

Conservation Innovation Grants 2004-17

Innovation Today for Tomorrow's Agriculture

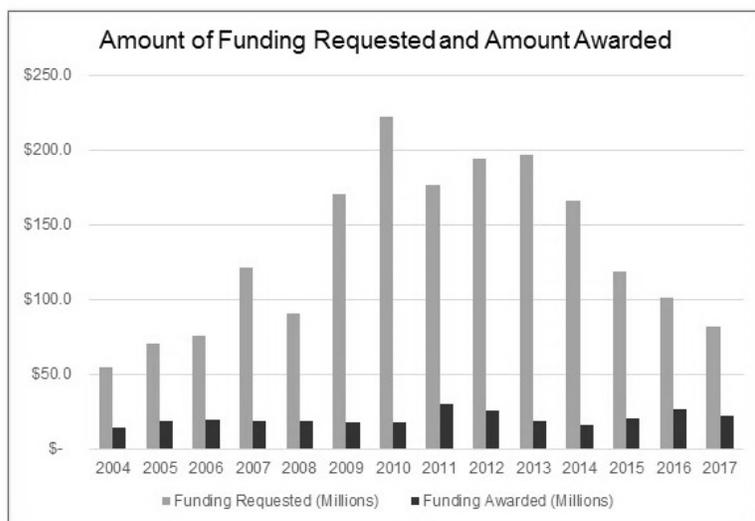


USDA's Natural Resource Conservation Service (NRCS) awarded its first Conservation Innovation Grants (CIG) in 2004. Since then, CIG awardees have worked with NRCS, farmers, ranchers and forest landowners to develop next-generation conservation approaches and technologies.

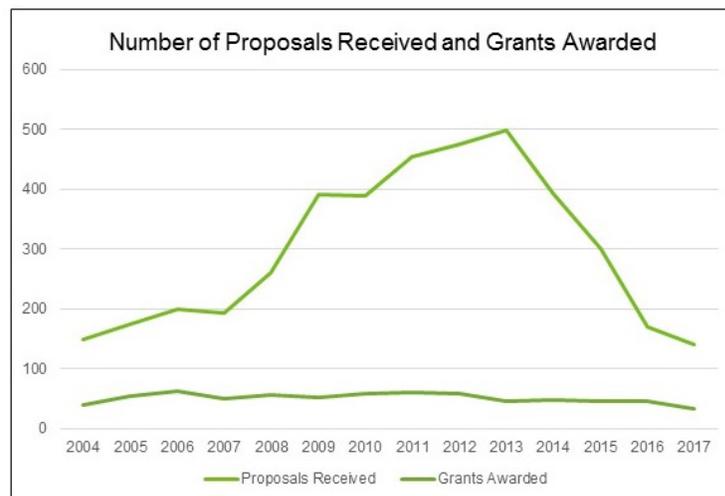
CIG was first authorized by the 2002 Farm Bill as a part of the Environmental Quality Incentives Program (EQIP). The program stimulates development and adoption of innovative conservation approaches and technologies in conjunction with agricultural production. All CIG projects must involve producers eligible for EQIP.

Nongovernmental organizations, state and local governments, Tribes, and individuals are eligible for CIG awards.

Approximately \$286 million has been awarded for 711 national CIG projects since 2004.



Each CIG award must be matched with at least an equal amount of funding, more than doubling NRCS's investment. NRCS evaluates results of CIG projects for incorporation into conservation practice standards, technical notes, training, and programs.



Across the nation, CIG projects are improving nutrient management, reducing energy use on farms, making more efficient use of water needed for irrigation, and stimulating development of water quality trading and greenhouse gas markets.

Here are several examples of the impacts that CIG projects has had on advancing technologies and approaches to natural resource conservation.

Innovation Successes

Solar Irrigation Pumps Water quantity is a significant issue in many parts of the country, particularly in the arid Southwest. Many producers on the Navajo Nation work their land beyond the reach of the energy grid, so they must choose between diesel-generated power or renewable energy options for irrigation. Tó Łání Enterprises (TLE) received a 2012 CIG award to conduct a three-year national pilot project to demonstrate the environmental, agricultural, economic and sociocultural effectiveness and benefits of solar energy systems for pumping irrigation water. The project was designed to encourage and facilitate adoption of such systems among Navajo, Hopi and other tribal conservation districts, farmers and ranchers in the arid and semiarid Southwest. Following the completion of the demonstration sites in August 2013, many Navajo farmers were encouraged by the promising pilot project results to adopt the solar powered system.

