
Receipts and pictures of the installed variable frequency drive(s).

References

Wisconsin Supplement 2/2/2015

Motors associated with farmsteads or animal housing are not eligible for this enhancement. The primary use of this enhancement is for motors associated with water pumping for irrigation, drainage, or livestock (pasture).

This is an 'Actual' type enhancement. Actual type enhancements must be installed in the year(s) scheduled in the contract and maintained for the duration of the contract.