Stewardship in Practice:
Climate-Smart Agriculture in Marin & Sonoma County

Partnerships in Agriculture Leads to Climate Benefits and Solutions

Farmers and ranchers are experiencing the impacts of climate change on their operations through shifts in weather patterns and the severity and frequency of storms, floods, droughts, and wildfires. Known for their innovation, resilience, and community-building efforts, producers in this region are also leading the way on agricultural solutions to climate change.

In partnership with conservation organizations, and with support from local, state, and federal agencies, producers are taking action by implementing agricultural practices that reduce greenhouse gas emissions, store carbon in soils, and build agricultural systems that are more resilient to a changing climate. This work aligns with county and state efforts to combat climate change, enhances food security, and promotes biodiversity, while simultaneously improving long-term agricultural productivity and viability in the region.

Climate change requires solutions at scale. Agricultural partnerships in this region have delivered innovations and projects demonstrating that agriculture can be an effective and scalable climate solution. This article on climate-smart agriculture appears in both Sonoma and Marin County's Crop and Livestock Reports. It reflects the ongoing collaboration between both counties and underscores the immense value of the work carried out by farmers, ranchers, and their conservation partners in the region to advance agricultural climate solutions and sustain agricultural productivity with benefits to us all.

Photo by Matt Dolkas, Leiss Ranch

Building strong partnerships between farmers and ranchers and the local institutions that support them are critical to creating climate resilient agricultural landscapes. Together they are leading the advancement of agriculture as a climate solution.

Photo by Gold Ridge RCD: Ranchers learning how to use the no-till drill

Photo by North Coast Soil Hub: Field Workshop

What is Climate-Smart Agriculture?

A term first defined by the Food and Agriculture Organization of the United Nations, climate-smart agriculture has since been endorsed by the USDA in recognition of its important role in tackling climate change.

"***Climate-smart agriculture*** and forestry is an integrated approach that enables farmers, ranchers, and forest landowners to respond to climate change by reducing or removing greenhouse gas emissions (mitigation) and adapting and building resilience (adaptation), while sustainably increasing agricultural productivity and incomes." - USDA

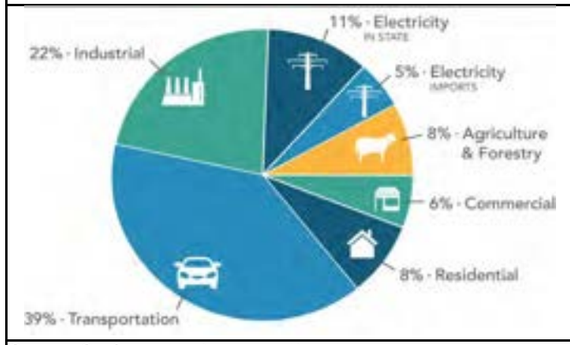
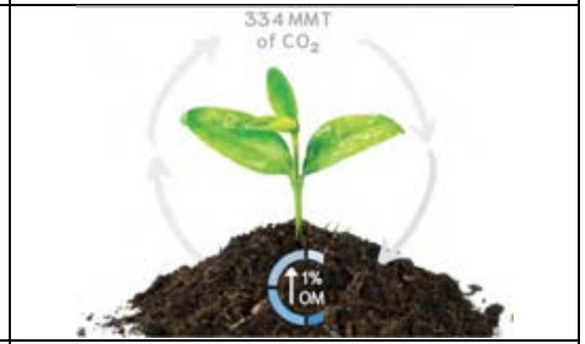
Climate-smart agricultural practices include a diverse and wide range of activities such as, switching to renewable power sources to improve on-farm energy efficiency, planting cover crops to improve soil health and soil carbon storage, and manure management to reduce methane emissions.

Agricultural Climate Solutions

A 2019 Carbon Cycle Institute analysis estimating carbon sequestration opportunities on California's farms and ranches suggests that the agricultural sector has the potential to ***reach and exceed carbon neutrality*** over the next two decades, if deployment of agricultural carbon sequestration practices are initiated at scale in the near term.

"Our ***agricultural lands present large untapped climate solutions*** that also deliver economic, social and environmental co-benefits." - Carbon Cycle Institute

Recognizing the enormous potential for climate solutions on agricultural lands in Sonoma and Marin, both counties are integrating climate-smart agriculture into their climate action plans.

California's Greenhouse Gas Emissions 2021 Total: **381.3 million metric tons of carbon dioxide equivalent (MMT CO_2e)**	A 1% increase in the organic matter (OM) content of the state's 20M acres of arable lands would represent a transfer of **334 MMT CO_2e** from the atmosphere to the soil.
	
