Maine Earth Smart
"Farming for the Future"

Whole Farm Assessment and Certification
May 2012

Authors

Susan Gammon, Androscoggin Valley Soil and Water Conservation District
Mark Hedrich, Maine Department of Agriculture
Arthur Grindle, Kennebec County Soil and Water Conservation District
Andrew Whitman, Manomet Center for Conservation Sciences
Richard Kersbergen, University of Maine Cooperative Extension
Laughlin Titus, AgMatters

Reviewers/Editors

Ellen Mallory, University of Maine Cooperative Extension
Thomas Gordon, Maine Association of Conservation Districts
Jon Olsen, Maine Farmer Bureau
Claudia Lowd, Maine Rural Partners
John Gunn, Manomet Center for Conservation Sciences
Eliav Bitan, National Wildlife Federation
Ivan Fernandez, University of Maine
Juan Alvez, University of Vermont
Dave Struble, Maine Department of Conservation

This project has been made possible by the following contributing partners:

Northeast SARE Sustainable Agriculture Research & Education

Androscoggin Valley Soil & Water Conservation District

Maine Department of Environmental Protection

Maine Department of Agriculture, Food and Rural Resources

Farm Energy Partners
a network of Maine Rural Partners

Maine Association of Conservation Districts

National Wildlife Federation

Manomet Center for Conservation Sciences

Department of Conservation Maine Forest Service

Gund Institute for Ecological Economics, Rubenstein School of Environmental and Natural Resources, University of Vermont

1865 The University of Maine Cooperative Extension

AgMatters LLC

Time and Tide Resource Conservation and Development Area

USDA NRCS

Kennebec County Soil and Water Conservation District

THE UNIVERSITY OF MAINE
Sustainable Agriculture Program

Farm Credit Northeast AgEnhancement

Maine Earth Smart
Introduction and Instructions

Introduction

Maine Earth Smart is a voluntary Maine agricultural emissions reduction certification program developed by collaborating partners to recognize farmers for good stewardship. The program's goal is to encourage farm stewardship, including the use of best management practices that will help farmers address agricultural greenhouse gas emissions in a way that will also benefit their business. It focuses on practices that reduce greenhouse gas emissions and costly inputs such as fertilizers and fuels. It also focuses on practices that will enhance productivity and soil health, profitability and the farm financials. It recognizes that good stewardship can only come with improvements in the bottom-line.

Maine Earth Smart is an easy way for farmers to understand how to improve their stewardship without doing a lot of research and get credit for their hard work. Participating farmers are recognized for qualifying best management practices. Farmers with local markets can distinguish their farm and their products using the Earth Smart label and demonstrate to their customers that they care about the environment.

Each farm is different, thus the program has been developed to allow a farmer to pick practices that will work best for their farm, within the framework of a modular system. Six modules, crop and land, pasture, energy, forest, manure and fertilizer management accompany a required whole farm assessment. The whole farm assessment will help farmers prioritize recommended practices and may, by gathering baseline data, also help position farmers to take advantage of a voluntary offset market if they choose. Within the six modules are management practices that have been selected by agricultural and forest scientists that will reduce agricultural emissions and provide other co-benefits. The practices chosen are backed by most relevant scientific research. The program is fluid, practices can be added or eliminated as research continues and documentation is provided.

Whole Farm Assessment

The whole farm assessment is a comprehensive survey used to gather information needed to prepare a farm management plan that prioritizes practices. The information requested is also needed for modeling and quantification of baselines and projected reductions, especially important if the farmer is considering participation in a voluntary offset market. The intent is to prioritize the practices with emphasis on those that deliver the "biggest bang for the buck". In other words, what will work for the farm, reduce emissions, deliver co-benefits and be affordable for the farmer. For planning and certification purposes, the management plan doesn't have to be fancy, but does have to have specific reasons why recommendations have been made and prioritized, thus it will be helpful to use quantification tools such as Comet Farm or Adapt N and to provide some rationale for decisions. If the participation in a voluntary offset market is a goal, the information gathered will be needed for additional quantification.

Program Materials

Earth Smart program materials include:

1. Program Introduction and Instructions.
2. Whole Farm Assessment Document Checklist: To be sent to the farmer to gather records and information prior to the initial assessment appointment. It may take a substantial amount of time for the farmer to gather materials, depending on record keeping. Most likely, many will not have adequate records in some if not all of the categories.

3. Earth Smart Whole Farm Assessment: The assessment is designed for a professional to use on-site with the farmer; however the farmer can do it without help if preferred. The assessment should include a farm site (all crop fields) and building walk through. The assessment will take at least two hours to complete, depending on the size of the farm, farmer preparation, etc.
4. Six modules: Energy, Forest, Pasture and Grazing, Crop and Land, Manure and Fertilizer Management. Each module has a selection of practices to choose from, each with a corresponding score. Each module has a minimum total score, performance standards and requirements.
5. A farm funding resource list.
6. A program outreach flyer and fact sheet.
7. A permission agreement to sign so program professionals can make regular certification inspections to verify practices.
8. A list of accepted quantification tools.
9. Selected references.
10. Verification template for pilot program participating professionals to be used to track activities for reporting purposes.
11. Logos of participating partners-for those who would like to know who was involved in development of the program.

Program Instructions

1. **Outreach to farmer and explanation of program** - Send program modules to them for reference.

2. **Send Whole Farm Assessment Document Checklist to farmer** - Before the first scheduled appointment, the farmer will need to gather records for the site visit and the checklist is a guide for what is needed. Not all records and/or information requested will be available. If the farmer can easily copy materials such as nutrient management plans, maps etc., it will be helpful.

3. **On-site assessment -**
    a. **Review the Whole Farm Assessment with the farmer** - Sit down with the farmer and complete the Whole Farm Assessment (WFA), filling it out as completely as possible. There is a certain amount of repetition within the sections. We have found that a little repetition is useful. Asking the question in different ways works well to get the answers we need. You will be able to skip some sections, if they are not pertinent to the farm. The WFA will most likely take at least two to four hours, depending on the size and complexity of the farm. For very large farms, it could take considerably longer. The WFA has plenty of table templates to use for entering information, but they are limited in size, so additional notepaper or graph paper will be useful.

    b. **Review the modules, the practices and scoring system with the farmer -** If they have gone over the modules prior to the site visit, they may already have an idea of what they will be able to do to get certified. It is very important to get their input, it will save time and you will be able to run the numbers on the practices they are most interested in, as well others that you think will fit the farm. Ultimately, they will choose what they feel is best for their farm and they must have good comparisons and good information to make the choice.

    c. **Identify each farm fields** - When gathering field information, clearly identify the fields, using identifying information from the farmer and from consultants, NRCS etc. It can be difficult to identify fields as farmers may have a different name for the field than others. The “back forty” can also be called “Tract 1” or have a number associated with it. Ideally, you should GPS at least the center of the field, or lacking a GPS unit, you could use Google Earth or a GIS program

(immediately after the visit while the memory of location is still fresh) to find the latitude and longitude of the site.

d. **Gather materials for preparing the management plan** - Gather copies of all related materials, such as maps, soils, nutrient management plan etc., if possible. They will help you develop the management plan and will provide information you will need to run the numbers in various models.

e. **Create a simple inventory for benchmarking** - Do a quick check of buildings and fields, take pictures of current practices if possible, field equipment, motors, compressors, barn heating units, etc., whatever directly relates to the WFA sections and take ample notes, if needed, to clarify the WFA. The pictures will be a record of current practices and they will also help you identify and remember what is there when you develop the management plan. More is better than less; you can always delete what is not needed.

4. **Prepare a management plan** - Prepare a plan that focuses on management priorities chosen from the modules that will be the best fit for the farm. Include basic quantification such as results from modeling and/or other documentation and the reasons why they were prioritized the way they were. GHG emissions reductions must be taken into account as well as co-benefits and cost. In some instances, the co-benefits will be more important to the farmer than emissions reductions and that is okay. All of the practices are rated so the scoring takes that into account and implementation of any of the practices will reduce emissions to some extent.

5. **Review the plan and timeline with the farmer** - Meet with the farmer to go over the management plan and develop an implementation timeline. Provide the farm funding resource sheet and any other pertinent information, such as NRCS program fact sheets.

6. **Review the modules requirements** - Modules have different requirements. Make sure that they are explained and that the farmer understands what is expected to meet certification requirements.

7. **Existing practices** - All modules except Energy Management: If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

8. **Review Energy Management practices** - Energy conservation measures can be used for certification points if they were implemented within five years prior to the assessment and they have documentation to prove energy savings on measures taken after an audit recommendation.

9. **Submit your materials for certification** - Send to AVSWCD (until further notice) for certification (1) verification of your activities (for grant tracking purposes), (2) a copy of the assessment and management plan (with permission from the farmer), and (3) the implementation timeline and/or proof of implementation with required records.

10. **Certification Requirements**:
    - Completion of any one module as the primary module, which requires implementation of practices to achieve the minimum requirements, performance standards and the minimum

overall score needed for the module. Any combination of practices can be selected to achieve the necessary score.

- Implementation of additional practices chosen from any of the modules to total 70 out of 100 points (including the completed module). 10 points are awarded just for doing the assessment and management plan.
- Proof of land ownership or proof of rental or lease agreement for the duration of certification.

We strongly recommend that the energy module be chosen as the primary module, however meeting the overall score and 10% requirement may be difficult for smaller farms, thus it is not a requirement. Certainly selecting as many practices as possible from that module should be implemented, as energy use reduction will provide one of the most direct and immediate benefit to the farmers.

Example Scoring:
Management plan recommends crop management module as the primary module and the farmer decided to apply some practices including zone tillage and cover crops with crop rotation, **30 points**.
Farmer has woodlot and IFM is chosen as a practice: **15 points**.
Farmer plants crops and three of the fertilizer management practices have been selected: **15 points.**
Energy management practices selected: electricity reduction **15 points**
Conversion of marginal cropland to rotational pasture: **15 points**
Completion of the assessment: **10 points**
Total: 100 points.

This is a pilot project and on-site technical assistance may not be available in all counties, though farmer can get assistance by calling the program administrator. The program is a work in progress and there are details that have yet to be worked out, such as who will do certification inspections in the future and how the program will continue to be funded. There will be a workshop in the spring of 2013 to go over results, discuss improvements needed and improve the program as necessary.

Maine Earth Smart
Whole Farm Assessment Document Checklist

The documents and records should be available for the assessment visit or sent to the technical assistance provider prior to visit, if requested. Please note that not all documents will be needed for all farms and not all documents will be available.

- ☐ Field names and tract number, physical location and field location maps
- ☐ Current Soil Tests
  - ☐ Soil sampling procedure, locations
- ☐ Crop records and history
  - ☐ Crops grown, location, planting and harvest dates
  - ☐ Realistic yield goals
  - ☐ Rotation Schedule
  - ☐ Forage quality tests
- ☐ Fertilizer type, application rates and dates, expenses
- ☐ Pesticide application records:
  - ☐ Method of application
- ☐ Nutrient Management Plan
- ☐ History of nutrients applied to each field
- ☐ Field stacking sites
- ☐ Complete manure application records:
  - ☐ Dates of incorporation
  - ☐ Weather conditions
  - ☐ Field conditions
  - ☐ Manure quantities produced and nutrient analysis
  - ☐ Rates of manure applied for all spreaders
  - ☐ Manure application consistent with Nutrient Management Plan and/or soils tests if no Nutrient Management Plan
  - ☐ Biosolids analysis, if available
- ☐ Livestock numbers, age, feed
- ☐ Uniformity tests for irrigation systems, if available
- ☐ Irrigation application records:
  - ☐ Crop type and location
  - ☐ Source of water
  - ☐ Date and amount of water
  - ☐ System maintenance
  - ☐ Calibration of fertigation and chemigation
  - ☐ Irrigation scheduling data
  - ☐ Well pumping capacity
- ☐ Identified wetlands
- ☐ Forest Management Plan
- ☐ Farm Energy Expenses
- ☐ Farm Energy Audits, if available

Maine Earth Smart
Permission for On-Farm Certification Inspections

I/we as owner/owners/operators of _____ Farm, give permission to Maine Earth Smart certification personnel to regularly perform on-site farm inspections of all management practices enrolled in the Maine Earth Smart certification program to ensure compliance with performance standards and rules as outlined in the Maine Earth Smart modules. Inspections may include a review of records, as well as on-site management practices.

