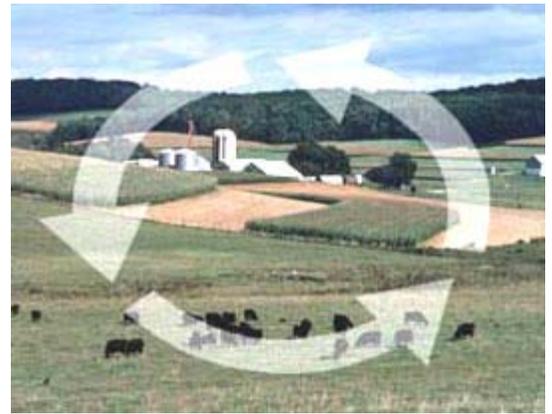


# NRCS & Global Climate Change

## Reducing Greenhouse Gas Emissions and Sequestering Carbon

- [Greenhouse Effect and Climate Change](#)
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## The Greenhouse Effect and Climate Change

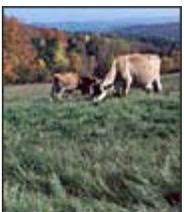
Greenhouse gases (GHGs), such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and water vapor (H<sub>2</sub>O) are a critical part of our climate system. These gases are effective in trapping heat at the earth's surface. Without GHGs, most of the currently cultivated regions of the earth would be too cold for agricultural production. However, human activity is contributing to increases in GHG concentrations in the atmosphere and the increases are causing potentially detrimental changes in temperature and other aspects of climate. Global annual-mean surface temperature has shown a rapid and widespread increase of 1.4° F (0.7°C) since the early 20th century with about 0.9° F of that increase occurring since 1978. The [National Academy of Sciences](#) has produced a document that summarizes these findings in a clear and an understandable manner (1). While uncertainties remain in our understanding of climate science, we know enough to act now as science justifies, to slow and eventually stabilize GHG increases. Although agricultural sources account for only 7 percent of the total GHG emissions in the USA, many sources can be reduced with minimal economic impact. Producers have opportunities to employ practices that save money and time, and take advantage of market forces that may lead to new commodities such as, carbon, bioenergy crops, and GHG emissions reductions.

### References

- (1) [Understanding and responding to climate change](#): Highlights of National Academies Reports. October, 2005. The National Academy of Sciences.
- (2) [IPCC Working Group 1 Contribution to the 4th Assessment Report. Climate Change 2007: The Physical Science Basis](#)

## Climate Change and Agriculture

### Climate Change Impacts on Agricultural Production



Climate change and climate variability present a challenge to ecologically, economically, and socially sustainable land management. Drought, floods, and temperature fluctuations due to climate change can directly affect agricultural operations through damage to crops and livestock. Indirect effects of climate change include higher soil erosion rates, more invasive species, and changes in soil and vegetative relationships. The consequences of global warming will not be spread evenly across the planet and the challenges of coping with changes will be regionally unique. The Natural Resources Conservation Service (NRCS) is focusing global climate change efforts in several areas: 1) quantifying the effects of conservation practices on greenhouse gas emissions and carbon sequestration; 2) refining incentives in conservation programs to address the effects of climate change on agriculture; 3) developing and encouraging the use of

conservation practices and systems that reduce GHG emissions; and 4) enhance opportunities to increase farm profitability on the emerging voluntary emissions trading markets.

## Agricultural Activities That Mitigate the Impact of Greenhouse Gas Emissions

Agricultural and forestry activities can contribute to the reduction in atmospheric buildup of GHGs in three important ways: sequestration, emissions reductions, and fossil fuel substitution.

- **Sequestration:** Carbon dioxide (CO<sub>2</sub>) removed from the atmosphere can be stored in soils, biomass, and harvested products, and protected or preserved to avoid CO<sub>2</sub> release back to the atmosphere. These become carbon stores or carbon sinks.
- **Emissions reductions:** Agricultural CH<sub>4</sub> and N<sub>2</sub>O emissions can be reduced through effective manure and feed management and efficient fertilizer application. CO<sub>2</sub> emissions can be reduced by adopting more fuel efficient technologies and practices.
- **Fossil fuel substitution:** Using biofuels produced in the agricultural sector instead of fossil fuels can help lower GHG concentrations.