Source: California Air Resources Board	*Source: Carbon Cycle Institute*

Reaching County Climate Goals in Partnership with Agriculture

The Sonoma-Marin Agriculture and County Climate Coalition, a new project funded by USDA's Partnerships for Climate-Smart Commodities program, will collaboratively lead a $10 million investment to increase the pace and scale of climate-smart agricultural practices and pilot regional marketing and sustainable funding programs. Over five years, project partners will provide support to farmers and ranchers implementing climate-smart practices, resulting in a measurable reduction and removal of greenhouse gas emissions from local agriculture.

Anchored in historic partnerships between producers and local conservation organizations, the adaptive, voluntary approach of this project is designed to serve as a model for coordinated climate-smart agriculture, scalable to any region in the state or country.

USDA Partnerships for Climate-Smart Commodities

"As we face down the dual crises of climate change and food insecurity, USDA recognizes that changes to our agriculture and food systems can only happen at the needed scale and speed if ***farmers are at the center of our solutions***."

"USDA is proud to play a pivotal role through our new Partnerships for Climate-Smart Commodities…that position ***American agriculture as a leader in delivering climate solutions*** through ***voluntary, incentive-based, market-driven and collaborative approaches***." - United States Secretary of Agriculture Tom Vilsack

Photo by Paige Green: Climate-smart agricultural projects on Millerton Creek Ranch, protected by the Marin Agricultural Land Trust (MALT) in 2018, include riparian restoration in 2019, cross fencing and water infrastructure in 2020, and a Drought Resilience & Water Security initiative project in 2021.

Pioneers of Climate-Smart Agriculture

Working together, farmers, ranchers, scientists, and local conservation organizations in Sonoma and Marin were some of the first pioneers of climate-smart agriculture in the nation. Agricultural conservation partnerships in the two counties resulted in important contributions to soil carbon science and projects demonstrating that implementing science-informed practices on agricultural lands could be effective climate solutions at scale.

Did you know…

…that in 2008, the Marin Carbon Project initiated a study site in Marin providing some of the ***earliest evidence that enhanced land management could increase carbon sequestered in soils***.

Photo by John Wick: Nicasio control site 16 years later – Note the dramatically shorter vegetation dominated by annual grasses

Photo by John Wick: Nicasio compost application site 16 years later – Note the native perennial bunchgrasses

…that Jackson Family Wines in Sonoma County is one of the first vineyard owners and wineries who made a commitment to ***cut carbon emissions in half by 2030 and be climate positive by 2050*** and that Straus Family Creamery in Marin County, is committed to becoming ***the first carbon neutral dairy*** in the nation.

Photo by Sonoma RCD: Spreading compost in Saralee's Vineyard long-term Soil Health Ongoing Field Trial

Photo by Straus Family Creamery: On-farm electric vehicles as part of the Carbon Neutral Dairy Farming Model – Electric Loader and Electric Feed Truck

Partnerships Lead to Solutions

Scaling climate-smart agricultural practices requires investing in agricultural conservation programs and services that provide both technical and financial assistance to farmers and ranchers, and ensure that proposed agricultural climate solutions are regionally appropriate, support rural economic development, and have long-term, measurable benefits.

Carbon Farming

The North Coast Soil Hub, led by seven RCDs including Gold Ridge, Marin, and Sonoma, is a regional partnership of agencies, organizations, and agricultural producers dedicated to improving soil health and advancing climate-smart agriculture. It is part of the wider Carbon Farming Network, composed of 45 RCDs across California, each working with local communities and partners on a voluntary basis to steward natural resources and build agricultural resilience. Playing a key role in achieving California's climate and habitat goals, RCDs are experienced in collaborating with land managers, agencies, and local organizations to leverage resources to achieve greater impact.

In a joint project funded by the California Department of Food and Agriculture's (CDFA) Healthy Soils Program to promote the development of healthy soils on agricultural lands, the RCDs and UC Cooperative Extension (UCCE), which extends the power of UC research to solve community problems, combined their expertise to provide essential support to producers implementing innovative conservation management practices in Sonoma and Marin that sequester carbon, reduce greenhouse gasses, and improve soil health.

In 2023, RCDs, in collaboration with Zero Foodprint, received funding from the Healthy Soils Program Block Grant Pilot, designed to facilitate financial assistance to agricultural operations in California, with a focus on socially disadvantaged farmers and ranchers. This will further expand assistance to producers adopting climate friendly farming practices in our region.

What is Carbon Farming?

Carbon farming involves implementation of agricultural conservation practices that are known to reduce greenhouse gas emissions and/or capture carbon dioxide from the atmosphere and store it in soils and vegetation. Carbon farming is successful when carbon gains from implementing these practices exceed carbon losses from agricultural production.

Photos by Jessica Rowland Photography: Riparian Planting Ebabias Creek March 2020 - The restored riparian zone will serve as an important wildlife corridor, perennial aquatic habitat, and migration shelter.

Photo courtesy of Marin Agricultural Land Trust

What is Healthy Soil?