An appointment will be made prior to the inspection, and owner/operators will be given the opportunity to schedule the meeting at their convenience, which will be within 30 days of the anniversary date of module enrollment, or according to the schedule set forth in the module, whichever is pertinent. Each module may have a different inspection or verification schedule; however, attempts will be made to combine visits whenever possible. Records should be organized and ready for review prior to the appointment to ensure efficient use of time.

To maintain certification throughout the enrollment period, inspections must be performed as scheduled, and management practices must be consistent with the established standards. If inspections reveal that management practices are inconsistent with the program goals, or if inspections are unable to be performed, certification will be revoked.
By signing this agreement, the owners/operators of the above named farm agree to the conditions.

_____ _____
Owner/Operator Date

Address: _____

_____ _____
Owner/Operator Date

Address: _____

_____ _____
Owner/Operator Date

Address: _____

Farm Address: _____

_____

Maine Earth Smart Whole Farm Assessment
Section 1

General Management

Name: _____
Headquarters Physical Location: _____
Mailing Address: _____
Phone and/or email: _____

Type of Farm: ☐ Livestock
☐ Dairy ☐ Beef ☐ Swine ☐ Sheep ☐ Goat ☐ Horse ☐ Poultry ☐
Other _____
☐ Feed Crops (list) _____
☐ Greenhouse
☐ Maple Syrup
☐ Blueberry
☐ Apple
☐ Vegetable/Fruit
☐ Diversified (list) _____
☐ Other (list) _____

Total Farm Acres: _____

Greenhouse Area: _____S.F. Heated? ☐ Yes ☐ No If so, with what? _____
Have you considered or are you interested in fuel switching? ☐ Yes ☐ No
If so, what_____

Maple Syrup:
Do you use reverse osmosis? ☐ Yes ☐ No
What type of fuel do you use to boil sap? _____

Total Cropland Acres: _____ Owned _____ Rented _____
Number of acres tilled annually: _____
Total number of acres in crop rotation: _____

Total Pasture Acres: _____ Owned _____ Rented_____

Total Permanent Hay Land Acres: _____ Owned _____ Rented _____

Total Forested Acres: _____

Are field location maps available? ☐ Yes ☐ No If yes, attach.

Are fields identified by a unique tract number or by other means? ☐ Yes ☐ No

Are GPS coordinates available for crop fields? ☐ Yes ☐ No

List Fields and Locations by Name & Tract #, if available. Note if it is owned or rented.

Field & Tract #, Physical Location or GPS Coordinates (mid-tract)	**Annual Cropland Acres**		**Perennial Acres (Hay, Alfalfa) Note with an R if in rotation, a P if permanent.**		**Pasture Acres Note with a P if permanent, an H if hayed before pasturing, PH if both.**		**Forested Acres**	
	Owned	**Leased**	**Owned**	**Leased**	**Owned**	**Leased**	**Owned**	**Leased**
Exp. Tract Ojala	28		12P				13	

Is this a certified organic operation? ☐ Yes ☐ No
Contact: MOFGA X568-4142 DOA, 287-7520 for information if interested in becoming certified.
*Literature cites diversity and abundance of wildlife on organic farms in general increases by 50%. (Eliav Bitan, National Wildlife Federation)

Do you keep records for: **Crops** grown ☐ Yes ☐ No (type, planting, harvest dates, yield, expense?)
Fertilizer use ☐ Yes ☐ No (type, application rate, schedule expense?)
Manure & Compost use ☐ Yes ☐ No
(type, application rate, schedule, crops, pasture, expenses?)
Other Soil Amendments ☐ Yes ☐ No
(type, application rate, schedule, crops, pasture, expenses?)
Livestock ☐ Yes ☐ No (numbers, age, feed, pasture, expense?)
Wood harvest or planting ☐ Yes ☐ No (when, type, yield, expense, profit?)
Farm Expenses ☐ Yes ☐ No

If you do not keep records, why not? _____

<u>Nutrient Management</u>

Does this operation have a current, certified State of Maine Nutrient Management Plan? ☐ Yes ☐ No
If no, contact: **Mark Hedrich, DOA, 287-7608 for information.**

Does this operation have a current NRCS Comprehensive Nutrient Management Plan? ☐ Yes ☐ No
If no, contact: Mark Hedrich, Maine Department of Agriculture (DOA), 287-7608 or a local SWCD office for information.

Manure & Compost

Do you spread manure? ☐ Yes ☐ No
If yes, fill out the Section 4, Nutrient Management and applicable parts of Sections 2 Pasture and Section 3 Crops.
For Guidance, contact Mark Hedrich, DOA, 287-7608; NRCS Nutrient Management Code 590

Do you make or purchase compost? ☐ Yes ☐ No
If yes, fill out the Section 4, Nutrient Management and applicable parts of Sections 2 Pasture and Section 3 Crops.
Contact: NRCS Code 317 Compost Facility; contact Mark Hedrich, DOA, 287-7531

Do you have a manure and/or compost storage facility? ☐ Yes ☐ No
If yes, fill out the Section 4, Nutrient Management and applicable parts of Sections 2 Pasture and Section 3 Crops.
NRCS Code 313 Waste Storage Facility
Check all that apply
☐ Lagoon (provides biological treatment of wastes) Capacity _____
☐ Slurry Tank Capacity _____
☐ Methane Digester
What type? _____ Capacity _____
☐ Pit (storage only) Capacity _____
☐ Field Stacking
Are they NRCS approved stacking sites? ☐ Yes ☐ No Capacity_____
List fields where stacked
_____
_____
_____
☐ Other, list _____

Is there runoff from the storage facility or storage area? ☐ Yes ☐ No

Crop

Have you had forage quality tests? ☐ Yes ☐ No If yes, please attach.
Have you had soil tests? ☐ Yes ☐ No
If yes, please provide field name and/or tract #, year of testing and attach results. If not, **Contact: local University of Maine Cooperative Extension office for test kits and guidance.**

Did the soil tests include organic matter? ☐ Yes ☐ No

Are crop rotation practices used on this farm? ☐ Yes ☐ No
If yes, fill out crop rotation schedule in Section 3 Crops.
NRCS Conservation Crop Rotation, Code 328.

Are your crop production and/or harvesting handled by a private contractor?
☐ Yes ☐ No
If no, fill out applicable crop sections.
Contact: Mark Hedrich, DOA, for contractor list 287-7608

Do you use commercial and/or purchased organic fertilizer and soil amendments? ☐ Yes ☐ No

If yes, fill out the applicable Section 3 Crop and/or Section 2 Pasture.

Do you routinely test soils for nitrates? ☐ Yes ☐ No

Do you use pesticides or organic pest control methods? ☐ Yes ☐ No
If yes, answer the applicable Pest Control questions in Section 3 Crops.
Contact: Gary Fish, DOA, 287-7545, for information. NRCS IPM Code 595

Do you use a private contractor to apply pesticides? ☐ Yes ☐ No

Have any structures or devices been developed on your farm for handling silage leachate? ☐ Yes ☐ No
NRCS Waste Treatment Code 629

Energy

How do you handle waste petroleum products on your farm? _____
_____

Do you use a clean burning furnace to utilize waste petroleum products? ☐ Yes ☐ No

Have you had a Headquarters Energy Audit of any kind? ☐ Yes ☐ No
If yes, what year was it completed and what recommendations were made? If not, why not?
_____
NRCS Agricultural Energy Management Plan Headquarters Code 122

Have you implemented any of the recommendations or made any recent efficiency upgrades? ☐ Yes ☐ No
If no, why not? If yes, what did you do? _____
_____

Have you had a Landscape Energy Audit? ☐ Yes ☐ No
If yes, what recommendations were made? If not, why not? _____
_____
NRCS Agricultural Energy Management Plan Landscape Code 124

Are you interested in alternative energy? ☐ Yes ☐ No
If yes, what type? _____
Contacts: Maine Rural Partners, Claudia Lowd, 581-4523; USDA Rural Development Grants; Efficiency Maine, 866-376-2463

Have you had a site assessment for alternative energy? ☐ Yes ☐ No
If no, are you interested in having one? ☐ Yes ☐ No

Livestock Operations

Is this a total confinement operation? ☐ Yes ☐ No
Is this a mostly pasture-based operation? ☐ Yes ☐ No
If yes, fill out Section 2 Pasture.

Is this a mixture of the above? ☐ Yes ☐ No

How many animal units are pastured? _____

How many animal units are confined? _____
Fill out Section 2 Pasture and Section 5 Energy.

Livestock Units (Please report in animal units where one animal unit = 1000 pounds live animal weight)
Dairy _____ Beef _____ Sheep _____ Goats _____ Hogs _____ Poultry _____ Horse _____ Other _____
Total animal units: _____

Animal Inventory						
	Species (circle one): Dairy Beef Sheep Goat Hogs Horse Poultry Other			**Species (circle one): Dairy Beef Sheep Goat Hogs Horse Poultry Other**		
Age	Number	x Weight (lbs)	= Total (lbs)	Number	x Weight (lbs)	= Total (lbs)
0-3 months						
4-6 months						
6-12 months						
12 months to mature						
Mature						
Total						
Total All			÷ 1,000	=		Total Units

Conservation Easements

Have you ever had or do you have a conservation easement on all or a portion of the property or participated in CRP? ☐ Yes ☐ No
If yes, what years? _____
What property? _____
Who with? _____

Do you participate in the Maine Farmland Protection Program? ☐ Yes ☐ No
If no and you want to learn more about it, contact **Stephanie Gilbert**, DOA.

Equipment

Tractors, combines, other motorized (not tractor pulled) planting or harvesting equipment: List please.

Type, Make/Model &	**PTO Horsepower**	**Annual Average Hours**	**Estimated (hours) tractor is used for each crop and operation. List crop & operation.**
Exp. International 756	**70**	**100**	**50 hrs. silage corn, planting, spraying** **50 hrs. tedding & raking**

List All Other Equipment and Implements Used for Each Crop & Practice.

Implement	Make/Model/Size	What crop and/or operation is this used for?	Depth of tillage, if applicable	Harvest residue, if applicable (residue remaining in the field after harvest)	Primary tractor used with this implement
Exp. Planter	JD 7200 4 row	corn	2”		International 756

If your farm has practices or other management aspects not listed above that you feel are important to your farming operation and energy use, please tell us about them.

_____

_____

Farmer Input/Concerns

Are you interested in or have you recently adopted new practices? ☐ Yes ☐ No
If yes, please list them; tell us why you adopted them and if they are working out as planned.

_____

Have you considered utilizing anaerobic digestion of the manure produced on your farm? ☐
Yes ☐ No

Do you have any specific concerns related to nutrient management and best management practices on your farm that you believe are not working effectively and should be addressed?
☐ Yes ☐ No
If yes, what are they? _____
_____
If no, what are the impediments to addressing these issues? _____
_____
_____

Do you believe that you could utilize more technical assistance for certain aspects of your operation to help make it more efficient or to address any environmental or other concerns?
☐ Yes ☐ No
If yes, please specify. _____

Are you or would you be interested in participating in a voluntary carbon offset market, for selected practices if doing so increased farm income? ☐ Yes ☐ No

Carbon registries may require different contract terms and requirements and contracts can vary in length from 1 to 10 years for agricultural practices and 10 to 100 years for Integrated Forest Management and/or afforestation. Practices typically will need to be verified occasionally for compliance with contract terms.

