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Cropland Enhancement Bundle – BCR06 (Improves nutrient and pesticide application techniques and widens buffers)

Enhancement Description
This bundle of enhancement activities includes: AIR04-Use drift reducing nozzles, low pressures, lower boom height, and adjuvants to reduce pesticide drift; AIR07-GPS, targeted spray application (SmartSprayer), or other chemical application electronic control technology; WQL11-Precision application technology to apply nutrients; WQL13-High level IPM to reduce pesticide environmental risk; and one of the buffer widening enhancements ANM05, ANM07 or ANM32.

Land Use Applicability
Cropland

Benefits
This bundle of enhancements is focused on applying nutrients and pesticides using technologies that will limit their impact on the environment. The inclusion of one of the buffer widening enhancements will provide further protection of off-site areas from the impact of agricultural operations. By implementing these activities together a synergy is achieved that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

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

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

Follow the criteria in the respective enhancement activity sheets to implement each enhancement in the bundle.

For this bundle, implement AIR04, AIR07, WQL11 and WQL13 according to their respective criteria on all of the area selected for bundle application. Implement the buffer widening enhancements ANM05, ANM07 or ANM32 where needed according to the criteria for the respective enhancements. If a buffer is needed to address a resource concern but does not exist, the requirements of this bundle can be met by installing a new buffer to the minimum width required by these enhancements.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement in the bundle.

In addition, document the actual amount, fields and when each enhancement in the bundle is applied:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
AIR04			
AIR07			
WQL11			
WQL13			
ANM05, 07 or 32			

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Cropland Enhancement Bundle – BCR09 (Addresses orchard and vineyard resource concerns)

Enhancement Description
This bundle of enhancement activities includes: AIR03-Replace burning of pruning, removals and other crop residues with non-burning alternatives; AIR04-Use of drift reducing nozzles, low pressures, lower boom height, and adjuvants to reduce pesticide drift; PLT15-Establish pollinator and/or beneficial insect habitat; SQL11-Cover cropping in orchards, vineyards and other woody perennial horticultural crops; and WQL13-High level IPM to reduce pesticide environmental risk.

Land Use Applicability
Cropland

Benefits
This bundle of enhancements is focused on activities that address air, water and soil resource concern in orchards and vineyards. Implementing these activities together creates a synergy that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

Conditions Where Enhancement Applies
This enhancement applies only to acres of orchards and vineyards in the crop land use.

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

For this bundle implement AIR03, AIR04, PLT15, SQL11 and WQL13 according to their respective criteria on all of the area selected for bundle application.

If the orchard or vineyard can benefit from any of the criteria listed in SQL11 a state can require that it be implemented, otherwise if existing cover is adequate to meet the resource needs, SQL11 does not have to be implemented.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement.

In addition, document the actual amount, fields and when each enhancement in the bundle is applied:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
AIR03			
AIR04			
PLT15			
SQL11			
WQL13			

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Forest Enhancement Bundle –BFO07 (Improves wildlife habitat in conifer or mixed forests)

Enhancement Description
This bundle of enhancement activities includes: ANM12-Shallow water habitat; PLT15-Establish pollinator and/or beneficial insect habitat; PLT21-Forest stand improvement pre-treating vegetation and fuels preceding a prescribed fire; WQL01-Biological suppression and other non-chemical techniques to manage brush, weeds and invasive species; and WQL13-High level IPM to reduce pesticide environmental risk.

Land Use Applicability
Forestland

Benefits
This bundle of enhancements is focused on activities that will improve wildlife habitat and soil quality. Implementing these activities together creates a synergy that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

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

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

Follow the criteria in the respective enhancement activity sheets to implement each enhancement.

For this bundle implement ANM12, PLT15, PLT21, WQL01, and WQL13 according to their respective criteria on all of the area selected for bundle application.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement.

In addition, document the actual amount, fields and when each enhancement in the bundle is implemented:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
ANM12			
PLT15			
PLT21			
WQL01			
WQL13			

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Forest Enhancement Bundle –BFO08 (Improves wildlife habitat in hardwood or mixed forests)

Enhancement Description
This bundle of enhancement activities includes: ANM12-Shallow water habitat; PLT15-Establish pollinator and/or beneficial insect habitat; PLT17-Create forest openings to improve hardwood stands; WQL01-Biological suppression and other non-chemical techniques to manage brush, weeds and invasive species; and WQL13-High level IPM to reduce pesticide environmental risk.