Healthy soil is the foundation for productive and sustainable agriculture.

The USDA Natural Resources Conservation Service (NRCS) defines healthy soils as those with the continued capacity to function as a vital living ecosystem that sustains plants, animals, and humans. Characteristics of healthy soil include good soil drainage, a large population of microorganisms, sufficient levels of essential nutrients and organic matter, and low weed pressure.

Healthy soil can also be an effective way to address climate change. With an increased capacity to store carbon, healthy soil contributes to climate change mitigation. Higher levels of soil organic carbon also improve nutrient availability for plants, water infiltration and retention, and soil structure. Improved soil health increases agriculture's adaptive capacity and resilience against wildfire, drought, heat, and flood risks that are exacerbated by climate change. It also contributes to more resilient regional food systems.

Manure Management

With 19 cow dairies in Marin County and 48 in Sonoma County, there is significant potential to reduce methane emissions through alternative dairy manure management practices, and to sequester carbon through reutilization of organic materials for soil enhancements.

In another joint project funded by CDFA's Alternative Manure Management Program (AMMP), which provides financial assistance for the implementation of non-digester manure management practices in California, RCDs and UCCE in both counties scaled up their capacity to provide technical assistance to producers implementing practices that reduce methane emissions in their livestock and dairy operations.

Photo by Paige Green, Moretti Family Dairy

Compost Amendments & Recycling Organic Waste

Organic waste can be diverted from landfill and recycled as compost for use on agricultural lands. As part of a statewide effort to reduce emissions of short-lived climate pollutants, California's SB 1383 targets a 75% reduction in organic waste (food and green waste) disposal in landfills by 2025. Applied as a soil amendment, compost can improve soil health, leading to improved productivity, climate resilience, and carbon sequestration in soils. Compost application is a practice frequently implemented in carbon farming and healthy soils programs.

Informed by insights from prior initiatives such as the Carbon Sequestration Pilot Program in Sonoma and the West Marin Co-Composting Program RCDs, governments in both counties, and Zero Waste Marin and Sonoma are currently working together to divert organic waste from landfills, and produce high quality compost locally for use on agricultural lands.

What is compost?

"...***compost*** is the final product of a managed thermophilic process through which microorganisms break down organic materials into forms suitable for beneficial application to the soil. A well-managed composting process has plenty of oxygen, goes through a high-heat phase that accelerates the natural biodegradation of organic materials and produces a stable form of organic matter that is made up of carbon and nitrogen, contains other important nutrients, and is free of weed seeds and harmful pathogens." - Marin Carbon Project

Compost application support for farmers and ranchers:

The Dirt on Compost
Zero Waste Sonoma Compost Rebate Program
Zero Foodprint Compost Connector Program

Photo by David Evershed, Eames Institute: Applying compost as a soil amendment on rangeland

Total Impact of Highlighted Climate-smart Agricultural Projects and Programs

As of December 2023

18+ Partners collaborating on climate-smart agriculture programs and projects

16 RCD trained carbon farm planners

88,408 Acres of agricultural land covered by programs and projects in Marin, Sonoma & surrounding counties

399,340 Cumulative MTCO2e in estimated climate mitigation benefits*

$25.3 million Dollars invested in the projects highlighted, including matching contributions and cost-share

3 7 8 Projects on farms & ranches completed, in progress, or in the pipeline

*Over 20 years for SMACCC project & 5 years for AMMP program

Advancing Agricultural Climate Solutions Together

Building on the successes in climate-smart agriculture through engaging with producers in strong local and regional partnerships, the agricultural community in Sonoma and Marin continues to take the lead in advancing agriculture as a key climate solution. Sustained support is needed to engage more farmers and ranchers in climate-smart agriculture to achieve climate action planning goals, adapt and build resilience to climate change, and most importantly to keep local agriculture thriving in the decades ahead.

Support Climate-Smart Agriculture

- Learn more about climate-smart agriculture.
- If you are a farmer or rancher interested in climate-smart agriculture, reach out to your local RCD or UCCE office.
- Buy from local agricultural producers.
- Support AB 408, the Food and Farm Resilience Bond co-sponsored by the Food and Farm Resilience Coalition.

Contributions to this article were provided by Sonoma County Department of Agriculture/Weights & Measures, Marin County Department of Agriculture, Weights & Measures, County of Sonoma Climate Action & Resiliency Division, County of Marin Community Development Association, Gold Ridge, Marin, and Sonoma Resource Conservation Districts, University of California Cooperative Extension Marin & Sonoma, Agricultural Institute of Marin, Marin Agricultural Land Trust, Carbon Cycle Institute, North Coast Soil Hub, and Zero Waste Marin, with support from the Marin Carbon Project Coordinator.

Photos by Jeff Lewis: Gallagher North Bend Ranch