If you are interested in participating in a voluntary offset market, what practices would you be interested in using as an offset for the length of contract time required, if returns are adequate?

Improved Forest Management
Afforestation
Improved Nutrient Management
Energy Reduction
Alternative Energy Installation
Livestock Waste Management
Feed Management
Pasture Management
Crop and Land Management
Other*

New protocols are under development by different registries. The options listed above may not be viable for your operation, may not be available and/or new ones may be added.

In order to establish that practices have changed, protocols for carbon markets may require up to 5 years of records. This includes fertilizer applications, yields and tillage practices, etc. Good record keeping is crucial to profitable farming operations and a must for market participation**.**

Are you willing to keep records that will ultimately be of benefit to your operation?
☐ Yes ☐ No

Will you be willing to participate in verification of practices, if needed? ☐ Yes ☐ No

Maine Earth Smart Whole Farm Assessment
Section 2

Pasture

Current (Tier 1) 1990-2012

Do you graze? ☐ Yes ☐ No
If yes, is it seasonal? ☐ Yes ☐ No year round? ☐ Yes ☐ No
If yes, list number of animal units grazed each pasture (per acre). _____
If seasonal, what is your normal start and end of pasturing (dates)? _____

Is hay or other crops harvested prior to using as a pasture? ☐ Yes ☐ No
If yes, note and include in the chart below and in the Crop Production section.

Do you intensively graze? (Rotating pasture less than 48 hours) ☐ Yes ☐ No
What are the beginning and ending dates? Beginning _____ Ending _____

Do you rotate pasture? ☐ Yes ☐ No
If yes, what is your rotation schedule (grazing time in each section or pasture)? Note in chart for each pasture.
If yes, how long have you practiced rotation? _____

How is it rotated (pasture to pasture, fenced sections, etc.)? If different for different pastures, please note. _____

List each pasture

Field & Tract #, Physical Location or GPS Coordinates	Number of animals grazed	Seasonal or year round & year started	Pasture Forage Type	Hay harvested & when, if applicable	Rotation Schedule (days, weeks, months)	Permanent Pasture?

Has the number of animal units per acre been reduced or increased over the last 5 years? ☐ Yes ☐ No
If yes, when and by how many? _____

Are nutrients applied? ☐ Yes ☐ No
Type? _____
Application schedule? _____
Application rate (lbs. or gal. per acre _____
Maintenance/reseeding schedule _____

Do you irrigate or pump water for drinking? ☐ Yes ☐ No
If yes, how?_____
Watering facilities (for irrigation or livestock use) NRCS Watering Facilities, Code 614

Energy Source? _____

Gallons of fuel used annually or KWHs? _____

Is forage transported to pastures away from the farmstead or feed storage areas? ☐ Yes ☐ No
If yes, please list types of crops imported: (1)_____: tons annually _____; (2) _____: tons annually _____; (3) _____: tons annually_____

Number of animals fed _____

If known, vehicles/equipment used _____

Annual number of trips & distance to the farm or fuel used _____
Contact NRCS Prescribed Grazing, Code 528; Fence, Code 382; Watering Facility, Code 614

Historical & Modern Use: List each pasture (if known), needed for modeling.
Historical 1880-1970, Modern 1970-1990

Field & Tract #, Physical Location or GPS Coordinates	Type (Forest, Grass, Legume Mix)	Acres	Seasonal or year round, note time period	Animal Units Grazed	Use if known, such as rotational	Change to different practices (list year & practice)	Clear cut or burned, year and how

Maine Earth Smart Whole Farm Assessment
Section 3

Crops

Current Crops (Include cover crops)
For guidance, contact University of Maine Cooperative Extension and/or use NRCS Forage Harvest Management, Code 511. For testing services, use Cornell University)

Do you use high or low tunnels? ☐ Yes ☐ No If yes, what. _____

Are cover crops planted on this farm? ☐ Yes ☐ No
N**RCS Cover Crop, Code 340**
* Presence of cover crops provides wildlife forage and habitat and can increase wildlife by 50-100% depending. They also reduce erosion and nutrient pollution to waterways by 50% (nutrients) and 80% (erosion), which benefits fish habitat. (Eliav Bitan, National Wildlife Federation)

Frequency of cover cropping Always ☐ Occasionally ☐ Never ☐

Method
- ☐ Inter-seeding
- ☐ After primary crop harvest

If cover crops are occasionally or never utilized, what would help you to expand use of this practice on your farm or convince you to do so? _____
_____
_____

Are cover crops used for green manure? ☐ Yes ☐ No
If yes, what cover crop? _____
If yes, include in table below.
If yes, when are crops plowed under? _____

Do you alternate (or rotate) tillage practices on each field or crop? ☐ Yes ☐ No
If yes, how frequently? Explain_____
_____
If yes, list the crops rotated in the table below.
How many years have you been rotating these crops? _____
If not, why not? _____

Crops, Cover Crops & Crop Rotation: please provide a field-by field schedule

Types of Crops Grown	Field & Tract #, Physical Location or GPS Coordinates	Current Crops & Acres	Year & Location of Soil Test, if possible, soils (existing map or Web Survey)	Crop Rotation Schedule (List primary crops, years grown by field	Cover Crop, plant date	Year Current Practice Began
Example: Potato, silage corn, oats	**450 Green Rd, long. & lat., middle of field**	**Corn, 50**	**2005, mid-field**	**2 year rotation, 1 year corn, 1 year potato,**	**Oats sown in late August after potato harvest**	**1995**
Mixed Vegetables- (List)						
Soybean						
Potatoes						
Sweet Corn						
Fruit (List)						
Feed Grain (List)						
Mixed Hay						
Alfalfa						
Silage Corn						
Barley						
Oats						
Forage Legume (List)						
Other (List)						

Has drainage been installed? ☐ Yes ☐ No
Is it still effective? ☐ Yes ☐ No
If no, how long has it not been effective? _____

If yes, list fields, type and year of installation (i.e. Field 1, drainage tile, 1975):

Field & Tract #, Physical Location or GPS Coordinates	Type of Drainage	Year Installed

Tillage

Tillage Practices Definitions: (from Conservation Technology Information Center http://www.ctic.purdue.edu/)
Conventional Tillage: full width tillage with moldboard plow and/or multiple tillage passes, leaving less than 15 % residue on the soil surface after planting.
Conservation Tillage: At least 30% residue cover left after planting.
Reduced Till: 15 to 30% residue cover left at planting.
Mulch Till: Full-width tillage, one to three passes, leaves more than 30% residue cover at planting
Ridge Till: Row cultivation to build 4-6 inch high ridges and scraping off 1 to 2 inches during planting. Residue left on the surface between the ridges.
No-Till (includes variations, strip till, vertical tillage), minimal soil disturbance.
Also see **NRCS Residue and Tillage Management No-till/Strip Till/Direct Seed, Code 329**

List all crops (including cover crops), type of tillage, # of times tilled, and depth of tillage, etc.

Field & Tract #, Physical Location or GPS Coordinates	Crop	Acres	Tillage Practice	Implement Used	Depth of Tillage	Number and types of operations, months completed	Fallow? When?	Number of years practice has been used

Nutrients applied? ☐ Yes ☐ No **(**Less volatile types of nutrients applied deeper in the ground and closer to the needs of the crop reduces run-off, improving water quality and habitat. (Eliav Bitan, National Wildlife Federation)

If yes, list for each crop

Crop	Nutrient Type	Application Method	Application Schedule (Months)	Application Rate (lbs or gal. per acre	Application Frequency

Harvest: Please fill out.

Crop	How (combined, cut & baled, chopped etc)	When (Months)	Frequency	% Residue Left (NRCS Residue Management, Seasonal Code 344; Residue and Tillage Management, No Till/Strip Till/Direct Seed, Code 329)	Is residue plowed under or removed?

Crop Production: List current annual crop production for each field (yields and dry matter will be relatively inaccurate.)

Field & Tract #, Physical Location or GPS Coordinates	Acres	Crop	Cuts per Field	Yield Tons/Acre	% Dry Matter	Crop Rotation Schedule (list alternate crop & years)	Year Current Practice Began
		Dry Mixed Hay (tons/acre)					
		Dry Forage Legumes (tons/acre)					
		Wrapped Silage/Baleage (tons/acre &percent dry matter)					
		Ensiled Mixed Hay and Legumes					
		Silage Corn (tons/acre & percent dry matter)					
		Farm-Produced Grains: Barley (tons/acre)					
		Potatoes					
		Soybeans					
		Alfalfa					
		Oats					
		Barley					
		Other (specify)					

Are crops irrigated? ☐ Yes ☐ No

If yes, what year was irrigation started? _____

If yes, what type of pump is used? _____

If yes and a tractor is used to generate, what tractor do you use and what are the estimated hours operated? _____

NRCS Irrigation Water Management, Code 449 et al.

Is application rate the optimum for growth and quality of crop? ☐ Yes ☐ No ☐ Don't know

Do you use a system for monitoring soil moisture? ☐ Yes ☐ No
If yes, what is it? _____

Is regular system maintenance performed? ☐ Yes ☐ No
If yes, how often? _____
If no, why not? _____

Irrigation: please fill out the chart.

Field & Tract #, Physical Location or GPS Coordinates	Crop	Acres	Type of System used	System Pressure	Application Schedule	Application Rate	Average Annual Water Used

Pest & Weed Control: differentiate between historical info and info from a given time period. Contact: University of Maine Cooperative Extension Service Rick Kersbergen 342-4229, John Jemison 581-3241

Please fill out

Field & Tract #, Physical Location or GPS Coordinate	Crop	Cultivation? If yes, how many times per month? Annually?	Organic? If yes, what is used and how is it applied?	Application Schedule	Flame Control	Crop Protectants Herbicides Insecticides Fungicides	Time period- years of use for each practice

What was the control frequency over the last 5 years? _____

What is your target control frequency? _____

Crop Fertility

NRCS Nutrient Management, Code 590; Rick Kersbergen, John Jemison, University of Maine Cooperative Extension; Mark Hedrich, DOA

Are nutrient sources (manure, compost, other) tested for nutrient levels?
☐ Yes ☐ No

Is a Nitrogen credit taken for legumes when balancing nutrients? ☐ Yes ☐ No

Are nutrient applications based on Nitrogen or Phosphorus? _____

Tier 2 Optional- Historical Practices: –Needed information to establish a baseline for soil carbon, necessary for quantification in some protocols and to obtain more accurate modeling results.

Historical Practices
Historical 1880-1970, Modern 1970-1990, Current 1990-2012

Have fields been cleared? ☐ Yes ☐ No

If known, please list the year each field was cleared, the acres cleared and the method of clearing.

Field	Acres Cleared	Year Cleared	Method (cutting, fire)	Equipment used to remove stumps & rocks

Has drainage been installed? ☐ Yes ☐ No
If yes, when and what type? _____
Please fill out chart in Section 3, Crops.

Has there been any landscape modifications other than drainage? ☐ Yes ☐ No
If yes, what when and where? _____
_____
_____
*landscape modification examples: dug ponds, gravel mining, waterways, riparian buffers, parking lots, windbreaks etc.

Has this property had any forest fires? ☐ Yes ☐ No
If yes, when, where and how many acres burned? _____
_____
_____

Crop & Tillage Practices (i.e. planted continuous corn in Field 1 with moldboard plow in fall, spread manure, 2 spring disk harrow, planting & 3 cultivations from about 1950 until 1965. Switched to reduced tillage using chisel plow in 1966, 2 spring disk harrow and no cultivation (herbicides). Switched to no-till in 2000 using standard no-till planter. List by field if different.