By adopting these practices, producers can save money and time while enhancing and improving the environment around them, a common goal for many farmers and ranchers as well as their community partners.

## Market-Based Programs and Trading

The USDA plans to broaden the use of private-sector markets for environmental goods and services through emerging voluntary market mechanisms. Ecosystem services are part of the focus of market-oriented approaches proposed for a component of the Conservation Title in the 2007 Farm Bill. The goal of market-based conservation is to take conservation beyond the farm, ranch, and forest and develop a system that mainstreams environmental credit trading. A USDA policy memorandum, [USDA Roles in Market-Based Environmental Stewardship](#) and [Departmental Regulation](#) established a role for agriculture and forestry in providing environmental offsets and enhancements and developing accounting practices and procedures for quantifying environmental goods and services in advance of the 2007 Farm Bill.

The USDA has instituted new standards and targeted specific portions of incentive programs toward an ecosystem market place by aligning its conservation programs with other Federal programs aimed at reducing non-point source pollution, preservation of wildlife habitat, enhancing carbon sequestration in soils, and reducing GHG emissions. The USDA-NRCS and the Department of Interior Fish and Wildlife Service and Associated Agencies recently signed a partnership agreement to explore and facilitate [habitat credit trading markets](#) for conservation benefits of listed endangered, and other at-risk species. NRCS has also partnered with EPA to collaborate on efforts to establish a [water quality credit trading market](#) and coordinate related programs. A pilot program in water quality credit trading is being developed for the [Chesapeake Bay Basin](#) in support of this collaboration. These activities and partnerships are all expected to stimulate and facilitate other actions including participation in carbon or bundled environmental benefits markets.

USDA is sponsoring improved monitoring and reporting guidelines for voluntary initiatives. The USDA agencies and their cooperators are developing tools to estimate the amount of carbon stored and GHG emissions reduced at the field and producer level. [COMET-VR](#) is a web-based, interactive decision support tool that includes the effects of land-management changes and is authorized for voluntary GHG reporting under section 1605(b) of the 1992 Energy Policy Act. It is a cooperative effort between NRCS and Colorado State University. Tools like COMET-VR make it easier for producers to estimate carbon storage and GHG emissions reductions for their entire holdings. The market for carbon credits trading in the form of carbon emissions reduction is in its formative stages and agricultural producers stand to benefit. NRCS has also instituted an Environmental Credit Trading Information Series to answer basic questions in environmental trading. The first document in the series discusses [Carbon Credit Trading on Rangeland](#).

USDA policy goals in this section are linked to other major ongoing Presidential initiatives and activities including voluntary greenhouse gas reporting under section [1605\(b\) of the 1992 Energy Policy Act](#), the [Clear Skies](#) legislation including the [EPA Clean Air Interstate Rule \(CAIR\)](#), the Healthy Forest Initiatives in 2002, the [National Environmental Policy Act Task Force \(NEPA\)](#) in 2003, and the [White Waters to Blue Water Initiative](#) under the Oceans Act of 2000.

Several organizations have begun to offer market opportunities for agricultural GHG emission reductions and carbon sequestered as commodities such as the [Chicago Climate Exchange](#) and [The Climate Trust](#).

## 1605(b) Voluntary Reporting Registry

Section 1605(b) of the energy Policy Act established a voluntary reporting program for GHG emissions and reductions. The initial guidelines were issued in 1994. Over 200 utilities, industries, institutions, and other entities now report annually.

USDA has worked closely with the Department of Energy (DOE) in developing new accounting rules and guidelines for voluntary reporting of greenhouse gas emissions and carbon sinks for agriculture and forestry. NRCS, through the USDA Office of Global Change helped finalized the agricultural portion of the DOE [Voluntary Greenhouse Gas Emission Reporting Registry](#) section 1605(b) in 2006 as a means to meet the President's goals for greenhouse gas (GHG) emissions intensity. [EIA/DOE](#) provides the forms and instructions for Registry filing.