A First-of-its-Kind Carbon Markets Transaction

Environmental markets have the potential to generate new revenue streams for agricultural producers while enhancing natural resource conservation. Ducks Unlimited used a 2011 CIG award to develop a protocol for measuring and quantifying the amount of carbon stored by avoiding the conversion of grasslands to cropland. This protocol was then approved by the American Carbon Registry and used by private landowners to generate carbon credits on ranch lands in North Dakota. In 2014, General Motors became the first entity to purchase these credits as part of its corporate sustainability initiative. This success is being used as a model for future environmental markets to enhance conservation of natural resources.

Temperature Credit Trading for Salmon Habitat

Using a 2011 CIG award, The Freshwater Trust worked with the Willamette Partnership and a number of other organizations, agencies, and regulators to develop the standards, calculation methodologies, verification and validation procedures, and state policies necessary to allow for trading ecosystem service credits for water temperature in Oregon. Through the project, the city of Medford worked with farmers, ranchers, and other private landowners to shade the Rogue River in order to meet its regulatory compliance requirements for salmon habitat under a Total Maximum Daily Load. Incentivizing landowners to take action on a voluntary basis cost approximately half of what it would have cost to build and operate chillers to cool the effluent from Medford's wastewater treatment plant.

Developing an Air Quality Tool for Livestock Operations

For several years, NRCS has supported efforts by a consortium of universities working to develop a National Air Quality Site Assessment Tool (NAQSAT) for livestock and poultry operations. The first CIG funding for this effort was awarded in 2007. After many years of development, refinement and testing, the NAQSAT was accepted as NRCS' official Air Quality Site Assessment Tool in 2015. The present online version can be found at <http://naqsat.tamu.edu>.

Generating Greenhouse Gas Credits through Nutrient Management on Cropland

In 2011, NRCS awarded a CIG grant to the Delta Institute to develop a protocol that would allow farmers to generate greenhouse gas reduction credits arising from voluntary implementation of more efficient nitrogen fertilizer management techniques. The Delta Institute engaged a variety of partners in the project, including American Farmland Trust, Conservation Technology Information Center, Environmental Defense Fund, and agricultural retailers. The result was a

methodology approved by the American Carbon Registry that allows for the generation of carbon credits (converted nitrogen oxide credits) on cropland. In a first-of-its-kind transaction, The Climate Trust purchased credits developed using the methodology in early 2014, providing a new income stream for those farmers generating the credits. This demonstrates how improving nitrogen management can be used to generate marketable credits that improve the environment and provide additional income for producers.

Rebuilding Pollinator Habitat People depend on pollinators for about 30 percent of their food. Habitat for pollinators has declined in recent years. A 2009 CIG award to the Xerces Society developed new NRCS guidelines for improving native bee habitat. The project demonstrated that establishing native pollinator habitat in previously abandoned agricultural areas significantly increased native bee populations. The project was carried out in California where most of the nation's fruit and vegetable crops are located. The guidelines developed led to publication of an NRCS bee habitat improvement reference guide. NRCS is now providing funding to establish bee habitat on previously unused farm areas on hundreds of thousands of acres across the nation.

Saving Water with Online Irrigation Technology

Growers using traditional cranberry irrigation systems have to turn their systems on and off manually, which wastes time, money and water. With support from a CIG award, the Cape Cod Cranberry Growers Association worked with growers to install automated sprinkler systems that conserve water and reduce costs. These systems have sensors among the cranberry vines that monitor temperature and other weather conditions. Growers can monitor and control the systems online. These systems can save more than 9,000 gallons of water per acre on a frost night. During the study period, the systems reduced water application times by two hours per application. For a typical growing season, 280,000 gallons of water per acre can be conserved by using this system.