Field	Years	Crop & Fertilizer	Implements used	Tillage practice and # of events	Typical Schedule	Manure & Fertilizer Application Rate
Exp. Field #1	**1950-1965**	**Continuous corn-cow manure, fertilizer**	**Moldboard plow, disc harrow, row cultivator**	**1 plow, 1 harrow, manure spread, 1 harrow, plant, 3 cultivation**	**October plow, 2 May harrow, may plant, 2 June, 1 July cultivation**	
	1966-1999	**Continuous corn-fertilizer**	**Chisel plow, disc harrow, spray herbicides**	**1 plow, 2 harrow, 1 fertilizer at planting, 1 herbicide, 1 side dress,**	**October plow, May harrow, May fertilizer, June herbicide, July side dress**	
	2000-2011	**No-till corn-fertilizer**	**No-till planter**	**No-till plant, 1 fertilizer at planting, 1 herbicide, 1 side dress**	**No-till plant, May, June herbicide, July side dress**	

Maine Earth Smart Whole Farm Assessment
Section 4

Nutrient Management

Is manure produced on this farm ☐ Yes ☐ No
Manure Type*:* Solid ☐ Yes ☐ No; Semi-solid ☐ Yes ☐ No; Liquid ☐ Yes ☐ No

Is any manure composted? ☐ Yes ☐ No
If yes, what percent of manure is composted?_____
If yes, what composting system is used?
Static pack ☐ Yes ☐ No
Windrows turned regularly ☐ Yes ☐ No
Passive windrow ☐ Yes ☐ No
Other _____

Is any manure imported? ☐ Yes ☐ No
If you import manure, what type of manure are you utilizing? _____

Are you using regulated residuals? ☐ Yes ☐ No
DEP Chapter 419 Agronomic Utilization of Residuals for guidance
If you use regulated residuals, please list: (1)_____ (2) _____ (3) _____

Do you have a headquarters manure storage structure(s)? ☐ Yes ☐ No
Is it roofed? ☐ Yes ☐ No

Are there any field stacking pads for storing manure? ☐ Yes ☐ No

Manure Handling Systems*:* NRCS Waste Storage Facility, Code 313; Mark Hedrich, DOA and Cooperative Extension staff

Is field application of manure handled by:
This farm ☐ Yes ☐ No
A private contractor ☐ Yes ☐ No

Is manure is spread on row-crop land? ☐ Yes ☐ No
How is it applied? _____

When is most manure applied to crop land?
Spring ☐ Yes ☐ No Application rate/acre/crop _____
Summer ☐ Yes ☐ No Application rate/acre/crop _____
Fall ☐ Yes ☐ No Application rate/acre/crop _____

Is the manure mechanically incorporated? ☐ Yes ☐ No
If so, how soon after spreading is manure mechanically incorporated? _____
How is it incorporated ? _____

Estimate miles on vehicles for hauling manure to sites. _____

If nitrogenous commercial fertilizers or manure are applied to cropland, is an attempt made to time the application with impending rainfall to reduce nitrogen losses and odor? ☐ Yes ☐ No
(Take into account the risk of increased nutrient runoff if application occurs before extremely heavy rainfall.)

Is manure spreading equipment calibrated annually? ☐ Yes ☐ No

Do you plan nutrient application to reduce volatization or runoff? ☐ Yes ☐ No ☐ I don't know.
If yes, what steps do you take? _____

Are commercial fertilizers used? ☐ Yes ☐ No
If you use commercial and/or purchased organic fertilizers or amendments, what types do you use? Fill out chart.
List application rate, schedule and method in the chart.
NRCS Nutrient Management, Code 590; NRCS Compost Facility, Code 317,

List for each crop or refer to Section 3 if filled out there.

Crop	Nutrient Type	Application Method	Application Schedule (Months, years)	Application Rate (lbs or gal. per acre	Application Frequency

Is compost made on the farm? ☐ Yes ☐ No
If yes, include in chart above.
If yes, what are the contents?_____
Include the application rate, schedule and method for each crop in the chart above.

Is compost imported? ☐ Yes ☐ No
If imported, what type of compost are you utilizing for what crops? Include in chart above.
Contents?_____
Include the application rate, schedule and method for each crop in the chart above.

Are other amendments/lime used? ☐ Yes ☐ No
Contents?_____
Include the application rate, schedule and method for each crop in the chart above.
If used, do you have them commercially spread? ☐ Yes ☐ No
Amendment Sources: Irving Trucking, Clinton, Me.; Northeast Ag, Detroit, Me.; New England Organics

Maine Earth Smart Whole Farm Assessment
Section 5

Energy Management

Energy Use: Maine Rural Partners/Farm Energy Partners; Efficiency Maine grants; USDA Rural Development Energy Efficiency and Renewable Energy Grants

If an energy audit has been completed recently and available, the electrical portion of this section can be skipped.

Is a significant amount of water heated? ☐ Yes ☐ No

How many gallons per day? _____

How is it heated? _____

What is your water source and what pump is used? _____

Is refrigeration used? ☐ Yes ☐ No

What types of compressors are used? _____

How are buildings are lit? (If large areas use lighting)

☐ Incandescent bulbs
☐ Fluorescent bulbs
What type of fluorescent bulbs? _____

How are buildings heated? _____

If heat sources are different, list each building. _____
_____

What is your annual heating expense? _____

Dairy Specific

Is milk pre-cooled? ☐ Yes ☐ No
If yes, how? _____

Is water preheated? ☐ Yes ☐ No
If yes, how? _____

Electrical: Contact: Efficiency Maine; Maine Rural Partners; USDA

What is the average annual KWH use? _____

Is it variable month to month? ☐ Yes ☐ No
If so, why? _____

Annual KWH and annual expense: _____

Existing equipment & lighting (coolers, pumps etc.)

_____
_____
_____
_____

What do you think is the heaviest electricity user? _____

Alternative Energy Used

Is any renewable energy generated on site? ☐ Yes ☐ No
If so, how? _____
What type is it? _____

How many KWHs are produced or fossil fuel is saved? _____

Installation Expense, operating costs & expected payback time _____
_____

Fossil Fuel
If a landscape audit has been completed this portion of the section can be eliminated.

Dairy and Crop Fossil Fuel Use

Vehicles	Tractors	Other	Diesel Fuel	Gas	Annual hours of operation (tractors)	Annual mileage/miles per gallon (vehicles)	Annual expense for each

Estimated Energy Use for Practices-Include Type of Fuel:

Tillage	Planting	Cultivation	Harvest	Manure App	Fert.App	Soil Amend	On-Farm Vehicle Transport	Off Farm Transport

Estimate number of trips to and from fields for each crop for all operations. Estimate number of trips around the field for each harvest.

Field & Tract #, Physical Location or GPS Coordinates	Acres	Crop	Harvests # per crop	Miles & round trips to field	Trips around field/estimated miles.	Vehicles Used

Maine Earth Smart Whole Farm Assessment
Section 6

Forest Management

Contact ME Forest Service Wood Wise at http://www.maine.gov/doc/mfs/woodswise/.
District foresters: http://www.maine.gov/doc/mfs/fpm/ff/foresters.htm

What conservation easements exist for forests on your property?

- ☐ None
- ☐ Development and building restrictions only
- ☐ Timber harvesting
- ☐ Restrictions that prohibit the conversion of forest to non-forest
- ☐ Other land use restrictions due to easements, list: _____

If you answered other than "None", how long has the easement been in place and with what organization(s)? _____

What is your primary objective for managing your forest?
NRCS Forest Stand Improvement, Code 666; Forest Harvest Management, Code 511

☐ Family legacy	☐ Nature protection	☐ Privacy
☐ Part of home or cabin	☐ Aesthetics	☐ Non-timber forest products
☐ Firewood production	☐ Timber production	☐ Part of farm
☐ Land investment	☐ Hunting and/or Fishing	☐ Other recreation

Which carbon sequestration strategies would be consistent with your landowner objectives and possible on your lands?

- ☐ Planting trees in areas that have not had trees > 10 years
- ☐ Long rotation, uneven-aged management that extends the length of harvest rotation
- ☐ Forest reserve establishment.
- ☐ Low-impact forestry (but somewhat reducing timber income)
- ☐ Plant trees on burned lands

How many acres of forest do you have? _____

Please fill out the chart Attach map if available.

Stand name/identifier	**Physical Location, Tract # or tax/lot # for each Stand**	**Species type**	**Age class**	**Acres**	**Past History (note years of past treatments, including fertilizer applications)**
(a stand is a continuous patch of forest of the same species type and age class)		(hardwood, softwood mixed wood)	(seedling/sapling, pole timber, saw timber, large saw timber)		☐ Clear cut in _____ ☐ Shelterwood harvest in _____ ☐ Selection harvest in _____ ☐ Partial harvest in _____ ☐ burned in _____ ☐ Planted trees in _____ ☐ Broadcast fertilizer _____lbs/acre in _____

Resource: Manomet carbon forecaster tool lookup table for California Action Reserve common practices baseline with others to follow. Compare basal area or board feet volume with the baseline for a given eco-region. http://www.manomet.org/sites/manomet.org/files/scidocs-pdfs/Proforma20110630.xls

Is your forested land enrolled in the Maine Tree Growth Tax program? ☐ Yes ☐ No
NRCS Forest Harvest Management, Code 511; Forest Trails and Landings, Code 655
If "No", then please answer the following questions

Do you presently or plan to harvest timber? ☐ Yes ☐ No

Do you have a Forest Management Plan? ☐ Yes ☐ No
If yes, when was it written? _____
If yes, was it a plan developed under the WoodWise Program (a USDA program managed by the ME Forest Service)? ☐ Yes ☐ No
If it is not a WoodWise plan, what type is it? _____
If yes, were stand maps included in the plan that show the location of different stands and their stand or forest type? ☐ Yes ☐ No
If yes, did a forester conduct a forest inventory and estimate timber volumes and do you have access to the field data or data summary? ☐ Yes ☐ No
If yes, what were the plot sampling methods?
☐ Prism plots-
What was prism BAF? : ☐ 10, ☐ 15, ☐ 20, ☐ other: _____
☐ Fixed area plots
What was the area of the plot? _____ sq. ft.
If yes, were tree heights measured? ☐ Yes ☐ No
How many plots were sampled? _____
If there is no forest management plan, why not? _____

Do you or have you participated in financial assistance programs through NRCS or the State, for any forest management practices? If so, what programs? _____
When? _____
Are program agreements currently in place? ☐ Yes ☐ No
If no, why not? _____

On how many acres do you intend to plant trees where the lands have not been in forest for >10 years? _____ acres
NRCS Tree/Shrub Establishment, Code 612;Tree/Shrub Site Preparation, Code 490; Tree/Shrub Pruning, Code 660

Have fields been cleared? ☐ Yes ☐ No
If yes, when? _____
NRCS Forest Harvest Management, Code 511; Forest Stand Improvement, Code 666
What type of trees?
☐ Hardwood
☐ Softwood
☐ Mixed

Maine Earth Smart Whole Farm Assessment
Section 7

Wetland

Are there any wetlands on your property? ☐ Yes ☐ No
If yes, how many acres? _____

Physical location & tract # or tax lot, acres _____

I**s it used?** ☐ Yes ☐ No
If yes, how? _____

Has it been filled? ☐ Yes ☐ No
If yes, how many acres? _____ When? _____

Has drainage been installed? ☐ Yes ☐ No
If yes, on how many acres? _____ When? _____
What type of drainage? _____

Has any wetland been re-created? ☐ Yes ☐ No
If yes, how many acres? _____

Are you interested in participating in NRCS Wetland Reserve Program (WRP) or any other conservation easements? ☐ Yes ☐ No

Are you interested in creating or conversion of filled wetlands to benefit wildlife habitat and sequester more carbon? ☐ Yes ☐ No
NRCS Wetland Enhancement, Code 659; Wetland Restoration, Code 657; Wetland Wildlife Habitat Management, Code 644

Maine Earth Smart Certification Requirements and Management Practices
Crop and Land Management

Implementation of certain crop and land management practices has significant potential to reduce GHG emissions by increasing carbon sequestration and to a lesser extent decreasing nitrous oxide emissions. In all cases, attention must be paid to effects of implementation on productivity and yield, co-benefits and cost. Increased carbon sequestration depends on climate, soils, topography, crops grown, tillage nutrient management, etc. The practices selected have the best chance of reducing emissions in Maine, however, that said, they still will require careful consideration on an individual farm basis prior to including in a GHG Management Plan.

