

What is Regenerative Agriculture?

Soil plays an important role in the global carbon cycle. Because plants absorb carbon from the atmosphere, convert it to plant tissue, and return it to the soil as plant residue, soils globally act as the world's largest sink of active carbon. Farming practices influence how much carbon soils retain and how much is released into the atmosphere. Regenerative agriculture¹ refers to a set of agricultural techniques that improve soil health by increasing soil organic matter and the carbon content of soil.

Regenerative agriculture not only improves soil health, productivity, and resilience to weather extremes, raising farm yields and income while strengthening regional food security in the face of a changing climate, but can also form part of a region's broader climate strategy. Under improved management, soils have the potential to absorb hundreds of millions of tons of atmospheric CO₂ more than they do today.

Soil organic matter (SOM) refers to plant and animal matter in soil in various stages of decomposition as well as the cells and tissues of soil microbes. SOM makes up 2-30% of the soil's mass and is critical for its health because it provides nutrients and improves soil fertility, water retention, structure, and nutrient recycling². Soil organic carbon (SOC) is a component of SOM and refers to the carbon content of soils. High levels of carbon improve soil structure, increasing physical stability. This in turn improves soil aeration, water drainage and retention, and reduces erosion and nutrient leaching. SOC content is also important for the soil's chemical composition and biological productivity, improving soil's fertility and nutrient holding capacity.

Regenerative agriculture techniques include:

Biochar – A highly fertile substance generated from burning organic matter in an anaerobic environment. When added to soils, biochar is a source of nutrients, helping to create a fertile soil.

Organic mulch and crop residue – Wood chips, straw, or crop residue used to cover soil around plantings to prevent carbon losses. As the mulch and crop residue decompose, soil organic carbon and soil organic matter increases.

Compost – A nutrient-rich substance made from animal, plant, and food waste that replenishes soil organic matter, supporting soil health and productivity. Compost can be spread on top of fields or mixed with soil and reduces the need for fertilizers, thus decreasing emissions associated with fertilizer manufacturing.

Cover crops – Fast growing plant species used to cover the soil between growing seasons. Cover crops protect soils and prevent soil erosion. They increase soil carbon pools, improve water and nutrient cycling, and promote biodiversity.

Perennial crops – Perennial crops are crops that are planted year-round. They develop thick root systems that improve soil water retention. When used as cover crops between growing seasons, perennials increase biodiversity and ensure that the soil's integrity is maintained between seasons.

Agroforestry – The use of trees in agriculture and livestock production: planting rows of trees between crops, planting trees in livestock pastures, or creating canopies over cropland or pastures. Agroforestry improves biodiversity, sequesters carbon, protects the plants from extreme weather, and improves water retention.

Managed grazing – Rotating livestock through different parts of a pasture. This permits crops to develop strong root systems, provides livestock constant food, and allows manure to be integrated into the pastures.

Reduced or zero tillage – Tilling mixes soil with air, causing the soil carbon to oxidize into the atmosphere. It also degrades the soil structure and decreases soil fauna such as earthworms that contribute

¹ In this text, we are using “regenerative agriculture” to refer to an umbrella of practices that improve soil health and carbon sequestration in soils, acknowledging that there is much overlap with other schools of agriculture, such as “conservation agriculture,” “climate-smart agriculture,” or “carbon farming.”

to soil health through nutrient cycling. Reduced tillage means avoiding mechanical seedbed preparation or soil disturbances.

References:

1. Bot, Alexandra, and José Benites. The Importance of Soil Organic Matter: Key to Drought-Resistant Soil and Sustained Food Production. Food and Agriculture Organization of the United Nations, 2005. Library of Congress ISBN, <http://www.fao.org/3/a-a0100e.pdf>.
2. Cornell University Cooperative Extension. The Carbon Cycle and Soil Organic Carbon. Fact Sheet, 91, Cornell University College of Agriculture and Life Sciences, 2016, <http://nmsp.cals.cornell.edu/publications/factsheets/factsheet91.pdf>.
3. Schupp, Courtney. "What Is Regenerative Agriculture?" Food Insight, 2019.