Land Use Applicability
Forestland

Benefits
This bundle of enhancements is focused on activities that will improve wildlife habitat and soil quality. Implementing these activities together creates a synergy that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

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

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

Follow the criteria in the respective enhancement activity sheets to implement each enhancement.

For this bundle implement ANM12, PLT15, PLT17, WQL01, and WQL13 according to their respective criteria on all of the area selected for bundle application.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement.

In addition, document the actual amount, fields and when each enhancement in the bundle is implemented:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
ANM12			
PLT15			
PLT17			
WQL01			
WQL13			

Pasture Enhancement Bundle –BPA07 (Improves forage utilization)

Enhancement Description
This bundle of enhancement activities includes: ANM25-Stockpiling of forages to extend the grazing season; ANM26-Managing calving to coincide with forage availability; ANM29-On-farm forage based grazing system; PLT16-Intensive rotational grazing; and WQL07-Split nitrogen applications 50% after the crops/pasture emerge/green-up.

Land Use Applicability
Pastureland

Benefits
This bundle of enhancements is focused on activities that improve forage utilization for a longer period of the growing season while saving energy, protecting water quality and improving soil. Implementing these activities together creates a synergy that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

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

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

Follow the criteria in the respective enhancement activity sheets to implement each enhancement.

For this bundle implement ANM25, ANM26, ANM29, PLT16, and WQL07 according to their respective criteria on all of the area selected for bundle application.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement.

In addition, document the actual amount, fields and when each enhancement in the bundle is implemented:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
ANM25			
ANM26			
ANM29			
PLT16			
WQL07			

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Pasture Enhancement Bundle –BPA09 (Addresses multiple resource concerns)

Enhancement Description
This bundle of enhancement activities includes: AIR04-Use drift reducing nozzles, low pressures, lower boom height, and adjuvants to reduce pesticide drift; ANM03-Incorporate native grasses and/or legumes into 15% or more of herbage dry matter productivity; ANM27-Wildlife friendly fencing; PLT16-Intensive rotational grazing, and WQL07-Split nitrogen applications 50% after the crops/pasture emerge/green-up.

Land Use Applicability
Pastureland

Benefits
This bundle of enhancements is focused on activities that address all aspects of pasture management: pests, nutrients and forage quality while improving wildlife access to water. Implementing these activities together creates a synergy that should result in more conservation benefits than might be expected from the individual activities. Applicants that choose to implement this bundle of activities will receive an increase in ranking and activity points.

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

Criteria
Bundle rules

1. All of the activities in the bundle must be implemented. However, if an applicant is already implementing 1 or 2 of the activities, they are still eligible for the bundle and only need to implement the remaining 3 or 4 activities.
2. Applicants will be required to install all enhancements in the bundle wherever they are needed on the applied area.
3. Other enhancements cannot be substituted for those in the bundles.
4. Applicants choose the acres of their operation where they want to implement the bundle. If the applicant chooses to implement the activity on only a portion of their operation, their ranking and performance points will be reduced proportionally.
5. The amount of the bundle that can be scheduled cannot exceed the most limiting individual “system” enhancement scheduled.

Follow the criteria in the respective enhancement activity sheets to implement each enhancement.

For this bundle implement AIR04, ANM03, ANM27, PLT16, and WQL07 according to their respective criteria on all of the area selected for bundle application.

Adoption Requirements
This enhancement is considered adopted when rules # 1 and 2 from "Rules for Enhancement Activity Bundles" above have been fulfilled.

Documentation Requirements
Follow the documentation requirements in the respective enhancement activity sheets to document the implementation of each enhancement.

In addition, document the actual amount, fields and when each enhancement in the bundle is implemented:

Enhancement Activity	Amount (unit)	Field(s) Number or Name	Year Applied
AIR04			
ANM03			
ANM27			
PLT16			
WQL07			

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Supplemental payment activity –CCR99–Resource Conserving Crop Rotation (RCCR)

Enhancement Description
Resource-conserving crop rotation means a crop rotation that:
1. Includes at least one resource conserving crop as determined by the State Conservationist;
2. Reduces erosion;
3. Improves soil fertility and tilth;
4. Interrupts pest cycles; and
5. In applicable areas, reduces depletion of soil moisture or otherwise reduces the need for irrigation.