In April, 2006, when revised guidelines for voluntarily reporting greenhouse gases were announced, Deputy Agriculture Secretary Chuck Conner said, "These guidelines represent an important milestone in the effort to encourage new technologies to reduce greenhouse gas emissions without impairing economic growth. By participating in this program, our farmers and ranchers have a unique opportunity to be part of the solution to greenhouse gas emissions." The revised guidelines include "state-of-the-science" guidance and tools for estimating emissions from agricultural, forestry, and conservation activities.

The 1605(b) registry allows the user voluntarily to report carbon sequestration and greenhouse gas emissions reductions annually. Producers enter location information, carbon storage, fertilizer usage, emissions information, and fuel usage. Actions that producers might consider reporting include conservation tillage, installing waste digesters, improving nutrient management and managing forest land.

## Carbon Management Reporting Tool: COMET-VR

The Carbon Management Online Tool for Voluntary Reporting ([COMET-VR](#)) is a decision support tool developed jointly by the NRCS and Colorado State University for calculating soil carbon stored or sequestered by changing land management practices. Producers enter location information, past, present, and planned land management practices and obtain an estimate of the change in carbon sequestered. This tool is also sanctioned for reporting carbon sequestration in the DOE 1605(b) Voluntary Greenhouse Gas Emissions Reporting Registry. In the future, interested producers using [COMET-VR](#) will be able to transfer information electronically to the [1605\(b\)](#)



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## Incentive Programs and Assistance for Producers

### Incentives and Assistance in NRCS

The USDA has instituted new standards targeting specific portions of incentive programs that encourage carbon sequestration and greenhouse gas (GHG) emission reductions. Some practices that decrease GHG emissions or sequester carbon may require a capital investment or increase farm-operating costs. The USDA is providing incentives and supporting voluntary actions by private landowners in targeting GHG and carbon sequestration through a portfolio of beneficial conservation programs.

### NRCS Conservation Practices and Systems that Save Money and Benefit the Environment

Agricultural and forestry production systems offer a wide variety of opportunities to increase carbon sequestration (carbon storage) and reduce greenhouse gas emissions. Many conservation practices mitigate the negative effects attributed to climate change while providing many other benefits and enhancements to the producer and the environment. Conservation practices such as no-till have the potential to save an estimated 217 million gallons of fuel and as much as \$480 million annually while increasing the carbon stored in soils and



improving soil quality.

NRCS Program	Purpose	Effects on GHGs
<a href="#">Conservation Technical Assistance (CTA)</a>	Provides assistance to landusers, communities, state and local governments, and other Federal agencies in planning and implementing conservation systems.	Provide technical assistance to promote activities that will increase carbon sequestration and increase energy efficiency.
<a href="#">Environmental Quality Incentives Program (EQIP)</a>	A voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. EQIP offers contracts that provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.	<p>National priorities have been recently revised to include energy conservation. Examples of EQIP-funded conservation activities include:</p> <p>Crop Residue Management - Promotes no-till, which is a conservation practice that leaves the crop residue undisturbed from harvest through planting except for narrow strips that cause minimal soil disturbance. No-till reduces greenhouse gases because it requires less fuel and sequesters carbon in the soil.</p> <p>Nutrient Management - involves proper timing and placement of the right amounts of nutrients and soil amendments for adequate soil fertility and to minimize potential environmental degradation, particularly of water quality. Also entails the use of anaerobic digesters, such as covered lagoons and complete mix digesters, coupled with electricity generation from methane. Methane emissions -&gt; carbon dioxide emissions = less harmful greenhouse gas emissions.</p> <p>Irrigation Water Management – energy saving and less carbon dioxide emissions (many irrigation systems use diesel).</p> <p>Precision Agriculture - By reducing overlap in fertilizer and pesticide applications on the 250 million acres of cropland used to produce major crops, petroleum-based fertilizer and pesticide costs could be reduced up to \$1 billion annually.</p> <p>Pesticide Management - Pesticide production depends heavily on energy resources, less pesticide use = less energy used to produce pesticides.</p> <p>Prescribed Grazing Systems - Well-managed grazing systems improve the health and vigor of plants, enhance the quality and quantity of water, and reduce accelerated soil erosion and improve soil condition on the land. As a result, they can enhance the carbon storage in soil.</p>

