

# Carbon Farming: Fighting Climate Change with Regenerative Agriculture

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Published: March 10, 2017



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Lowering atmospheric carbon dioxide to a [level that will avoid catastrophic climate change](#) requires massive shifts across all industries. While industrial agriculture is responsible for high levels of [greenhouse gas emissions](#), there are more sustainable agricultural practices that can in fact help reverse climate change. The term ‘[carbon farming](#)’ refers to a set of agricultural practices that can reduce [atmospheric carbon dioxide](#). Carbon farming techniques include different approaches for sequestering carbon in soil and plants, as well as decreasing carbon dioxide emissions from agricultural sites.

A number of programs are committed to furthering research and advocacy around carbon farming strategies, including the [Marin Carbon Project](#), [Carbon Underground](#), the [Carbon Cycling Institute](#) and the [Carbon Management and Sequestration Center](#) at Ohio State University. Here’s some background information on this exciting application of sustainable agriculture to climate change mitigation.

## Building on Natural Processes

### *Carbon Sequestration*

The foundation of carbon farming is the use of soil and plant biomass as carbon reservoirs. [Carbon sequestration](#) occurs naturally as a part of the [carbon cycle](#), which is the exchange of carbon in various forms between the atmosphere, oceans, ecosystems and geological systems. Plant and soil carbon sequestration starts when plants absorb carbon dioxide during

[photosynthesis](#), using sunlight and water to convert the carbon dioxide into carbon compounds, which are then assimilated into soil through microbial and other biological activity.

The capacity for soils to sequester carbon hinges upon [soil organic matter](#) (SOM) content. SOM comprises fresh plant residues and [living soil organisms](#) (e.g., bacteria and insects), decomposing organic matter (detritus) and stable organic matter ([humus](#)). Aside from carbon sequestration itself, increasing SOM also enhances structural stability, improves water holding capacity and aeration, promotes nutrient exchange and supports [buffering capacity](#).

### ***Industrial Agriculture and the Problem of Carbon Emissions***

Industrial farming practices degrade [soil quality](#), both releasing carbon from the soil and diminishing soil's capacity for carbon sequestration. Conventional tilling exposes stored carbon to the air, and returns it to the atmosphere as carbon dioxide. Tilling's destruction of soil structure and microbial communities also promotes erosion by wind and water. Wind erosion further perpetuates soil carbon exposure to the atmosphere while water erosion transfers soil carbon and other nutrients (as well as contaminants) to waterways. The use of heavy machinery necessary for managing large swaths of [monocropped](#) land also inflicts heavy soil compaction, which inhibits the biological processes that transfer carbon from plants to soil.

### ***Regenerative Farming Techniques***

Carbon farming utilizes combinations of various regenerative agriculture strategies, many of which have been employed for centuries. For farmers with existing annual-crop focused operations, some of the most accessible carbon farming strategies include [compost application](#), [conservation tillage](#), [rotational grazing](#) and [cover cropping](#). [Agroforestry](#), the land use management system of integrating trees and shrubs into crop and/or pasture land, offers a whole-ecosystem approach. In the US, the five widely recognized practices of agroforestry include [wind breaks](#), [alley cropping](#), [riparian buffers](#), [forest farming](#) and [silvopasture](#). The [Carbon Cycling Institute](#) lists these and other practices that can be incorporated into a carbon farming program.

## **The Future of Carbon Farming**

### ***Success for Farmers***

The [Marin Carbon Project](#) in California has outlined carbon farming plans to provide a framework for farmers interested in transitioning their practices. While the regenerative impacts of carbon farming techniques can boost fertility and productivity of agricultural operations, farmers can gain economic incentive for building the carbon sequestration potential of their farms and other sites by selling carbon credits. Programs that facilitate the entrance of farmers and land managers to the carbon market include the [Carbon Farming Initiative](#) in Australia and the [Duck's Unlimited Carbon Sequestration Program](#) (which serves areas throughout North America). Those who want to break into the carbon market can also improve their understanding

of their site's potential for improved carbon sequestration using tools such as [COMET-Farm](#), a greenhouse gas and carbon accounting system.

### *Maintaining Sustainability*

Many of the practices utilized in carbon farming also fall under the umbrella of [Climate Smart Agriculture](#) (CSA). CSA comprises different approaches for using agricultural practices to improve food security while combatting climate change. However, the broad criteria for [what constitutes 'climate smart'](#) has left open the potential for greenwashing. In 2014, over 100 civil society organizations combined to [issue a letter in rejection](#) of the CSA platform, due to the Global Alliance on CSA's inclusion of companies like [MacDonalds](#) and [Kellogg's](#). As carbon farming gains traction both on its own and within the context of CSA, it will be critical to ensure that any companies advertising affiliation with carbon farming endeavors are pursuing comprehensive sustainability plans.

Carbon farming offers immense potential to shift agriculture's impact on climate change. As a strategy that encompasses numerous regenerative practices, there are many ways that carbon farming can be incorporated into existing agricultural operations. Continued research around how different techniques perform in different contexts will bolster the effectiveness and economic viability of future carbon farming endeavors.

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