Resource-conserving crop means a crop that is one of the following:
1. A perennial grass;
2. A legume grown for use as forage, seed for planting, or green manure;
3. A legume-grass mixture;
4. A small grain grown in combination with a green manure crop consisting of a grass, legume, forbs, or grass-forbs mixture, whether interseeded or planted in rotation.

Land Use Applicability
Cropland

Benefits
Resource-conserving crop rotations provide:
- Substantial aboveground residue and extensive root systems resulting in controlled erosion, improved soil tilth and carbon sequestration into soil organic matter.
- Improved soil condition and deep root channels resulting in enhanced water infiltration and soil moisture holding capacity; all of which reduce runoff losses as well as the frequency and amount of irrigation required.
- Improved soil biological activity for enhanced soil health via green manures and rhizodeposition (i.e., root exudates; fine root sloughing).
- Biological N fixation by legumes for soil fertility building and reduced energy consumption.
- Disrupted pest and weed life cycles by varying plant families and timing of field management activities

Conditions Where Enhancement Applies
This enhancement applies to all annually planted crop land use acres. The enhancement does not apply to permanent hayland, orchards, or vineyards.

Criteria
Design the crop rotation with sufficient diversity in plant family and species as well as timing and type of field operations to reduce the weed and pest populations. The rotation plan should reduce anticipated needs for pesticides, cultivation, or other pest/weed control measures.

The resource conserving crop rotation shall include at least one of the following resource conserving crops:
1. With at least one other crop in the rotation, include a perennial grass grown at least 2 years from time of planting;
2. With at least one other crop in the rotation, include a legume that is grown at least 2 years from time of planting;
3. With at least one other crop in the rotation, include a legume-grass mixture that is grown at least 2 years from time of planting;
4. With at least one other crop in the rotation, include a grass-forbs or legume-grass-forbs mixture, in which at least the grass component of the mixture is grown at least 2 years from time of planting, or
5. With at least two other crops in the rotation, include a small grain grown in combination with a grass, legume, forbs or any grass-forbs mixture that is used as a green manure, whether interseeded or planted after small grain harvest. Neither the small grain residue nor the cover crop shall be harvested or grazed.

Contract Criteria
1. The rotation shall cover at least 3 fiscal years of the CSP contract.
2. The resource conserving crop must be adopted by the third fiscal year of the contract and established or planted on all planned acres prior to the final annual payment.

Adoption Requirements
This enhancement is considered adopted when the resource conserving crop rotation is planted on at least 1/3 of the rotation acres.

Documentation Requirements
Planned Resource-Conserving Crop Rotation(s):

List crop rotation(s), resource conserving crops, and cover crops that will follow the specific crops as applicable for each rotation to receive supplemental payment:

Rotation#1: _____Fields: _____Years_____
Resource Conserving Crop(s) to be used: _____

Rotation#2: _____Fields: _____Years_____
Resource Conserving Crop(s) to be used: _____

Rotation#3: _____Fields: _____Years_____
Resource Conserving Crop(s) to be used: _____

Records:
a. Crop rotation records by field
b. Cover crops planted
c. Photographs of representative fields showing different phases of the rotation
d. Seed tags and receipts

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Supplemental payment activity – CCR99 – Resource Conserving Crop Rotation (RCCR)

(1) A perennial grass

The following is a list of perennial grasses that qualify as a resource conserving crop:

Big blustem, Canada wildrye, Festolium or tall fescue, Creeping or Chewings red fescue, Indiangrass, Kentucky bluegrass, Little bluestem, Meadow brome, Meadow fescue, Orchardgrass, Perennial ryegrass, Redtop, Side oats grama, Smooth bromegrass, Switchgrass, Timothy, Virginia wildrye

(2) A legume grown for use as forage, seed for planting, or green manure.

The following is a list of legumes that qualify as a resource conserving crop:

Alfalfa, Alsike clover, Birdsfoot trefoil, Improved white clover (Alice, Ladino), Kura clover, Ladino clover, Red clover

(3) A legume-grass mixture

Any combination of a least 1 perennial grass and at least 1 legume identified above.