<a href="#"><u>Conservation Innovation Grants (CIG)</u></a>	A voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program funds are used to award competitive grants to non-Federal governmental or non-governmental organizations, Tribes, or individuals.	Windbreaks and Shelterbelts – can entail tree planting, which provides carbon sequestration and energy savings.
<a href="#"><u>Conservation Security Program (CSP)</u></a>	Voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and range land, as well as forested land that is an incidental part of an agriculture operation. The program is available in all 50 States, the Caribbean Area and the Pacific Basin area. The program provides equitable access to benefits to all producers, regardless of size of operation, crops produced, or geographic location.	Better land management – carbon sequestration  Encourages farmers and ranchers to implement new methods to recycle waste lubricants in their operations, reduce the use of fossil fuels, and reduce impacts on the environment from the use of energy.  CSP offers payments for these and many other conservation activities:  Performing a professional energy audit of farm/ranch operations; Supplying 90% of crop nitrogen needs with legumes, manures, and/or other organic sources; Purchasing bio-fuels (bio-diesel and or ethanol) for farm operations; Producing renewable energy on farm; Less tilling – which reduces energy use and increases carbon sequestration
<a href="#"><u>Wetlands Reserve Program (WRP)</u></a>	Voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection through the establishment of permanent or 30-year conservation easements or through restoration cost-share agreements where no easement is involved.	Wetlands are carbon sinks – increasing the acreage of wetland increases carbon sequestration. Prevent the loss of wetland.
<a href="#"><u>Wildlife Habitat Incentives Program (WHIP)</u></a>	Voluntary program that encourages creation of high quality wildlife habitats that support wildlife populations of National, State, Tribal, and local significance. NRCS provides technical and financial assistance to landowners and others to develop upland, wetland, riparian, and aquatic habitat areas on their property. NRCS works with the participant to develop a wildlife habitat development plan. This plan becomes the basis of the cost-share agreement between NRCS and the participant. NRCS provides cost-share payments to landowners under these agreements that are usually 5 to 10 years in duration, depending upon the practices to be installed.	Habitat development – carbon sequestration results from conversion of cropland to perennial vegetation or improved management of forests and grasslands.
<a href="#"><u>Healthy Forests Reserve Program (HFRP)</u></a>	A voluntary program established for the purpose of restoring and enhancing forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and 3) enhance carbon sequestration. Program achieves these goals through 30-year or 99-year easements or through habitat restoration cost-share agreements for up to 10 years.	Tree planting – increases the amount of carbon stored in soil and in trees, Prevent the development of forested land.
<a href="#"><u>Farm and Ranch Lands Protection Program (FRPP)</u></a>	Provides funds to purchase developmental rights to keep productive farmland in use. The program provides matching funds to State, Tribal, or local governments and non-governmental organizations with existing farm and ranch land protection programs to purchase conservation easements.	Prevent the development of farm land – so continual carbon sequestration
<a href="#"><u>Grassland Reserve</u></a>	Voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property through easements. The program	Well-managed grazing systems improve the health and vigor of plants,

<a href="#">Program (GRP)</a>	emphasizes support for working grazing operations; enhancement of plant and animal biodiversity; and protection of grassland and land containing shrubs and forbs under threat of conversion to cropping, urban development, and other activities that threaten grassland resources.	enhance the quality and quantity of water, and reduce accelerated soil erosion and improve soil condition on the land. As a result, can enhance the sequestering atmospheric carbon in the soil.
<a href="#">Resource Conservation and Development (RC&amp;D)</a>	The purpose of the RC&D program is to encourage and improve the capability of volunteer local elected and civic leaders in designated RC&D areas to plan and carry out projects for resource conservation and community development. Program objectives focus on "quality of life" improvements achieved through natural resources conservation and community development. Such activities lead to sustainable communities, prudent land use, and the sound management and conservation of natural resources. Assistance is provided, as authorized by the Secretary of Agriculture, to designated RC&D areas through their organized RC&D councils (comprised of local leaders). RC&D priorities are set by area residents to meet their needs.	Better land management – carbon sequestration
<a href="#">Agriculture Management Assistance (AMA)</a>	Provides cost-share and incentive payments to agricultural producers to voluntarily address issues, such as water management, water quality, and erosion control by incorporating conservation practices into their farming operations. Producers may construct or improve water management structures or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming. AMA is available in 15 states where participation in the Federal Crop Insurance Program is historically low.	Planting trees for windbreaks or to improve water quality can also serve as carbon sequestration.  Energy conservation
<a href="#">Emergency Watershed Protection Program (EWP)</a>	The purpose of the Emergency Watershed Protection (EWP) program is to undertake emergency measures, including the purchase of flood plain easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a sudden impairment of the watershed.	Less erosion – more carbon sequestration
<a href="#">Watershed Operations (WF-03/08)</a>	Watershed planning and management	Land treatment practices that are beneficial to reducing GHG emissions and increasing carbon sequestration.

