



Healthy Soils: Addressing the Climate Threat

Why does the health of our soils matter?

- Soils are the basis of life, yet they have been severely degraded over the past century due to deforestation, urban development, tilling, chemical-heavy farming, and erosion.
- Soils play a key role in absorbing carbon from the atmosphere and filtering and holding water while supporting biodiversity. The health of rural communities is ultimately directly tied to the health of our lands.

What is the state of our soils?

A third of the planet's land is severely degraded and fertile soil is being lost at the rate of 24 billion tons a year, according to a 2017 United Nations-backed study that calls for a shift away from destructively intensive agriculture.

Why do soils matter for our efforts to address climate disruption?

The Paris Agreement requires dramatic reductions in GHG emissions and large-scale capture and sequestration of CO₂ from the atmosphere. Soil destruction creates a vicious cycle, in which less carbon is stored, the world gets hotter, and the land is further degraded, threatening food security. Healthy, restorative practices help draw carbon emissions from the atmosphere into our lands for sequestration and carbon removal. Carbon farming offers impressive and neglected climate mitigation potential. Win-win agricultural practices also increase soil fertility, improve the nutrient value of food, help manage for climate impacts, retain water in soil, and reduce costs for farmers after the initial transition from conventional practices. Protecting our soil will also help us adapt to a changing climate where food production is increasingly threatened.

What are the practices that help sequester carbon in soil while achieving other co-benefits?

There are many practices and they vary by region and soil type. Farmers and ranchers committed to healthy soils take steps to:

- Minimize disturbance of the soil and reduce tilling Feed the soil, through cover crops, composting, and crop rotations
- Cover the soil – avoid bare land whenever possible
- Diversify agriculture and avoid monocultures
- Integrate animals, trees, and crops whenever possible
- Reduce reliance on chemical inputs
- Integrate perennial plants and deep-rooted plants that restore soil and hold carbon at greater depths
- Incorporate rotational grazing and silvopasture
- Maximize agroforestry and multi-tiered vertical and horizontal farming



What is the potential of agriculture to help us address climate change?

The technical potential for soil carbon sequestration is large enough to be worth pursuing aggressively. The range of peer-reviewed technical potentials that have been estimated for agricultural lands (croplands and grasslands) have been in the range of 1.5 to 15.6 gigatons of CO₂ annually by 2030. To put this in context, one gigaton is equivalent to one billion tons. In order to stay below the globally agreed upon limit of 2 degrees C of average global warming and strive to stay below the more ambitious target of 1.5 degrees C, we must as a global community both reduce emissions from fossil fuels and other greenhouse gas sources and remove carbon dioxide from the atmosphere, through forestry, agriculture, land restoration, and possibly various industrial methods. By 2030, a gap of 12 gigatons CO₂e will prevent the world from reaching the targeted +2 maximum global warming threshold. Soils have a critical role to play in closing this gap. But soil carbon sequestration cannot happen in a vacuum. Agricultural mitigation must include consideration of six key factors:

1. Reducing emissions from agriculture
2. Sequestration of carbon in soils and aboveground biomass
3. Climate change adaptation
4. Avoided deforestation through sustainable intensification of yields;
5. Repurposing food waste and other organic waste streams as compost and focusing on a circular economy;
6. Ensuring food security for all.

Who is working to build this field?

The field is taking off globally with field trials, policy initiatives, demonstration sites, and farmer networks. Finland, France, Australia, the state of California, and several other nations are leading the way in advancing soil carbon sequestration programs, policies and field trials. Numerous NGOs, farmer networks, foundations, and government officials in conjunction with the FAO and a range of agricultural research networks and universities are contributing knowledge and support. The Intergovernmental Panel on Climate Change (IPCC) is working on a special report on Climate and Land and global climate modelers are seeking additional data sets to integrate into their integrated assessment models on climate change. Current models rely too heavily on a few practices and do not incorporate all that is known about soil carbon practices. For more information on the science, policies, practices and scaling up of this field, see our additional resource lists and updates.