(4) A small grain grown in combination with a green manure crop consisting of a grass, legume, forbs, or grass-forbs mixture, whether interseeded or planted in rotation.

The small grain must have an associated grass and/or legume green manure cover crop. The cover crop may be planted at the same time as the small grain; or may be planted after the harvest of the small grain crop. The cover crop must be utilized as a green manure crop and is not to be harvested.

Eligible small grains: Oats, Barley, Wheat, Rye, Triticale

Eligible grass/legume green manure crops: Alfalfa, Alsike clover, Annual ryegrass, Austrian winterpea, Barley, Berseem clover, Brassicas (Forage Rape, Forage Turnips, Canola, Tillage Radish), Buckwheat, Cereal rye Chickling vetch ("Green Fix"), Cowpeas, Crimson clover, Field peas, Hairy vetch, Medium red clover, Oats Sorghum/sudangrass, Spring rye, Spring wheat, Triticale, Improved white clover (Alice, Ladino), Winter rye, Winter wheat

Criteria #1-#4: With at least one other crop in the rotation; add perennial grass, legume, legume-grass mixture, grass-forb, or legume-grass-forb

Example:
Existing Rotation: Cg-Sb
New Rotation: Cg-Sb-**2H**

(Cg = Corn Grain, Sb = Soybeans, H = Hay)

Criteria #5: With at least two other crops in the rotation; add a small grain grown in combination with a grass, legume, forbs, or any grass-forbs mixtures that is used as a green manure

Example:
Existing Rotation: Cg-Sb
New Rotation: Cg-Sb-**WW with cover crop (used as green manure) established after wheat harvest**

(Cg = Corn Grain, Sb = Soybeans, WW = Winter Wheat)

RCCR Definitions:

Reduces erosion = at or below tolerable soil loss limits as defined by NRCS
Improves soil fertility and tilth = positive Soil Conditioning Index (SCI)

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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
Klein, R.N. and R.K. Wilson. 2012. Crop Budgets Nebraska – 2012. Extension University of Nebraska. Lincoln, NE. EC872 (Revised January 2012). http://www.ianrpubs.unl.edu/epublic/live/ec872/build/ec872.pdf

Brown, E., R.N. Elliot and S. Nadel. 2005. Energy Efficiency Programs in Agriculture: Design, Success, and Lessons Learned. American Council for an Energy-Efficient Economy. Report Number IE051.

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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 – ENR09 - Variable frequency drive electric motors

Enhancement Description
This enhancement activity is for upgrading of existing single speed electric motors through the addition of variable frequency electric 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 frequency 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. Single speed electric motor-drive systems use more electricity during startup and as operating requirements vary during the run cycle. A variable frequency drive can start a motor slowly and ramp up to full speed reducing wear and tear on the motor.

Variable frequency 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 electric motors without variable speed drives within the selected land use. This enhancement does not apply to single speed electric 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 electric motors with a variable frequency drives or replace single speed electric 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 drive.

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

References
US-DOE. 2001. GREENING FEDERAL FACILITIES: An Energy, Environmental, and Economic Resource Guide for Federal Facility Managers and Designers. 2nd ed. Part V Energy Using Systems. 5.7.2 Variable-Frequency Drives. http://www1.eere.energy.gov/femp/pdfs/29267-0.pdf

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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.

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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. List of fields where enhancement was applied each year
7. Estimate of legume biomass produce each year (if applicable)

References

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

Magdoff, F. and H. van Es. Cover Crops. 2000. p. 87-96 *In* Building soils for better crops. 2nd Ed. Sustainable Agriculture Network Handbook Series; bk 4. National Agriculture Library. Beltsville, MD.

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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.
3. Plant woody species in multi-row (minimum of two-rows/set) sets.
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

Garrett, H.E. (editor). 2009. Alley Cropping Practices – Chapter 7. *In* North American Agroforestry: An Integrated Science and Practice. American Society of Agronomy, Inc.

State University of New York College of Environmental Science and Forestry. 2010. Short Rotation Woody Crops in a Renewable Energy Future: Challenges and Opportunities. 8th Biennial Short Rotation Woody Crops Operations Working Group Conference. Syracuse, NY.

USDA National Agroforestry Center. 1999. Alley Cropping: An Agroforestry Practice.. Agroforestry Notes – AF Note 12. Lincoln, NE.