## Financial Incentives and Assistance in related agencies and institutions

- [USDA Farm Service Agency \(FSA\)](#)
- [Conservation Reserve Program \(CRP\)](#)
- [Conservation Reserve Enhancement Program \(CREP\)](#)
- [Rural Development Renewable Energy Systems and Energy Efficiency Improvements, USDA Rural Development Agency](#)
- [USDA/DOE/EPA AgSTAR](#)
- [USDA National Agroforestry Center](#)
- [USDA Forest Service](#)
- [Forest Land Enhancement Program \(FLEP\)](#)
- [USDA Global Change Program Office](#)

- [National Association of Conservation Districts](#)
- [National Association of State Conservation Agencies](#)
- [Conservation Technology Information Center](#)
- [US DOE/EIA 1605b Greenhouse Gas Registry](#)
- [Cooperative State Research, Education, and Extension Service \(CSREES\)](#)
- [Sustainable Agriculture Research and Education \(SARE\)](#)

## Climate Change and Effects on Ecosystems

### Coral Reefs



Coral reef ecosystems are under stress from many sources including increased sea surface temperature, ocean acidification, pollution, over-fishing, coastal use and extreme events such as storm damage from hurricanes or typhoons. Loss of coral reefs adversely affects coastal economies. Island communities whose livelihoods depend on these reef systems as local resources are especially vulnerable to changes in coral reef ecosystems.

The [Coral Reef Task Force](#) was established by Presidential Executive Order in 1998. Its mission is to lead, coordinate and strengthen US government actions to better preserve and protect coral reef ecosystems. The Task Force is co-chaired by the Departments of Commerce and Interior and includes 12 federal agencies, 7 US states and territories and 3 freely associated states. As an Agency in the USDA, NRCS is a member of the Task Force working groups and participates in

meetings, resolutions, and working groups.

In partnering with federal, state, and territory governments, NRCS has the expertise and field offices to provide technical assistance on conservation practices that address Local Action Strategies designed to mitigate impacts on coral reef ecosystems. See more information on the [NRCS Coral Reef Initiative](#).

### Polar Regions

Soil Climate Research Stations:

NRCS has significant expertise in monitoring soil climate. Soil-climate information is used in a wide array of applications from water resource management to surface and ground water pollution to permafrost active layer studies, soil engineering uses and continental-scale climate modeling. Many NRCS soil-climate stations are located in regions of extremes. Soils in polar regions and in high altitude areas such as Tibet, are thought to be particularly sensitive to climate change. As early as 1999, some of these stations were established under the auspices of the US Global Climate Change Program to better understand soil moisture and temperature regime extremes for soil taxonomic classification. Additional sites have been added in the last few years. Satellite and ground surface measurements have shown that in recent decades, the polar regions have experienced more rapid changes in the seasonality and areal extent of snow cover and of sea ice than in the past. The installation of multi-depth sensors provides a comparative record of permafrost and active layer soil moisture and temperature at multiple depths.

