

Optimizing Carbon Management for Enhancing Soil and Crop Performances

Sustainable practices to keep soils productive and healthy

Optimizing Carbon Management for Enhancing Soil and Crop Performances is a research project being conducted at the USDA-ARS National Laboratory for Agriculture and the Environment (NLAE) in Ames, Iowa. An NLAE team collaborates on the project with government, industry, and university colleagues to perform decisive research through carbon-related field studies at regional and national scales.

Project accomplishments include:

- Developed the Soil Management Assessment Framework, the first soil health index to consider soil biological, chemical, and physical properties
- Established Corn Belt guidelines to sustainably remove corn stover for biofuel production while maintaining soil health
- Demonstrated how increased soil aeration can improve organic nitrogen cycling in rice fields—a practice now recommended by NRSC
- Identifying biochemical compositions of soil organic matter to support cereal rye cover cropping and other improved crop practices
- Explaining how weather, soil type, drainage and fertilizer applications affect the capability of humic products to promote crop growth
- Demonstrating long-term benefits of humic products to soil properties
- Initiating a new project to evaluate annual ryegrass and humic products as means to degrade hardened fragipans in subsoils of eastern U.S. states.

The project is just one example of NLAE's commitment to increasing agricultural productivity while minimizing harm to the environment through cutting edge studies of soil and plant processes.

Project Fast Facts

- Long-term field research sites begun in 2013
- Staffed by 2 NLAE Research Scientists, 1 Support Scientist, and 2 Technicians
- Falls under ARS National Program 212, titled "Soil and Air"
- Key knowledge source for soil health

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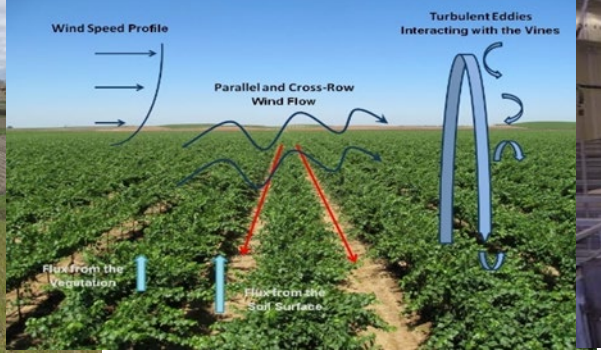

Soil, Water and Air Research

Increasing the soil's nutrient- and water-use efficiencies

The Soil, Water, and Air Research unit at the USDA-ARS National Laboratory for Agriculture and the Environment (NLAE) in Ames, Iowa, focuses on improving Midwestern cropping-livestock systems through optimized management and technology. Three specific focal points are conservation, livestock, and soil/plant microbiomes. The first evaluates tillage practices, cover crops, and fertilizer management for improved water and nutrient-use efficiencies, as well as reducing pesticide, nitrate, and greenhouse gas losses to the environment. The second focus is livestock dietary nutrients and management practices that reduce losses. The third focus is understanding the role microorganisms that can play in improving soil health and fertility.

Project achievements:

- Developing crop water stress indexes for Midwestern cropping systems
- Identifying soil-management practices to store soil carbon, increase water use efficiency, and reduce nitrous oxide emissions.
- Developing new irrigation strategies for vineyards in California to reduce water usage by up to 20 percent
- Determining pesticide volatilization as a function of tillage, soil water and temperature
- Validating vegetive buffers' ability to reduce particulates and gas emissions from poultry and swine operations
- Evaluating swine diet formulations to reduce gas emissions
- Identified management practices associated with swine deep-pit manure foaming and methane combustion.

This research is just one example of NLAE's commitment to increasing agricultural productivity while minimizing environmental impacts through cutting-edge studies of soil and plant processes.

Research Unit Fast Facts

- Staffed by 3 NLAE Research Scientists
- Program of national stature on non-point and point source emissions
- Falls under ARS National Program 212, titled "Soil and Air"

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Midwest Climate Hub

U.S. DEPARTMENT OF AGRICULTURE

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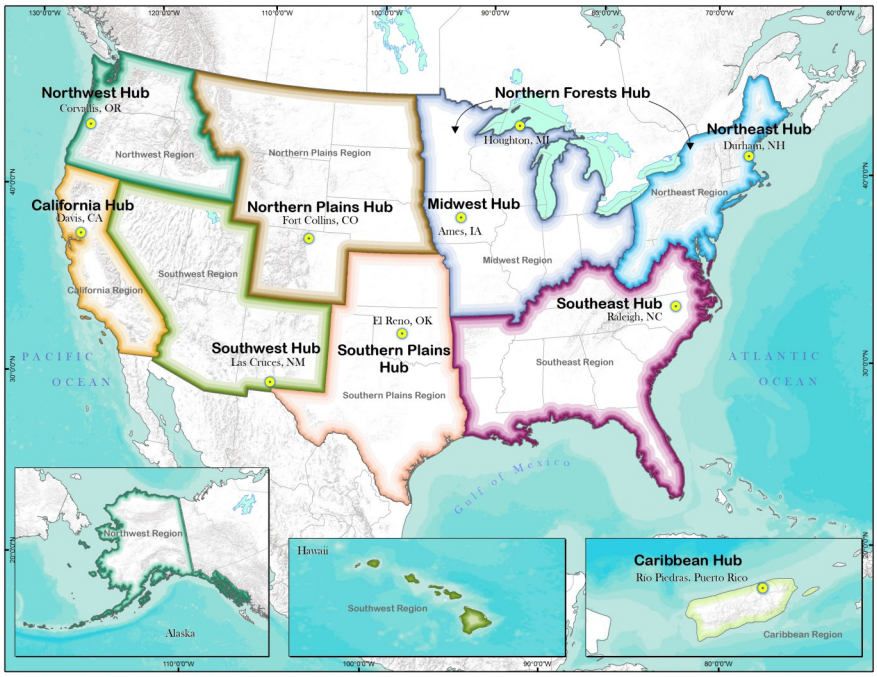
The USDA Midwest Climate Hub is located in Ames, Iowa, at the National Laboratory for Agriculture and the Environment. The USDA's Climate Hubs are a unique collaboration across the department's agencies and reflect the OneUSDA approach. The Hubs are led by Agricultural Research Service and Forest Service senior Directors located at ten regional locations, with contributions from the Natural Resources Conservation Service, Farm Service Agency, Animal and Plant Health Inspection Service, and the Risk Management Agency. The Climate Hubs link USDA research and program agencies in their regional delivery of timely and authoritative tools and information to agricultural producers and professionals.



The Midwest Climate Hub

Mission: To develop science-based, region-specific information and technologies alongside USDA agencies and partners, and deliver these products to agricultural and natural resource managers that enable climate-informed decision-making.

Vision: To become the leader in guiding climate-informed decisions that will generate sustainable agroecosystems in the Midwest.

Ongoing Communications

- Monthly ag-focus climate outlooks for the Midwest
- Quarterly climate reports
- Monthly drought webinars

Selected Current Projects

- Visualizing and understanding spring and fall freeze date changes at the county level
- Developing and mapping soil temperature data and trends
- Exploring farmers' perceptions of and attitudes towards climate change, and their adaptation behaviors

Partners

...And Many Others

Stakeholders

Crop Consultants
Commodity Organizations
Soil and Water
Conservation Districts
Other USDA Agencies
Cooperative Extension
Land Grant Universities
Farmers
Ranchers
Forest Land Owners
Specialty Crop Growers

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NLAE National Laboratory for Agriculture and the Environment