USDA National Agroforestry Center. 1998. Opportunities for Growing Short-Rotation Woody Crops in Agroforestry Practices. Agroforestry Notes – AF Note 10. Lincoln, NE.

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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.

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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

Clark, A.(editor.). 2007. Managing cover crops profitably. 3rd ed. Sustainable Agriculture Network Handbook Series.

Magdoff, F. and H. van Es. Cover Crops. 2000. *In* Building soils for better crops. 2nd ed. Sustainable Agriculture Network Handbook Series. pp87-96. National Agriculture Library. Beltsville, MD.

Liebman, M., Graef, R., Nettleton, D., Cambardella, C.A. 2011. Use of legume manures as nitrogen sources for corn production. Renewable Agriculture and Food Systems. p. 1-12. Available: http://dx.doi.org/10.1017/S1742170511000299

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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.

FPP02 - On-Farm Pilot Project

Enhancement Description
On-Farm Pilots showcase conservation activities that have proven environmental benefits, but have not been widely adopted in the local farm community. Participants select and agree to install, monitor and promote conservation activities (practices, components or management techniques) that have been identified by the NRCS State Conservationist as addressing specific resource needs.

Land Use Applicability
Each approved pilot project will have a land use designated, e.g. Cropland, Pastureland, Rangeland and/or Forest land.

Benefits
Conservation activities can show promise in research but until they are proven in actual field use farmers may be reluctant to adopt them. Pilot projects will provide a mechanism to prove that a new conservation activity is viable in the project area. Publicizing the implementation of the conservation activity can help other farmers learn about new conservation techniques by observing their peers.

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

Criteria
1. Producers will select from a pre-approved list of pilot projects (if available).
2. Pilots include practices, components, or management techniques that have shown environmental benefits but have not been adopted by farmers in the project area.
3. The pilots must be implemented and monitored according protocols developed specifically for the project.
4. Protocols include:
   a. Specifics of the practice, component or management technique being piloted
   b. Acreage required to adequately conduct the pilot
   c. How many years the pilot is to be conducted
   d. What the participant is required to provide (materials, labor, maintenance etc.)
   e. Type(s) of publicized events that will be used (field days, signage, winter meetings, etc.) to meet the minimum number of three (3) events. This activity will be schedule once per year that an educational event takes place.

5. Data on the costs and performance must be collected for the demonstration project as specified for each individual pilot project. The data collection needs are available in a separate document.

Adoption Requirements

This enhancement is considered adopted when the pre-approved pilot project has been implemented and monitored according protocols developed specifically for the project and events to publicize the project have been held.

Documentation Requirements

1. Documentation of the events held to publicize the project.
2. Data collected for the project will include as directed by the individual states:
   a. Practice cost, field operations conducted, etc.
   b. Frequency of collection
   c. Data collection forms

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FPP02 – On Farm Pilot Project

On-Farm Pilots showcase conservation activities that have proven environmental benefits, but have not been widely adopted in the local farm community.

Installing and adopting the following Conservation Stewardship Program enhancement is eligible to be showcased through the FPP02 enhancement:

WQL07 – Split Nitrogen Applications, 50% after Crop Emergence or Pasture Green Up

The intent of conducting the On Farm Pilot Project is to install and adopt the conservation activity identified above and to showcase the results to surrounding agricultural producers to stimulate interest in the adoption of the conservation activity and to promote producer enrollment into the Conservation Stewardship Program.

Criteria:

The criteria and documentation requirements identified on the WQL07 Job Sheet shall be followed.

At least 3 field day events must be conducted to publicize and promote the installed and adopted conservation activity.

The participant must apply Split Nitrogen Applications on at least 50% of the applicable acres of cropland or pastureland.

CMT Scheduling Note: WQL07 will not be scheduled in CMT along with FPP02 due to enhancement duplication and payment duplication with FPP02. Refer to the Enhancement Compatibility matrix so that enhancements considered duplicative with WQL07 are not scheduled on the same acres as FPP02.

FRD01 – On Farm Research and Demonstration

Enhancement Description
On farm research and demonstration consists of the implementation of applied research projects on working farms to gather information and demonstrate the efficacy of the activity. The projects must fit within identified state priority topic areas.

