

U.S. DEPARTMENT OF AGRICULTURE

Agricultural Research Service (ARS)
 Cooperative State Research, Education, and Extension Service (CSREES)
 Economic Research Service (ERS)
 Forest Service (FS)
 Natural Resources Conservation Service (NRCS)

Principal Areas of Focus

USDA conducts and sponsors a broad range of research that supports the CCSP. Areas of emphasis include evaluating environmental changes that pose risks to natural resources, forestry, and agriculture; assessing their likelihood, consequences, and potential responses; estimating the contribution of forestry and agricultural activities as drivers of environmental change; identifying processes that can be managed; and developing approaches in which agriculture and forestry can help reduce net greenhouse gas emissions. USDA's research program seeks to determine the significance of terrestrial systems in the global carbon cycle, to promote the capture and use of methane emitted from livestock waste facilities for on-farm power generation, to assess the potential of bioenergy as a substitute for fossil fuels, to identify agricultural and forestry activities that can help reduce greenhouse gas concentrations and increase carbon sequestrations, to quantify the risks and benefits arising from environmental changes to agricultural lands and forests, and to develop management practices that can adapt to the effects of global change, including potential beneficial and adverse effects. USDA is the lead agency responsible for preparing CCSP Synthesis and Assessment Product 4.3, "The Effects of Climate Change on Agriculture, Biodiversity, Land, and Water Resources." USDA intends to complete production of this report by the end of 2007. USDA is also partnering with other agencies on other synthesis and assessment products identified in the *CCSP Strategic Plan*. For example, USDA agencies have contributed substantially to the development of Synthesis and Assessment Report 2.2, "North American Carbon Budget and Implications for the Global Carbon Cycle."



Program Highlights for FY 2007

ARS's national program on global change continues to address carbon cycle and carbon storage, trace gas emissions and sinks, impacts of environmental changes on agricultural systems, and feedbacks among agricultural systems, weather systems, and the water cycle. A focus of the program is building a scientific knowledge base that will enable producers, land managers, and strategic decisionmakers to adapt to climate change, and to mitigate contributions of agricultural systems to factors contributing to climatic change. Infrastructure to measure greenhouse gas emissions from different tillage systems at different locations across the country will continue gathering data that will provide insights into agricultural greenhouse gas emissions and into soil carbon sequestration. The effects of elevated atmospheric carbon dioxide on plants will continue to be investigated, as will the hydrological response to climate change, such as drought, that may affect soil water availability for agriculture and other water supplies. Environmentally friendly and economically feasible alternatives to the use of stratospheric ozone-depleting methyl bromide are being developed as a treatment to control pests. ARS will continue to help develop and take note of guidance offered by interagency working groups to ensure that

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research provides relevant and significant contributions to the understanding of global change and its impact on the Nation's ability to produce food and fiber and to protect natural resources.

CSREES continues to support the USDA Ultraviolet-B Monitoring and Research Network Program. This program provides information on the geographical distribution and temporal trends of UV-B radiation in the United States. This information is critical to the assessment of potential impacts of increasing ultraviolet radiation levels on agricultural crops and forests. The program consists of both a research and climatological network. The research network provides state-of-the-art, high-resolution spectroradiometers to six sites, with cross-disciplinary use of the data. The climatological network uses less sophisticated instrumentation and will eventually total between 30 to 40 monitoring stations. Sites included in the research network enhance opportunity for collaborative research, and provide calibration benchmarks for the USDA climatological network as well as other CCSP agency ultraviolet radiation research efforts. CSREES continues to support global change research through the National Research Initiative (NRI) Competitive Grants Program and formula-funded programs. NRI includes programs for carbon and nutrient cycles, air and water quality, land-use and -cover change, ecosystems, agricultural waste management, and invasive species research—spanning forest, rangeland, and agricultural ecosystems. Formula funds received through the Hatch and McIntire-Stennis Acts fund climate-related research at the land-grant universities and colleges and at multi-state institutions and state agricultural research experiment stations. CSREES is using the *CCSP Strategic Plan* in formulating priorities under the NRI program and in shaping specific grant announcements for research, education, and extension projects.

Forest Service research is (i) expanding understanding of the global carbon cycle in forest and rangeland ecosystems, and the consequences and feedback from the management and use of these ecosystems as they interact with the atmosphere; (ii) improving accuracy and ease of analyses of U.S. forest carbon inventory, and other monitoring and analysis systems for carbon dioxide; (iii) enhancing understanding of climate variability on plant species migration on forests and rangelands; (iv) enhancing understanding of climate change impacts on forest health; (v) accelerating the development and deployment of management systems that reduce and mitigate greenhouse gas emissions and sequester carbon in cost-effective and environmentally beneficial ways; (vi) integrating observation and monitoring networks with process studies to better understand, forecast, and manage relationships between forest and rangelands and climate; (vii) accelerating the development of management technologies to increase carbon sequestration, provide fossil fuel offsets, enhance productivity, and maintain environmental quality; and (viii) providing integrated prediction models of forest carbon dynamics. Active forest management can enhance carbon sequestration by increasing the removal rate of carbon dioxide from the atmosphere and by storing carbon in living biomass, soil, litter, dead wood, and wood products, in addition to other benefits. Critical outcomes of this research include accelerated development, demonstration, and deployment of management systems that reduce and mitigate greenhouse gas emissions and sequester carbon in a cost-effective and environmentally sound manner.

Related Research

USDA remains active in the Climate Change Technology Program (CCTP) and related research efforts. The Forest Service, NRCS, ARS, CSREES, and the Rural Development mission area support improved measurement and accounting of greenhouse gases from agriculture and forestry systems, as well as

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energy initiatives and renewable energy systems such as biofuels and biomass-related research and development. NRCS and the Forest Service are cooperating in development of web-based assessment tools for agricultural producers to account for benefits accruing on carbon fluxes and greenhouse gas emission from conservation practices. In addition, NRCS and the Forest Service are developing new measurement technologies, analytical techniques, and information management systems related to spatial carbon distributions. USDA also is filling gaps in ecosystem information by continuing to collect data on land use, resource conditions, and climate through the National Resources Inventory, the Forest Inventory and Analysis Program, the Soil Climate Analysis Network, and the Snowpack Telemetry system. These networks provide critical data needs on the status and condition of land use in the United States in support of CCSP research.