Practices eligible for certification include: long-term rotation of annual and perennial crops (alfalfa or grass hay), cover crops, switching from conventional to zone tillage combined with cover crops (at least 30% residue cover on the surface after planting), no-till combined with cover crops, irrigation improvements, change from annual to perennial crops and conservation set-aside. While any one of these practices generally can be expected to yield some decrease in emissions, depending on climate and soils etc., greater benefit may be gained by the combination of multiple practices, such as long-term rotation combined with cover crops and/ or no-till. No-till alone in Maine may not be the best solution to sequester additional carbon in all areas or on all soils, however it can yield enough other benefits, such as decreased use of fossil fuel (accompanied by a decrease in emissions), to warrant inclusion into the certification program.

Crop and Land Management Certification Goals

- ☐ Decrease greenhouse gas emissions
- ☐ Maintain or increase crop productivity
- ☐ Decrease production expense

Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Nutrient Management Plan (Includes Fertilizer and Manure Management)
- ☐ Soil Tests
- ☐ Landscape Energy Audit, if available
- ☐ Allow regular on-site verification of practices to maintain certification
- ☐ Keep annual records of manure, fertilizer and soil amendment use, as outlined in fertilizer and manure management modules.

Performance Standards

All Practices

- All fertilizer management practices must meet established management criteria.
- Historical average annual crop yields maintained or increased (no net decrease in yield resulting from changes) or maintain acceptable new management goals that may be somewhat lower than historical average. Reduced inputs may result in acceptable lower yields if the cost per unit of the item produced is lower.

Crop Rotation

75% of all eligible crop acreage included in long-term rotation. The minimum rotation length is five years (3:2) with at least three years of a perennial crop (such as alfalfa or grass hay) included. Longer rotations are acceptable, such as five years of alfalfa, one year of grain, two

years of corn. When using longer rotations, perennial crops must be grown for a proportionally longer period of time, a minimum of 50% of cropping seasons.

Cover Crop

75% of all eligible acreage included four out of five years (to allow for weather/extenuating circumstances), must use no-till planting. Both summer and winter cover crops must be planted as soon as possible, inter-seeded in the main crop or immediately after harvest, by the date appropriate for area of the state, to be determined by planner and farmer.

Change from Annual to Perennial Crops

Maintain for a minimum of five years on at least 50% of total eligible acreage.
New acreage on or off the farm must not be planted to annual crops during that time.
Short-term woody products are allowed.

Switch from Conventional to Zone Tillage with Cover Crop

At least 30% residue must be left on the ground after planting. Must be used on 75% of eligible acreage. Residue must be measured and/or compared to picture guidelines.

No-till combined with Cover Crop

Used on 50% of eligible land, maintained for a minimum of five years.

Conservation set-aside

Any previously cropped land eligible for NRCS CRP program can be set aside.

Irrigation Improvements

All irrigated acres enrolled. Eligible activity: switch to drip irrigation or from a gun or reel to center pivot.

Points required for Crop and Land Management Certification: 15

Existing practices - If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

Certification Period: Five years, renewable for two additional terms.
Verification Period: Annually for certification period.
Opt out: To be determined on an individual basis for a catastrophic event.

Accepted Management Practices

Practice	GHG Benefit	Co-Benefit	Co-Benefit	Certification Period	Verification	Points
Crop Rotation	Increase carbon sequestration	Increased organic matter and increased carbon sequestration. Increased soil health, decreased nitrogen application and related emissions, less erosion, increased wildlife, decreased denitrification	Immediate payback as long as yield is not reduced.	5 years	Annually	5

Cover Crops	Increase carbon sequestration	Increased organic matter and increased carbon sequestration. Increased soil health, decreased nitrogen application and related emissions, less erosion, increased wildlife, decreased denitrification	Immediate payback as long as yield is not reduced and increased fossil fuel use is minimal.	5 years	Annually	10
Change from Annual to Perennial Crops	Increase carbon sequestration	Increased organic matter and increased carbon sequestration. Increased soil health, decreased nitrogen application and related emissions, less erosion, increased wildlife	Payback related to equipment cost and overall reduction of fossil fuel, if any.	5 years	Annually	15
Switch from Conventional to Zone Tillage with Cover Crop	Increase carbon sequestration	Increased organic matter and increased carbon sequestration. Increased soil health and decreased erosion	Payback depends on equipment needed versus increased productivity.	5 years	Annually	15
No-till with Cover Crop	Possible increase in carbon sequestration depending on area, reduced fossil fuel use	Reduced fossil fuel use, reduced potential for water quality degradation, better soil quality, less soil erosion, increased wildlife, increased organic matter	Payback depends on equipment needed versus decreased fuel use and labor.	5 years	Annually	15
Conservation Set-aside-all CRP eligible crop land as defined by NRCS.	Increased carbon sequestration, reduced nitrous oxide if not fertilized	Reduced fossil fuel use, reduced potential for water quality degradation, better soil quality, less soil erosion, increased wildlife habitat	Payback depends on production loss versus CRP payments and reduced cropping expenses.	Length of contract	5 years	5
Irrigation Improvement-Drip Irrigation, Center Pivot	Decreased nitrous oxide emissions, may be decreased NH3 if fertigating	Decreased leaching, improved water management, reduced erosion, reduced water withdrawal, reduced odors, less pumping and less engine emissions, improved crop uptake	Payback depends on equipment cost versus yield and water use.	5 years	Annually	5
Total Points						

Maine Earth Smart Certification Requirements and Management Practices
Fertilizer Management

Agriculture produces 73% of the total nitrous oxide emissions in the United States (about3.1% of all GHG emissions EPA, 2010), a large part of which is associated with the use of nitrogen fertilizers. A number of studies have shown a positive correlation between emissions and fertilizer application rates. As application rates increase beyond the needs of the plant, nitrous oxide emissions increase through nitrification and denitrification. Improved fertilizer management can reduce emissions while reducing the potential for water quality degradation. The 4R concept, right source, right time, right rate, and right placement when implemented will reduce potential emissions by taking into account environmental conditions at the site (soil, climate, weather etc.) and plant utilization.

Laughlin Titus, AgMatters, states*, "The utilization by crops of applied nitrogen sources is a very "leaky" system. Some studies show that only 30% is utilized by the crop. Nitrogen is lost in numerous ways. It leaches in wet conditions, it volatilizes into the air in warm and moist conditions, and it is lost through denitrification under cool and wet conditions. Applying nitrogen at a time when the crop cannot utilize it can result in more potential ways and times that the nitrogen can be lost to the environment. The right rate may seem obvious, but nitrogen has been cheap in the past and putting too much on has been a common practice by farmers as a cheap insurance policy to obtain yield. Right placement indicates that nitrogen needs to be in the soil (as opposed to on top of it) and in close enough proximity to the crop roots for them to utilize the nitrogen. Current trends indicate there is more use of liquid fertilizers (easier to put right rate, right time, right place and in most cases it is a "more" right material) and more use of fertilizer additives (there are several and they work in different ways, but they all strive to keep the N more available to plants for a longer period of time in the soil). There is also more monitoring of in-season crop nitrogen via tissue sampling or soil sampling to determine if the pre-season planning of N applications was accurate and if more needs to be added to produce the desired yield goal."*

Fertilizer Management Certification Goals:

- ☐ Decrease nitrous oxide lost to the atmosphere
- ☐ Optimize application rate, timing, placement and source (irrigation must be taken into account)
- ☐ Maintain or increase crop productivity
- ☐ Maintain resource nutrient levels available for crops (match supply with crop requirements)
- ☐ Decrease potential impact on water quality

Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Landscape Energy Audit, if available
- ☐ Site-specific Fertilizer Management Plan (FMP) (can be part of a Nutrient Management Plan) for all crops and fields. Soil tests, prescription blends, fertilizer and soil amendment analyses, crop nutrient requirements and soil maps are included in FMP.
- ☐ Current soil tests (done within the last 3 years prior to the assessment). Standard soil tests must include organic matter.
- ☐ Current manure tests if applicable, done annually.
- ☐ Pre-plant tests for residual nitrogen (Solvita test as part of the traditional soil sample instead of a separate sample and test).
- ☐ Pre-side dress tests for nitrogen (PSNT). Split application for nitrogen required. Option: Use Adapt N modeling (can determine N loss and predict side dress N needed).
- ☐ Crop nutrient requirements (part of FMP)

- ☐ Field soil maps
- ☐ Allow regular on-site verification of practices to maintain certification.
- ☐ Keep annual records of type of fertilizer, timing and dates of application, weather at time of application, rate and placement, crops and yield.
- ☐ Keep annual crop irrigation records, if irrigation is used, including irrigation type, amount and dates of irrigation.

Performance Standards

All Practices

- All crop acreage included in FMP enrolled.
- All fertilizer management practices must meet established management criteria.
- Historical average annual crop yields maintained or increased (no net decrease in yield resulting from change in fertilizer management).

Synchronize application with crop growth

Split application of nitrogen based on PSNT tests, land utilization (pasture or harvested forage) and forage species present.

Banding or injecting into sod, split applications

Include banded or injected split applications with rates based on yield potential and species utilization.

Points required for Fertilization Management Certification: 15

If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

Certification Period: 5 years, renewable
Verification Period: Annually
Opt out: None

Accepted Management Practices

Practice	GHG Benefit	Co-Benefit	Cost, Payback	Certification Period	Verification	Points
Application rate reduction to optimal crop needs to maintain yield	Reduction of nitrous oxide	Reduced expense, reduced potential for water quality degradation.	Immediate payback as long as yield is not reduced	5 years	Annual	5
Band placement near, below and to side of seed row	Reduction of nitrous oxide-depth may depend on soil, crop and climate-address in FMP	Reduced potential for water quality degradation if rate does not exceed crop uptake.	May require additional equipment. Payback related to equipment cost and overall reduction of application rate.	5 years	Annual	5

Injection into root zone	Reduction of nitrous oxide-depth may depend on soil, crop and climate-address in FMP	Reduced potential for water quality degradation if rate does not exceed crop uptake.	May require additional equipment. Payback related to equipment cost and overall reduction of application rate.	5 years	Annual	10
Synchronize application with crop growth (crop uptake) (spring application, split application tied to N tests)	Reduction of nitrous oxide, optimize plant uptake	Reduced potential for water quality degradation if rate does not exceed crop uptake.	Immediate payback if less fertilizer is needed	5 years	Annual	5
Switch to enhanced efficiency fertilizer	Reduction of nitrous oxide	Reduced potential for water quality degradation if rate does not exceed crop uptake.	Depends on increased cost of fertilizer compared to reduced rate of application	5 years	Annual	5
Cover Crops (No-Till) (scavenging potential)	Reduction of nitrous oxide	Reduced potential for erosion, captures excess N or N from fall applied manure, reduced crop nitrogen need, depending on cover crop.	Payback depends on reduced nitrogen needs versus cost of planting	5 years	Annual	5
Banding or injecting into sod, split applications	Reduction of nitrous oxide, better uptake	Reduced potential for water quality degradation	Payback related to equipment cost, reduction of application rate	5 years	Annual	10
Total Points						

Maine Earth Smart Certification Requirements and Management Practices
Manure Management

The primary direct GHG emissions related to manure are methane and nitrous oxide. Methane is generated from enteric fermentation by ruminants and from anaerobic decomposition when manure is stored. Nitrous oxide is emitted when manure is stored and/or spread. Emissions are affected by temperature, moisture, nutrient source, and oxygen level, which in turn are affected by manure type, storage and handling, application method and livestock diet. Stored liquid waste (lagoons) generates considerably more methane than solid and untreated solids generate more than composted solids. Spreading increases generation of nitrous oxide emissions through the denitrification process. Application of manure to crop and pasture land utilizing best management practices will generally increase or maintain soil organic matter and carbon sequestration.