The farmer will need to conduct one of the following types of research: 1) randomized and replicated experiment, paired comparison, or multiple activity comparison on the farm where data is collected and assessed to determine which activities might best enhance conservation or resource condition on their farming operation and others in their region, or 2) intense record keeping and analysis where data is collected on implementation, efficacy, and/or outcomes of one or more conservation practices or enhancements over a period of time and used for better decision-making concerning the farmer's activities addressing conservation concerns on working lands.

Land Use Applicability
Cropland, Pastureland, Rangeland and/or Forest land, each approved project will have a land use designated.

Benefits
On-farm research, documentation, and evaluation of alternative conservation techniques can help farmers and NRCS personnel develop more effective approaches to protecting resources and improving resource condition. Dissemination of findings through on farm field days, written summaries, and other means promotes adoption of the most effective current and new conservation practices and enhancements.

Farmers often need willing researchers to help them design research and demonstration projects they initiate. It is also true that researchers often need willing farmers to help them carryout out research projects on working farms. Regardless of who takes the lead in initiating the project, participating in such projects can help farmers learn about new technologies while helping researchers determine the results of new technologies. The results of the research can help NRCS identify new and innovative techniques to address on farm conservation problems.

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

Criteria

On-Farm Research and Demonstration projects consists of implementing applied research on working land to gather information and demonstrate the effectiveness of new and innovative conservation activities. The research projects must be conducted by an individual or entity that seeks to determine the value of a conservation practice, component, treatment, or process. The individual or entity must have the means and expertise to conduct the research, analyze the findings and develop conclusions from the findings that are relevant to NRCS. Projects are preapproved by the NRCS State Conservationist in each state.

This is not intended to require farmers to initiate on farm research and demonstrations but rather to encourage them to participate in new or ongoing research projects sponsored by other responsible parties such as universities or other research oriented entities. However, if farmers have the necessary capability to conduct scientific research, they can initiate their own projects within the topic areas identified by their state and the criteria of this activity.

The farmer may chose to work independently, or to collaborate with other farmers, a non-governmental organization, extension, university, NRCS, and/or other entities to help with trial design and protocol, and the conduct of the study or data collection. The farmer is not required to work with an outside group. However, if working independently, the participant must be able to demonstrate the ability to manage and lead an applied research project.

When field trials or other research on a particular practice, enhancement, or conservation topic are conducted on multiple farms, each farm is eligible for this enhancement. However, enrollment in the CSP is not a requirement for all farms participating in a multiform research project under this enhancement.

Participants will need to follow criteria as outlined for each project that include:

- Goals of the research and demonstration
- A schedule showing completion of the project during the contract period
- A chronological list or plan of activities expected to take place during the project
- Planned end products or outcomes from the project
- Acreage needed
- Years research is to be conducted
- Farm inputs, equipment needs, etc.
- Expected assistance with data collection

Adoption Requirements

This enhancement is considered adopted when the pre-approved applied research project has been implemented and monitored according protocols developed specifically for the project and events to publicize the project have been held.

Documentation Requirements

- Research plan, including objectives, resource concerns addressed, experimental design, and data to be gathered.

- Results or conclusions from the research and demonstration
- Plan for disseminating project outcomes
- The farmer is committed to sharing research plans, data summary, and project outcomes in writing with NRCS and with other farmers and the general public through written summaries, on-farm events, or oral presentations.
- Farmers are encouraged but not required to work with their NRCS and/or extension agents to have at least one field day/open house where the experimental practices can be reviewed and discussed with the public.
- Documentation of the CSP participant's participation in the research project including:
  - A schedule of activities undertaken by the participant
  - Fields or other areas of the farm involved in the research

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FRD01 – On Farm Research and Demonstration