A Tool for Tailoring Cover Crops for Water Quality and Weather Resilience

Cover crops can dramatically reduce nutrient losses to surface and ground water, provide nutrients for the next crop and enhance water infiltration, all of which improve resilience to extreme weather. Through a CIG award and other contributions, the Midwest Cover Crops Council developed a Cover Crop Decision Tool that incorporates expert knowledge across several states into a decision support system for farmers. As a result of this project, producers throughout the Midwest can evaluate their options and receive cover crop recommendations, such as species and seeding rates, tailored to their local conditions, soils, and management goals. This not only helps farmers be profitable, but also contributes public value through benefits

Taking Adaptive Nutrient Management to the Next Level

Nutrients are essential for food production, but loss of excess nutrients can degrade water quality. With support from a CIG award, the Iowa Soybean Association, in partnership with the Environmental Defense Fund, worked directly with producers to evaluate an adaptive nutrient management process for refining nutrient management on their farms. Results from this project showed that 80 percent of farmers participating changed their nutrient management practices within two years. The greater nutrient use efficiency made possible through adaptive nutrient management not only allowed producers to reduce their fertilizer inputs and associated costs, but also reduced the risk of nutrient loss to the environment. These results led NRCS to include adaptive nutrient management in its revised Conservation Practice Standard 590, Nutrient Management. NRCS then developed and provided guidelines and training to field staff on implementing adaptive nutrient management and is currently providing financial and technical support to increase adoption of this practice nationwide.

A Cloud-based Tool for Nitrogen Management

Nitrogen is required for plant growth, but loss of excess nitrogen can contribute to water quality impairments and greenhouse gas emissions. Determining the right rate to apply is difficult, because weather influences how much nitrogen is needed. With funding from a CIG and others, Cornell University developed and tested a publicly available, cloud-based nitrogen recommendation tool, Adapt-N, on farms over three years. The tool models local weather, soil, and management to provide better nitrogen recommendations. Results showed that Adapt-N saved producers \$30 an acre and decreased nitrogen inputs by 44 pounds an acre without decreasing yield. The model has been successfully tested on both research plots and on-farm trials and is currently available in 38 states throughout the Northeast, Midwest and Southern United States.

Payment for Environmental Services Pilot Leads to New Water Management Program

Using a 2005 CIG award, the World Wildlife Fund launched the Florida Ranchlands Environmental Services Project, a stakeholder partnership that included ranchers, environmental groups, state and federal agencies, and research scientists. The pilot project's goal was to design a Payment for Environmental Services program in which ranch-owner "sellers" could enter into contracts with state-agency "buyers" to provide water retention and nutrient load reduction services above and beyond regulatory requirements critical to improving the health of Lake Okeechobee and the estuaries, as well as contributing to greater restoration of the Everglades. The successful pilot led to creation of the Dispersed Water Management Program by the South Florida Water Management District.

Low-Cost Irrigation Scheduling Technology

The Flint River Soil and Water Conservation District and its partners used a CIG award to enhance irrigation efficiency in the Lower Flint River Basin of Georgia. This project used soil moisture sensors—in concert with a specialized crop model — to help farmers make more informed irrigation decisions at a lower cost. While the use of soil moisture sensors and specialized crop models were standard practices throughout NRCS, the technology linking them together was not commercially available. The project integrated real-time data from low-cost soil moisture sensors with automated irrigation recommendations derived from Irrigator Pro, a crop model developed by USDA's Agricultural Research Service National Peanut Research Lab. This integration was achieved through the development of a smart phone application for Apple and Android devices.

Bioreactors Form a Last Line of Defense against Nitrate Runoff

Denitrifying bioreactors are a relatively new technology that are gaining popularity for their potential to capture nitrates running off of farm fields. A bioreactor is basically a buried trench filled with a carbon source – usually wood chips – installed at the edge of a field. Tile drains from the field carry excess water from the plant root zone, and divert a portion of the drainage water into the bioreactor. Microorganisms on the wood chips consume the nitrates in the water and expel it as nitrogen gas.

In 2011, the Iowa Soybean Association was awarded a CIG to increase farmer awareness and accelerate implementation of denitrifying bioreactors. Project leaders monitored and analyzed the performance of new and existing bioreactors, and explored ways to limit buildup of harmful contaminants in the woodchip pile. The project also provided outreach and training to NRCS field staff and drainage contractors to build confidence and familiarity with the new practice. The project led to the development of a national NRCS conservation practice standard for installation of bioreactors through EQIP.