This certification program does not currently address management practices to reduce enteric fermentation-however there is research that shows changing the diet of ruminants to include more easily digested feed and/or feed that has a high polyunsaturated fatty acid content can reduce methane emissions, as can improving production efficiency through improved grazing management, improving genetics and other practices.

Manure management in Maine is regulated by the 7 M.R.S.A. Chapter 747, Nutrient Management Act and a nutrient management plan is required under certain conditions, including confining and feeding 50 or more animal units, utilizing or storing more than 100 tons of manure or compost per year not generated on the farm and storing or utilizing regulated residuals.

Manure Management Certification Goals

- ☐ Decrease methane production
- ☐ Decrease nitrous oxide production
- ☐ Increase carbon sequestration
- ☐ Reduce fertilizer nitrogen use
- ☐ Maintain or increase crop productivity
- ☐ Maintain resource nutrient levels available for crops
- ☐ Decrease potential impact on water quality

Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Landscape Energy Audit, if available
- ☐ Nutrient Management Plan
- ☐ Current soil tests done within three years prior to the assessment and every two years thereafter throughout the certification period. Standard soil tests must include organic matter.
- ☐ Current manure tests done within one year prior to the assessment, every year thereafter and when there is a change in feed or other management that would affect manure composition.
- ☐ Crop Nutrient Requirements
- ☐ Field Soil Map (soil tests, manure tests, crop nutrient requirements and soil maps are included in NMPs)
- ☐ Allow regular on-site verification of practices to maintain certification.
- ☐ Keep annual records of use, amount and date of application.

Performance Standards

All Practices

- All acreage included in NMP is enrolled.
- All manure management practices must meet established management criteria
- Historical average annual average crop yields maintained or increased (no net decrease in yield resulting from change in manure management).

Points required for Manure Management Certification: 15

If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

Certification Period: Five years, renewable
Verification Period: Annual
Opt out: None
Accepted Management Practices

Practice	GHG Benefit	Co-Benefit	Cost, Payback	Certification Period	Verification	Points
Methane Digester	Reduction of methane, can incorporate liquid manure, increase in carbon dioxide emissions is offset by decrease in methane	Possible use as energy source, decrease of pathogens, effluent retains nutrients	High, long payback can be reduced by using as energy source and/or sale of offsets	5 years	Annual	15
Composting-product spread or incorporated according to NMP and BMP's.	Reduction of methane, best used for solids	Reduction of volume, more usable form of nutrients, decrease of pathogens, increases organic matter, odor control	Low to moderate. Payback depends on equipment purchased versus less transportation costs related to lower volume and reduction of commercial fertilizer use.	5 years	Annual	10
Injection into root zone	Reduction of nitrous oxide	Nutrient availability, increased organic matter, increased carbon sequestration, odor control	Moderate-requires equipment. Payback depends on equipment cost and reduction of commercial fertilizers.	5 years	Annual	10
Cover existing lagoons	Reduction of methane emitted via collection/flaring	Odor control, reduction of rain entering system, less volume, methane removal	Moderate to high depending of method of removing gases and cost of cover	5 years	Annual	15
Improved Distribution (banded manure spread-according to BMP)	Reduction of nitrous oxide	Availability of nutrients, increased organic matter	Low to moderate depending on equipment purchased. Payback depends on equipment cost and commercial fertilizer reduced.	5 years	Annual	5
Total Points						

Maine Earth Smart Certification Requirements and Management Practices
Pasture and Grazing Management

Implementation of certain pasture and grazing management practices has potential to reduce agricultural greenhouse gas emissions (GHG) by increasing carbon sequestration and/or decreasing methane emissions. In all cases, attention must be paid to effects of implementation on productivity and yield, co-benefits and cost. Increased carbon sequestration depends on climate, soils, topography, pasture composition, tillage and nutrient management and it can be greatly improved using managed intensive rotational grazing (MIRG). The practices selected have the best chance of reducing emissions in Maine, however they will still require careful consideration on a farm basis prior to including in a GHG Management Plan.

Practices eligible for certification include: conversion of marginal cropland to permanent pasture with MIRG, conversion of full confinement operations to partial confinement operations with MIRG, conversion from full or partial confinement to year round MIRG, conversion of unmanaged pasture to MIRG. Any one of these practices generally can be expected to yield a net decrease in emissions via increased carbon sequestration and plant productivity and/or reduction in methane (compared to a confined operation), depending on climate and soils. *"Grazing animals emit more methane than confined ones. However, grazing (particularly MIRG) farms have lower net CO2 emissions because they do not heavily rely on grain for fee. Confined livestock feedstock requires soil tillage, cultivation, irrigation, fertilization, pesticide application, and machinery, transport, drying, processing packaging and delivery. All these processes, if accounted, surpass MIRG carbon emissions. Moreover, a significant feedstock percent is lost due to inefficiencies in the whole process further increasing the carbon emissions toll. The manure pit or lagoon accounts for most of the methane emissions of the confinement system".* Juan P. Alvez, Ph.D. Gund institute for Ecological Economics, Rubenstein School of Environmental & Natural Resources, University of Vermont.

Pasture and Grazing Management Certification Goals

- ☐ Decrease greenhouse gas emissions
- ☐ Maintain acceptable productivity

Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Nutrient Management Plan (Includes Fertilizer Management)
- ☐ Landscape Energy Audit, if available
- ☐ Allow regular on-site verification of practices to maintain certification
- ☐ Keep annual records of manure, fertilizer and soil amendment use
- ☐ Keep annual records of number of cattle grazed and rotation schedule for each paddock
- ☐ Site assessment and Pasture Management Plan

Performance Standards

All Practices

- Milk production losses resulting from conversion to pasture, if any, must be offset by an accompanying reduction in expenses.
- Number of animals grazed must be keyed to the seasonal productivity of the pasture, i.e. not overgrazed. Accordingly, rotation must remain flexible not fixed throughout the paddocks.
- Pasture productivity must be maintained or enhanced.
- No-till re-seeding is allowed when necessary.
- Additional grazing management techniques, such as mob grazing, can be added if research

supports a decrease in emissions per unit.

- All fertilizer and manure management practices must meet established management guidelines.

Conversion of marginal cropland to permanent rotational pasture

If converting from marginal cropland to pasture, new fields cannot be tilled to offset the loss in crop production. No-till will be allowed in new fields if it does not offset the gains from conversion to pasture. Yields can be increased in current fields with acceptable management practices.

Points required for Pasture and Grazing Management Certification: 15

If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

Certification Period: Five years, renewable
Verification Period: Annually for certification period-depending on practice
Opt out: To be determined on an individual basis for catastrophic events.

Accepted Management Practices

Practice	GHG Benefit	Co-Benefit	Cost, Payback	Certification Period	Verification	Points
Conversion of marginal cropland to permanent rotational pasture	Increase carbon sequestration, decreased emissions	Increased organic matter and increased carbon sequestration. Increased soil health, less erosion, increased wildlife, reduced water quality impact, decreased expenses, decreased nitrogen	Immediate payback via reduced expenses	5 years	Every 2 years	15
Conversion from full confinement to partial confinement and rotational grazing or year round rotational grazing	Increase carbon sequestration, decrease methane emissions	Better herd health, better feed utilization, reduced expenses, less chance of water quality impact from feed yard runoff.	Immediate payback via reduced expenses.	5 years	Every 2 years	15
Conversion of unmanaged pasture to managed rotational grazing	Increased carbon sequestration, reduced emissions	Increased organic matter and increased carbon sequestration. Increased soil health, less erosion, better productivity.	Immediate payback with better utilization.	5 years	Every 2 years	5
Total Points						

Maine Earth Smart Certification Requirements and Management Practices
Forest Management

Primary direct GHG emissions associated with forest occur when forest lands are converted to other uses (deforestation) or when management intensity increases such that average standing biomass is reduced over the long-term. The greatest greenhouse gas emissions (GHG) occur when forests are converted to other land uses. Standing biomass can also be reduced when management operations change and maintain forest trees that are smaller and younger than before or the rotation length is shortened. Forest soils store about half the carbon in a forest and will retain most of this carbon if rutting or creation of large canopy openings are avoided during harvest operations. A modest portion of a forest's carbon is stored in deadwood (snags and logs).

Forest Certification Goals

- ☐ Increase carbon sequestration in the forest
- ☐ Maintain or increase forest productivity
- ☐ Protect water quality
- ☐ Maintain species native to the Northeastern United States

General Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Allow regular on-site verification of practices to maintain certification
- ☐ Keep records of harvest and/or plantings.

Forest Management Requirements

- Forest Management Plan (FMP), including:
  - Carbon management plan that documents how carbon stocks will increase or not decline over time (optional for this program, required for offsets-carbon projections using accepted models).
  - Identify management practices that help protect soils and water quality and conserve native species.
  - Stand map with property boundaries, water bodies, landings, and access points for logging equipment identified on the map.
  - Ten year harvest plan (must include carbon management)
  - Current forest carbon inventory and carbon inventory every ten years.
  - Soil maps

Performance Standards

All Practices

- All acreage included in FMP is enrolled.
- All forest management operations must apply state water quality best management practices, as found in Best Management Practices for Forestry: Protecting Maine 's Water Quality, Maine Department of Conservation, available at:

http://www.maine.gov/doc/mfs/pubs/pdf/bmp_manual/bmp_manual.pdf.

Improved Forest Management and other forest management practices

- Maintain or increase carbon stocks over time.
- Harvest less timber than what your forest is growing for each ten year interval.

- When managing and harvesting at the stand level, manage to achieve net increase in carbon

stocks over 20 years.
- Retain 1/3 of the down and standing deadwood when harvesting.
- Practice low impact logging[1] to minimize soil rutting and excessive damage to residual trees in the harvested stand.

Afforestation and plantings

- Species native to the Northeastern United States shall be favored when tree planting, especially for afforestation, reforestation and establishment of plantations.

Certification points can also be awarded for:

- **Afforestation-**Planting tree species native to the Northeastern United States in cropping and forage areas no longer in production.
- **Afforestation-**Planting tree species native to the Northeastern United States in riparian areas lacking trees.
- **Conservation Easement**-Entering into a long-term conservation agreement to primarily sustain natural forest composed of naturally regenerated tree species native to Maine.
- General requirements as listed above must be met.

If there is an existing conservation easement on eligible property, credit for the remaining time (from the date of the certification) will be given

[1]Low impact logging employs the following practices to minimize and control impacts to soils and:

- having a written forest management or stewardship plan
- planning roads and trails before the harvest
- employing directional tree felling
- cutting stumps low to the ground
- constructing roads and trails to minimum widths
- constructing landings to minimum size and spacing
- minimizing ground disturbance
- paying attention to aesthetics or how the site looks after harvest
- minimizing residual stand damage
- following state best management practices (BMPs)
- having a good understanding among landowner, logger, and forester
- of how the site will be harvested, what will be removed, how it will be removed and measures taken to protect and enhance the remaining stand of trees.

Points required for Forest Management Certification: 15

If a qualifying practice has been implemented on a farm within ten years prior to the assessment, it may be used for certification points if the practice is uncommon for the county in which the farm site is located. An "uncommon practice" is defined as one that is implemented on less than 25% of the same type of farm in the county. If a qualifying practice is classified as "common", in use by more than 25% of same type farm within the county, certification points can be awarded only if additional greenhouse gas reductions are made, such as extended rotations, change in crop, etc.

Certification Period: Ten years, renewable
Verification Period: Five years
Opt out: Only for catastrophic event.