Using Perennial Cover Crops in Commercial Vegetable Production Systems

General Description of Research Project: Cover crops can be used effectively to reduce soil erosion and compaction, suppress weeds, increase soil organic matter, and protect water quality. Currently, cereal rye is the most common cover crop species used in vegetable crop rotations in Central Wisconsin. Benefits include rapid establishment, good germination and growth under cool conditions, winter persistence and spring re-growth, weed suppression, and relatively low establishment cost. Rye is a good nitrate scavenger, using up excess nitrate present in the soil at the end of a cropping season and from decomposing crop residue. However, studies on sandy soils show that this nitrogen is lost the following spring and unavailable to the subsequent crop. Small-plot studies at Hancock, Wisconsin by Copas, Bussan, and Drilias (2009, Proceedings of Wisconsin's Annual Potato Meeting) demonstrated the potential for perennial legume species to be incorporated into current vegetable rotations in Central Wisconsin. Results showed that legumes could be underseeded in snap beans at the first trifoliate leaf growth stage without yield reductions or increased residue in harvested pods. Sweet corn grown the following year where red clover, sweet clover, or alsike clover (established during snap bean production the previous year) was maintained in the understory and no nitrogen fertilization applied produced yields of seven ton per acre. In these studies, the perennial legume cover crops supplied between 50 and 100% of required nitrogen for the sweet corn crop. It is believed the nitrogen source was primarily from decomposing cover crop residue and nitrogen released from the growing legume cover crop species. Additionally, significant amounts of legumes remained after the sweet corn harvest that could be utilized as nitrogen credits for a following potato crop. This perennial cover crop system holds immediate potential as a production system and needs further evaluation under commercial scale on-farm trials.

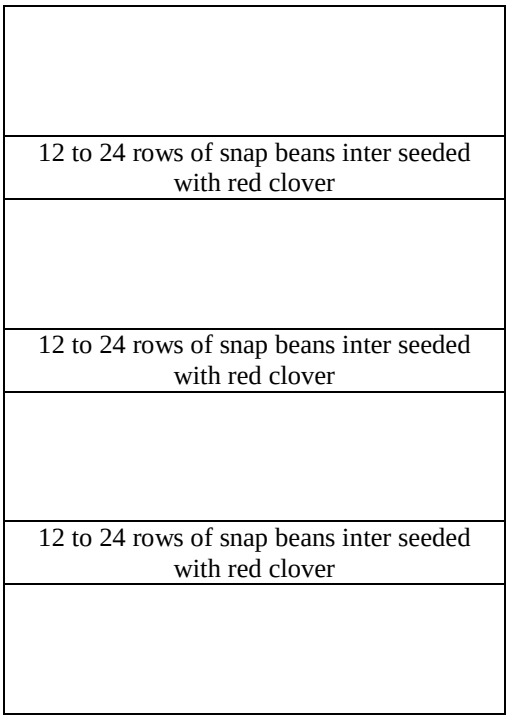
Geographic Location Targeted: Commercial potato and vegetable growers of the Wisconsin Central Sands region.

Requirements of Participants:

Research duration – three years

Crop rotation – snap beans, *sweet corn, potato
**in lieu of sweet corn, the rotation above may include corn grain or corn silage*
Other rotations may be eligible with prior approval from the Research Entity

Field Layout – At least three 12 to 24 row strips across the field inter seeded with red clover at the last cultivation of the snap bean crop and maintained until planting of the potato crop. Balance of the field to be seeded to a rye cover crop between vegetable crops.



Data to be collected – crop yields from conventional and red clover cover crop strips.

Procedures:

First year: sow red clover cover crop between snap bean rows at last cultivation (not to occur before 1st trifoliate leaf stage), record snap bean yields and harvesting data, allow cover crop to grow naturally. Sow rye cover crop on balance of field.

Second year: use a burn-down herbicide (glyphosate) on cover crop and disk/chisel prior to planting sweet corn, treat corn with herbicides other than Callisto, Laudis, or Impact if possible, record sweet corn yields and harvesting data, allow clover cover crop to grow naturally and sow rye cover crop on balance of field.

Third year: till under cover crop and plant potatoes, record potato yields from red clover areas and rye areas.

Fertilizer – apply 30 to 60 lbs less nitrogen per acre on the clover strips during the sweet corn and potato production years.

Field Days: On-farm field days will be held during the first and second production years to demonstrate the effectiveness of the cropping system.

Documentation and Reporting: Data will be statistically analyzed and reported at area and national grower/processor meetings. A written summery of the project will be published as well with additional procedural fact sheets possible.

Additional Criteria: Prior to obligation of the Conservation Stewardship Program contract, written documentation must be provided by the participant to NRCS to confirm that the property/operation has been evaluated and accepted for participation in the trial study by the Research Entity.

Contact:

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