Antarctica:

Relatively little is known about Antarctic soils and soil-climate in particular, other than that the soils may represent the coldest, driest part of the soil-climate continuum. Seven long-term soil-climate stations were located in Antarctica such that the effects of latitude, elevation, and soil age could be studied. One study site was chosen adjacent to Scott Base as part of an international cooperative project lead by Landcare Research, Hamilton New Zealand to conduct research on the effects of fuel spills on Antarctic soils. At all stations, measurements

at multiple depths are made at regular intervals throughout the day and recorded every hour. Because of the remoteness and extreme conditions at many of the locations, data cannot be transmitted instantaneously but is manually downloaded once a year from each station. The Scott Base site is a real-time climate station. Data from this site is posted on the National Water Climate Center [Soil Climate Analysis Network \(SCAN\)](#). A complete map of the sites, station records, data labels, and soils descriptions can be downloaded at: <http://soils.usda.gov/survey/scan/> . Data collected manually is posted to this latter site.

Alaska:

The discussion and links to the remote soil-climate stations in Alaska are currently under development. At present, only the data for the real-time stations sites can be accessed through the National Water Climate Center site <http://www.wcc.nrcs.usda.gov/scan/> .

## Resources and Publications

### Greenhouse Gas Reporting Registries:

- [1605\(b\) Voluntary Reporting Registry](#)

### Climate Partnerships:

- [Carbon Sequestration Regional Partnerships](#)
- [Methane to Markets Partnership](#)
- [NRCS Air Quality](#)
- [Western Climate Initiative](#)
- [Intergovernmental Panel on Climate Change](#)

### Inventories:

- [National Resources Inventory \(NRI\)](#)
- [Web Soil Survey](#)
- [Climate and Water Supply Data \(SNOTEL and SCAN\)](#)
- [Greenhouse Gas Emissions Inventories – EPA](#)
- [U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2005](#)

### Maps:

- [Global map of Soil Organic Carbon](#)
- [U.S. Drought Monitor](#)

### Publications and Reports:

- [NRCS Environmental Credit Trading Information Series: 1. Carbon Credit Trading on Rangelands](#)
- [NRCS Technical Note 190.AGR.1.ECS - Agronomy - Precision Agriculture: NRCS support for emerging technologies](#)
- [NRCS Conservation brief on Carbon Sequestration and Greenhouse Gas Emissions](#)
- [Policy Options for Reducing CO<sub>2</sub> Emissions](#) - Congressional Budget Office, February 2008
- [Intergovernmental Panel on Climate Change \(IPCC\) Working Group Reports](#)
- [The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the U.S.](#)
- [U.S. Climate Change Science Program: Synthesis and Assessment Products Summary Information](#)

- [Increasing Feedstock Production for Biofuels: Economic Drivers, Environmental Implications, and the Role of Research](#)
- [Climate Literacy: The Essential Principles of Climate Sciences](#) - National Oceanic and Atmospheric Administration, March 2009
- [4th Climate Action Report \(CAR4\)](#)

### **Tools and Protocols:**

- [COMET-VR Voluntary Reporting Carbon Management Online Tool](#)
- [Farm Energy Estimators](#)
- [NRCS Energy Estimators](#)
- [Protocol for Quantifying and Reporting the Performance of Anaerobic Digestion Systems for Livestock Manures](#)

### **Meetings:**

[IPCC Workshop: Revisiting the Use of Managed Land as a Proxy for Estimating National Anthropogenic Emissions and Removals](#) May 5-7, 2009, Sao Paulo, Brazil

[American Geophysical Union Joint Assembly](#) May 25-27, 2009, Toronto, Canada

[Thirtieth sessions of the UNFCCC Convention subsidiary bodies - SBSTA and SBI, sixth session of the AWG-LCA and the eight session of the AWG-KP](#) June 1-12, 2009, Bonn, Germany

[National Association of RC&D Councils Conference](#) June 14-18, 2009, Albuquerque, NM

[International Symposium on Organic Matter Dynamics: Land Use, Management and Global Change](#) July 6-9, 2009, Colorado Springs, CO

[3rd National Conference on Ecosystem Restoration](#) July 20-24, 2009, Los Angeles, CA

[North American Biochar 2009](#) August 9-12, 2009, Boulder, CO

[Harmonizing Greenhouse Gas Assessment and Reporting Processes](#) August 31-September 2, 2009, Baltimore, MD

[United Nations Framework Convention on Climate Change \(UNFCCC\) COP 15](#) December 7-18, 2009, Copenhagen, Denmark