Accepted Practices

Practice	GHG Benefit	Co-Benefit	Cost, Payback	Certification Period	Verification	Points
Afforestation-Riparian Buffers and Cropland/Pasture Conversion	Long term carbon sequestration, emissions reductions	Increased wildlife habitat, less soil erosion, improved water quality. Can be used as offset	Long term payback. Payback period can be reduced by NRCS program assistance, other programs or by marketing offsets.	10 years	5 years	15
Improved Forest Management-meeting all performance standards	Long term carbon sequestration, emissions reductions	Increased wildlife habitat, less soil erosion, improved water quality. Can be used as offset	Moderate to long-term payback, depends on management plan. Payback period can be reduced by NRCS program assistance, other programs, and managed harvest and/or by marketing offsets.	10 years	5 years	15
30 year Conservation Easement with carbon sequestration requirements	Long term carbon sequestration, emissions reductions	Increased wildlife habitat, less soil erosion, improved water quality	Payback depends on $, if any, received in return for the conservation easement.	10 years	5 years	15
In Perpetuity Conservation Easement - Avoided Development	Long term carbon sequestration, emissions reductions	Increased wildlife habitat, less soil erosion, improved water quality.	Payback depends on $, if any, received in return for the conservation easement.	10 years	5 years	7
Conservation Easement in Perpetuity with carbon sequestration requirements.	Long term carbon sequestration, emissions reductions	increased wildlife habitat, less soil erosion, improved water quality.	Payback depends on $, if any, received in return for the conservation easement.	10 years	5 years	20
Total Points						

Offset protocols require conservation easements, length depending on the protocol, as a way to insure lasting benefits. Typically, easements of a longer duration are more valuable as offsets.

Maine Earth Smart Certification Requirements and Management Practices
Energy Management

"Agricultural production consumes large amounts of energy, either directly through combustion of fossil fuels, or indirectly through use of energy-intensive inputs, especially fertilizer. Over 2005-08, expenses from direct energy use averaged about 6.7 percent of total production expenses in the U.S. farm sector, while fertilizer expenses represented another 6.6 percent. However, these sector averages mask much greater energy intensities for major field crops. Agricultural production is therefore sensitive to changes in energy prices, whether the changes are caused by world oil markets, policies to achieve environmental goals, or policies to enhance energy security."
(Impacts of Higher Energy Prices on Agriculture and Rural Economies / ERR-123Economic Research Service / USDA, Aug 2011)

This certification module deals only with direct reduction of on-site energy use of fossil fuels and electricity and includes energy conservation, energy efficiency, and renewable energy. Energy management is crucial for long-term agricultural economic sustainability and reduction of energy use will yield a reduction in GHG emissions while reducing production expenses immediately, given no investment in new equipment.

Energy Management Certification Goals

- ☐ Decrease carbon dioxide emissions (major GHG emission from fossil fuels)
- ☐ Reduce fossil fuel use
- ☐ Reduce overall energy use per unit of production
- ☐ Decrease production expense
- ☐ Maintain crop and/or herd production

Requirements

- ☐ Whole Farm GHG Assessment
- ☐ Whole Farm GHG Management Plan
- ☐ Landscape Energy Audit, if available
- ☐ Farm Building Energy Audit within four years prior to the assessment or one after.
- ☐ Two years of annual records of fossil fuel use. One year prior to practice implementation to establish a baseline and one year after implementation of management practices to provide proof of reduction of fossil fuel prior to certification. Annual records must be maintained for the life of the certification.
- ☐ Two years of records of electricity use-same as above.
- ☐ Provide summary of reductions and access to records annually.
- ☐ Allow regular on-site verification of practices to maintain certification.

Performance Standards

All Practices

- Annual reduction of energy use is based on unit production. Reductions must be real and actual, representing decreased energy use and decreased expenses related to crop and milk production, on an annual unit basis (yield).
- Reductions must total a projected 10% of baseline energy use over the certification period.
- Historical average annual crop yields or milk production maintained or increased (no net decrease in yield resulting from change in energy management).
- All changes must reduce emissions while not increasing the possibility of any other environmental impact compared to normal practice.

Fuel Switching

Fuel switching must include documentation that the new fuel used has less environmental impact and reduces GHG emissions when compared to an equivalent fossil fuel unit. There must be no possibility of engine damage attributed to the fuel switch. See requirements for fossil fuel use.

Energy Reduction (includes fossil fuel), Conservation and Energy Efficiency

Energy reduction, conservation and energy efficiency projects must be implemented and proof of reduction submitted prior to certification and annually thereafter. See requirements. Appropriate certification points can be awarded if acceptable practices have been implemented, as recommended by energy and/or landscape audits, within five years prior to the assessment and annual records documenting energy reduction are available.

Renewable Energy

- If opting for a renewable energy source, installation must be based on an appropriate assessment by a qualified consultant and documentation provided proving that the switch will result in overall conventional energy reductions. Reporting requirements are the same as fossil fuel and electricity.
- Reasonable energy conservation and energy efficiency practices, as outlined in the energy audit must be implemented before renewable energy practices can qualify for certification.

Points required for Energy Management Certification: 25

Energy conservation measures can be used for certification points if they were implemented within five years prior to the assessment and they have documentation to prove energy savings on measures taken after an audit recommendation.

Certification Period: Five years
Verification Period: Five years
Opt Out: None

Accepted Management Practices

Practice	GHG Benefit	Co-Benefit	Cost, Payback	Certification Period	Verification	Points
Fossil Fuel Reduction	Reduction of carbon dioxide, reduced upstream emissions reductions.	Reduced environmental impact, reduced expenses	Immediate payback, reduced expenses	5 years	5 years	15
Fuel Switching (exp. Fossil fuel to biofuel, diesel to propane)	Reduction of carbon dioxide based on equivalent fossil fuel use	Decreased fossil fuel consumption, decreased environmental impact.	Payback depends on modifications needed and fuel switch. Must eliminate any possibility of engine damage if switching fuel in vehicles or tractors.	5 years	5 years	5
Electricity reduction via conservation and efficiency	Reduction of carbon dioxide based on equivalent fossil fuel use	Reduced environmental impact, decreased expense	May require equipment or lighting upgrade. Payback related to equipment cost and overall reduction of energy use.	5 years	5 years	15

Renewable energy sources- solar, wind, biofuel etc.	Reduction of carbon dioxide based on equivalent fossil fuel use	Reduces dependence on fossil fuels and off farm electricity, direct emissions reduction. Can be used as offset.	Can be several years or longer pay- back period, needs careful analysis and assessment prior to investment. Excess energy production can be credited and used when production is reduced-for up to a year after it is made.	5 years	5 years	25
Total Points						

Maine Earth Smart
Farm Resources

All descriptions have been copied directly from the websites.

USDA/NRCS **http://www.me.nrcs.usda.gov/programs/**
"NRCS offers voluntary programs to eligible landowners and agricultural producers to provide financial and technical assistance to help manage natural resources in a sustainable manner. Through these programs the agency approves contracts to provide financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forest land." **Contact your local office for current program information.**

There are somewhat limited funding opportunities for implementation of practices beyond NRCS programs, which have their own limitations. However, other options may include:

Coastal Enterprise Institute Loans **http://www.ceimaine.org/Agriculture**
"CEI's business counselors deliver business counseling and technical assistance to develop products, business and marketing plans for agricultural and food-related enterprises. CEI finances loans to qualified borrowers to implement those plans".
"CEI provides business loans to farmers through the Organic Farms Loan Fund and the Maine Farm Business Loan Fund. The Organic Farms Loan Fund serves organic farmers or those transitioning to organic production with loans generally limited to $15,000".

The Carrot Project **http://thecarrotproject.org/farm_financing/maine_loans**
"The Maine Farm Business Loan Fund is a collaboration between Maine's Coastal Enterprises, Inc. (CEI) — a statewide, non-profit community development financial institution — and The Carrot Project. The fund was established to meet the financing needs of small and midsized farms that use sustainable practices and serve local and regional markets in this growing sector of Maine's economy. Qualified farm owners may borrow for working capital or other needs, such as equipment, buildings, production, or value-added enterprises. Farmers may apply for loans of up to $35,000; supplemental amounts for larger projects may be available through other CEI loan programs."

FAME **http://www.famemaine.com/Files/Pages/business/businesses/Direct_Loans.aspx**

Energy Conservation Loan Program
"Funded through the Maine Public Utilities Commission (PUC), this program provides low-interest loans to improve energy efficiency in Maine workplaces".

Potato Marketing Improvement Fund Loan
"Funded through the Maine Department of Agriculture, Food and Rural Resources, this program provides low-interest financing to help potato growers and packers improve the quality and marketing of Maine potatoes. Funds may be used for new construction or improvements to storage and/or centralized packing facilities as well as for the acquisition of packing, sizing, washing and drying equipment. In addition, PMIF funds may be used to fund programs and activities that improve the economic viability of the potato industry. such improvements include irrigation equipment and water source development."

Agricultural Marketing Loan Fund
"Funded through the Maine Department of Agriculture, Food and Rural Resources, this programs provides low interest financing to help eligible businesses employ new and innovative technologies and processes in order to improve, expand and enhance the manufacturing, marketability and production of Maine-made agricultural products. Funds may be used for the design, construction or improvement of facilities such as commodity

storage buildings and packing and marketing facilities. Funds may also be used to purchase or retrofit machinery and equipment."

Nutrient Management Loan Program (lots of money, but projects must be targeted)

"This low-interest loan program was created to fund the construction and improvement of livestock manure and milk room waste containment/handling facilities, including associated costs of the design and engineering of these facilities, as well as the cost of related equipment, in each case so long as the project meets the goal of the State's Nutrient Management Plan. The program is administered by FAME in cooperation with the Maine Department of Agriculture, Food and Rural Resources and the Maine Municipal Bond Bank".

Farm Service Agency – farm ownership and operating loans
http://www.fsa.usda.gov/FSA/webapp?area=home&subject=fmlp&topic=landing

"FSA makes direct and guaranteed farm ownership (FO) and operating loans (OL) to family-size farmers and ranchers who cannot obtain commercial credit from a bank, Farm Credit System institution, or other lender. FSA loans can be used to purchase land, livestock, equipment, feed, seed, and supplies. Our loans can also be used to construct buildings or make farm improvements".

Farm Credit of Maine – farm ownership and operating loans, financial consulting, crop insurance
https://www.farmcreditmaine.com/

USDA SARE grants-Farmer grants http://nesare.org/get/farmers/

"Farmer Grants are for commercial producers who have an innovative idea they want to test using a field trial, on-farm demonstration, or other technique. A technical advisor--often an extension agent, crop consultant, or other service professional--is required as a project participant".

MOFGA Organic Farmer Loan Fund
http://www.mofga.org/Programs/OrganicFarmerLoanFund/tabid/1058/Default.aspx

"Funds, generally in amounts of $5,000 to $20,000, may be used for working capital or farm equipment, and will be available to: MOFGA-certified organic farmers; farmers transitioning to organic production; and current participants and graduates of MOFGA's Journeyperson Program".

Nutrient Management Grant Program – contact Mark Hedrich (no funds available)
http://www.maine.gov/agriculture/narr/nutrientmanagement.html

USDA Rural Energy for America Program (REAP) Funding
http://www.rurdev.usda.gov/me/Energy/REAP.htm

"Section 9007 of the 2008 Farm Bill established a grant, loan, and loan guarantee program to assist eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems and for making energy efficiency improvements.
Eligible projects include those that derive energy from a wind, solar, biomass, or geothermal source, or hydrogen derived from biomass or water using wind, solar, or geothermal energy sources. Awards will be made on a competitive basis for the purchase of renewable energy systems and to make energy improvements".

Efficiency Maine Trust http://www.efficiencymaine.com/at-work/business-programs/cash-incentives

Loans, audits, cash incentives, alternative energy programs for businesses-including small, including agriculture.