Forging a Path to Carbon Markets for Private Forest Landowners in the Pacific Northwest

High transaction costs of working on small plots presents a daunting barrier for including small forest landowners in voluntary and regulatory carbon markets. The Pinchot Institute for Conservation used CIG funding to test technology advances—in the form of a smartphone app that greatly reduces the cost of inventorying carbon stocks—to aggregate small forest plot landowners in the Pacific Northwest. By creating a path to carbon markets, the Pinchot Institute is incentivizing sustainable forest management and providing new income streams to small forest landowners. The successful CIG pilot led the Pinchot Institute to secure funding for a Regional Conservation Partnership Program project, and the effort was featured in the New York Times in the fall of 2016.

Economic Data to Encourage the Adoption of Cover Crops and No-till Farming The National Association of Conservation Districts (NACD) saw a clear need for more than just anecdotal data on the economics of cover crops and no-till farming to accompany the body of research that shows the conservation benefits of these soil health practices. To address the dearth of economic research, NACD partnered with Datu Research LLC with the support of a CIG award to conduct a set of case studies that would quantify how these practices affect a farm's bottom line. During the three-year study, corn-soybean farmers experimented with cover crops and/or no-till, and quantified the year-by-year changes in income they attributed to these practices compared to a pre-adoption baseline. The project results showed that net farm income increased by up to \$110 per acre with the adoption of these practices.

Securing Safe Passage for Salmon Nets a CIG Success The Farmers Conservation Alliance, a nonprofit created by the Farmers Irrigation District of Hood River, Oregon, used CIG funding to help develop the Farmers Screen, a low technology solution to the problem of migratory salmon getting caught in irrigation systems in rural communities. The Farmers Screen has been an enviable success. By 2018, FCA projects that over 300 Farmers Screens will have been installed, opening up 2,200 stream miles for safe passage and saving landowners more than \$4 million in avoided operation and maintenance costs.

Rice Growers in Arkansas Sell Greenhouse Gas Credits to Microsoft Microsoft recently purchased carbon credits generated by Arkansas rice producers, a first-of-its-kind transaction made possible by development of a rice production protocol developed by Environmental Defense Fund and others under a CIG award. Rice producers who reduce their methane emissions—through dry seeding or a production technique known as Alternate Wetting and Drying (AWD)—can work with a third party to quantify the reductions and then sell them either on the voluntary market (as with Microsoft) or in the regulated California offset market. The rice protocol is the first, and to date only, cropland protocol approved by the California Air Resources Board for use in its offset market.

Precision Feeding of Livestock Helps Stem Nutrient Losses into the Chesapeake Bay Scientists at Virginia Tech University used CIG funding to demonstrate the potential for precision feeding strategies to reduce nitrogen and phosphorous losses into the Chesapeake

Bay. Precision feeding requires close attention to livestock rations and excretions to improve digestive efficiency and reduce excess excretions of valuable nutrients. The project used software to help dairy farmers manage their feed. Results showed substantial reductions in phosphorous excretions across all farmers enrolled in the project. These results helped lead to development of a new national NRCS Conservation Practice Standard, Feed Management.

Using Filter Mounds to Treat Wastewater on Dairy Farms The Clinton Conservation District, in partnership with Michigan State University, worked with small dairy farmers to evaluate the performance of a Filter Mound technology for treating milking center wastewater. Results from the project showed that the technology was economically viable for small dairies and that filter mounds could remove 90 percent or more of total phosphorous, ammonia, suspended solids, and E. coli bacteria in milking center wastewater. Based on these results, NRCS in Michigan developed an interim Conservation Practice Standard and design guide. Later, the practice was incorporated into the Milking Center Wastewater Conservation Practice Standard and can be installed using EQIP funding.

Innovation in the Tropics Helps Farmers Conserve Resources and Improve Soil Health Farmers in the Tropics needed a better tool to estimate the nitrogen contribution from cover crops to reduce their commercial fertilizer rates. With the support of a CIG award the University of Hawaii expanded on a calculator that had been created to address this issue in Idaho and Oregon and modified it for tropical climates and soil types in the Pacific Islands Area. A cover crop calculator encourages farmers to integrate and adopt cover cropping into their farming systems by making it easier to know what will work in their areas. This calculator helps farmers who implement cover crop conservation practices to know what nutrients are already in the soil, reducing the amount of fertilizers they need to apply—saving time, money, and potential negative impacts from excessive fertilizer run off into waterways.

2017 and Beyond

The Conservation Innovation Grants Program will continue to drive innovation in natural resource conservation in conjunction with agricultural production, yielding benefits for farmers, ranchers, forest landowners, and the American public.

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