"Efficiency Maine provides loans up to $35,000, currently at 1% interest, to help small businesses fund approved energy conservation measures of all types: electrical equipment including lighting, machinery, HVAC and refrigeration; heating equipment, regardless of fuel type; insulation. An energy audit identifying recommended energy efficiency measures is required".

Maine Earth Smart
A Selection of References

General

International Trade Center, *Product Carbon Footprinting Standards in the Agri-food Sector* Geneva: ITC, 2012. xiii, 46 p. (Technical Paper) Doc. No. MAR-12-217.E 2012. http://www.intracen.org/Product-Carbon-Footprinting-Standards-in-the-Agri-Food-Sector/

Eagle, A., L. Olander, L.R. Henry, K. Haugen-Kozyra, N. Millar, and G.P. Robertson. 2012. *Greenhouse Gas Mitigation Potential of Agricultural Land Management in the United States: A Synthesis of the Literature.* Report NI R 10-04, Third Edition. Durham, NC: Nicholas Institute for Environmental Policy Solutions, Duke University. http://nicholasinstitute.duke.edu/ecosystem/t-agg

Olander, Lydia P. Alison J. Eagle, Justin S. Baker, Karen Haugen-Kozyra, Brian C. Murray, Alexandra Kravchenko, Lucy R. Henry and Robert B. Jackson. 2011. *Assessing Greenhouse Gas Mitigation Opportunities and Implementation Strategies for Agricultural Land Management in the United States.* Report NI R 11-09, Durham, NC: Nicholas Institute for Environmental Policy Solutions, Duke University. http://nicholasinstitute.duke.edu/ecosystem/t-agg

Foucherot, Claudine and Valentin Bellassen. 2011. *Carbon Offset Projects in the Agricultural Sector.* Climate Report-Research on the economcs of climate change, Climate Report No. 31. http://www.cdcclimat.com/IMG/pdf/11-12-15_climate_report_31_-_carbon_offset_projects_in_the_agricultural_sector.pdf

Wightman, Jenifer. *Production and Mitigation of Greenhouse Gases in Agriculture*. Cornell University. Fact Sheet, New York case study. Climate Change and Agriculture: Promoting Practical and Profitable Responses (SARE Professional Development Program grant #ENE05-091 2005) http://www.climateandfarming.org/pdfs/FactSheets/IV.1GHGs.pdf

Peters-Stanley, Molly and Katherine Hamilton. 2012. *Developing Dimension: State of the Voluntary Carbon Markets 2012.* A Report by Ecosystem Marketplace and Bloomberg New Energy Finance, Washington D.C. and New York, N.Y. http://www.forest-trends.org/documents/files/doc_3164.pdf

Diaz, David, Katherine Hamilton and Evan Johnson. 2011 *State of the Forest Carbon Markets 2011 From Canopy to Currency.* Ecosystem Marketplace, Washington D.C. http://www.forest-trends.org/documents/files/doc_2963.pdf

Carbon and Agriculture: Getting Measurable Results. A Report of the Coalition on Agricultural Greenhouse Gases. Version 1, 2010. http://www.c-agg.org/docs/CAGMR_complete.pdf

Cooley, David, Lydia Olander and Lucy Henry. 2009. T-AGG *Summary of Existing and Developing Agricultural Offsets Protocols*, Nicholas Institute for Environmental Policy Solutions, Duke University. http://nicholasinstitute.duke.edu/ecosystem/t-agg/T-AGG_protocol_summary.pdf

Denef, K., S. Archibequie, and K. Paustian, 2011. *Greenhouse Gas Emissions from U.S. Agriculture and Forestry: A Review of Emission Sources, Controlling Factors, and Mitigation Potential*. Interim report to USDA under Contract # GS-23F-8182H. http://www.usda.gov/oce/climate_change/techguide/Denef_et_al_2011_Review_of_reviews_v1.0.pdf

Stockwell, Ryan and Eliav Bitan. 2011. *Future Friendly Farming: Seven Agricultural Practices to Sustain People and the Environment.* National Wildlife Federation http://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2011/%7E/media/54D873 36A358404084B1F0B0A2D9A03B.ashx

2011 U.S. Dairy Sustainability Report. U.S. Dairy Sustainability Commitment, Innovation Center for U.S. Dairy. http://www.usdairy.com/sustainability/Pages/Home.aspx

CCSP, 2008: *The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States.* A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. **P**. Backlund, A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B.A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M.G. Ryan, S.R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B.P. Kelly, L. Meyerson, B. Peterson, R. Shaw**.** U.S. Department of Agriculture, Washington, DC., USA, **362** pp. http://www.climatescience.gov/Library/sap/sap4-3/final-report/

Murdock, Sarah, Sandra Brown, R. Neil Sampson and Bill Stanley. 2007. *Terrestrial Carbon Sequestration in the Northeast Quantities and Costs.* Final Report Submitted to US DOE-NETL Cooperative Agreement DE-FC26-01NT41151 The Nature Conservancy, Winrock International and The Sampson Group. http://www.sampsongroup.com/Papers/NE Carbon Sequestration.pdf

INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990 – 2010. 2012. U.S. Environmental Protection Agency, Washington, D.C. http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf

Energy

McDonald, Kay, 2011. *How Higher Energy Prices Will Affect U.S. Agricultural Production*, (Blog) Big Picture Agriculture http://www.bigpictureagriculture.com/2011/08/how-higher-energy-prices-will-affect-us.html

Best Practices Guide Energy Savings Opportunities for US Dairy Farms, Innovation Center for U.S. Dairy, Rosemont, IL and EnSave, Richmond, VT. http://www.usdairy.com/saveenergy/Resources/White paper.pdf

Schnepf, Randy. 2004. *Energy Use in Agriculture: Background and Issues.* CRS Report for Congress. http://www.policyarchive.org/handle/10207/bitstreams/171.pdf

Crop and Land

Al-Kaisi, Mahdi. 2008. *Impact of Tillage and Crop Rotation Systems on Soil Carbon Sequestration.* Pasture and Grazing. Iowa State University , University Extension, Department of Agronomy http://www.extension.iastate.edu/Publications/PM1871.pdf

Greenhouse Gas Working Group. 2010. *Agriculture's Role in Greenhouse Gas Emissions and Capture*. Greenhouse Gas Working Group Rep. American Society of Agronomy, Crop Science Society, and Soil Science Society of America., Madison, WI. http://corn.agronomy.wisc.edu/Season/pdfs/2010_ghg-report-august.pdf

Cover Crops to Reduce Residual Soil Nitrate, Mitigate Greenhouse Gases and Boost Corn Production Efficiencies**.** Crop Advances: OMAFRA Field Crop Project Reports http://www.ontariosoilcrop.org/docs/V2Gen7pdf

Clark, Andy, Editor. 2007 *Managing Cover Crops Profitably*, Third Edition. Handbook Series Book 9, Sustainable Agriculture Network, ISBN 978-1-888626-12-4 (pbk.)
http://www.sare.org/publications/covercrops/covercrops.pdf

Kersbergen, Richard. 2003. *Cover Crops For Soil Health.* University of Maine Cooperative Extension.
http://www.newenglandvfc.org/2003_conference/proceedings_03/soil_health/cover_crops_soil_health.pdf

Davidson, Eric A., Mark B. David, James N. Galloway, Christine L. Goodale, Richard Haeuber, John A. Harrison, Robert W. Howarth, Dan B. Jaynes, R. Richard Lowrance, B. Thomas Nolan, Jennifer L. Peel, Robert W. Pinder, Ellen Porter, Clifford S. Snyder, Alan R. Townsend, and Mary H. Ward. 2012. *Excess Nitrogen in the U.S. Environment: Trends, Risks, and Solutions.* Issues in Ecology, No. 15. The Ecological Society of America. http://www.esa.org/science_resources/issues/FileEnglish/issuesinecology15.pdf

Forest

Nunery, J.S., Keeton, W.S., *Forest carbon storage in the northeastern United States: Net effects of harvesting frequency, post-harvest retention, and wood products*. Forest Ecol. Manage. (2010), doi:10.1016/j.foreco.2009.12.029 FORECO-12000; No of Pages 13. http://www.maforests.org/Keeton.pdf.

Sampson, R. Neil. 2010. *Potential Forestry Activities in the U.S. for Carbon Sequestration and Climate Change Mitigation*. http://www.sampsongroup.com/Papers/Potential Forestry Activities in the U.pdf

Wilkinson, Ethel and Andrew Whitman. 2011. *Climate Change and Forests: What can we expect? What can we do about it?* Manomet Center for Conservation Sciences.
http://www.manometmaine.org/documents/ClimateChangeandForests_10.11.pdf

Brooke, Rebecca, Joe Short, Keith Bisson, and John Gunn. *Payments for Forest Carbon Opportunities & Challenges for Small Forest Owners*. Manomet Center for Conservation Sciences, Northern Forest Center, Coastal Enterprises, Inc.
http://www.manometmaine.org/documents/ClimateChangeandForests_10.11.pdf

Manure

Manure Management and Greenhouse Gases - Things You Need To Know. Alberta Agriculture and Rural Development. 2007. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/cl10038

Langmead, Chris. 2003. *MANURE MANAGEMENT AND GREENHOUSE GAS MITIGATION TECHNIQUES: A COMPARATIVE ANALYSIS,* DISCUSSION PAPER C3 – 013. Climate Change Central
http://www.assembly.ab.ca/lao/library/egovdocs/alccc/2003/141764.pdf

Fertilizer

Baker, Justin S., Brian C. Murray*, Bruce A. McCarl, Steven K. Rose, Joshua Schneck. 2011.*Greenhouse Gas Emissions and Nitrogen Use in U.S. Agriculture Historic Trends, Future Projections, and Biofuel Policy Impacts.* Report NI R 11-08. Nicholas Institute for Environmental Policy Solutions, Duke University.
http://nicholasinstitute.duke.edu/ecosystem/t-agg

Reactive Nitrogen In the United States: An Analysis of Inputs, Flows, Consequences, and Management Options. A Report of the EPA Science Advisory Board. 2011. EPA-SAB-11-013
http://yosemite.epa.gov/sab/sabproduct.nsf/WebReportsLastMonthBOARD/67057225CC780623852578F10059533D/$File/EPA-SAB-11-013-unsigned.pdf

Baker, Justin S., Brian C. Murray, Bruce A. McCarl, Steven K. Rose, and Joshua Schneck. 2011. *Greenhouse Gas Emissions and Nitrogen Use in U.S. Agriculture: Historic Trends, Future Projections, and Biofuel Policy Impacts.* Report I R 11-08-2. Nicholas Institute for Environmental Policy Solutions, Duke University.
http://nicholasinstitute.duke.edu/climate/policydesign/greenhouse-gas-emissions-and-nitrogen-use-in-u.s.-agriculture

Pasture and Grazing

Rotz, Alan C., Kathy J. Soder, R. Howard Skinner, Curtis J. Dell, Peter J. Kleinman, John P. Schmidt, Ray B. Bryant. 2009. *Grazing Can Reduce the Environmental Impact of Dairy Production Systems.* Forage and GrazingLands doi:10.1094/FG-2009-0916-01-RS.
http://www.caes.uga.edu/commodities/fieldcrops/forages/events/PBDSummit/rotz%202009%20Grazing%20Can%20Reduce%20the%20Environmental%20Impact%20of%20dairy%20production%20systems.pdf

Bosch, Darrell J., 2008. *Effects of rotational grazing on carbon dioxide emissions and greenhouse gas credits.* doi: 10.2489/jswc.63.2.51A. Journal of Soil and Water Conservation March/April 2008 vol. 63 no. 2 51A.
http://www.jswconline.org/content/63/2/51A.extract

Additional References
http://www.biomassenergycentre.org.uk/portal/page?_pageid=73,1&_dad=portal&_schema=PORTAL
http://www.co2list.org/