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*The Round Barn Farm, Waitsfield, VT. (photo: Mad River Valley)*

# A Secret Weapon to Fight Climate Change: Dirt

By Michael Pollan and Debbie Barker, The Washington Post, 17 December 15

When Will Allen is asked to name the most beautiful part of his Vermont farm, he doesn't talk about the verdant, rolling hills or easy access to the Connecticut River. Though the space is a picturesque postcard of the agrarian idyll, Allen points down, to the dirt. "This precious resource not only grows food," he says, "but is one of the best methods we have for sequestering carbon."

We think of climate change as a consequence of burning fossil fuels. But a third of the carbon in the atmosphere today used to be in the soil, and modern farming is largely to blame. Practices such as the overuse of chemicals, excessive tilling and the use of heavy machinery disturb the soil's organic matter, exposing carbon molecules to the air, where they combine with oxygen to create carbon dioxide. Put another way: Human activity has turned the living and fertile carbon system in our dirt into a toxic atmospheric gas.

It's possible to halt and even reverse this process through better agricultural policies and practices. Unfortunately, the world leaders who gathered in Paris this past week have paid little attention to the critical links between climate change and agriculture. That's a huge mistake and a missed opportunity. Our unsustainable farming methods are a central contributor to greenhouse gas emissions. Climate change, quite simply, cannot be halted without fixing agriculture.

The industrialization of farming has allowed farmers to grow more crops more quickly. But modern techniques have also wreaked havoc on the earth, water and atmosphere. Intense plowing, for example, has introduced more oxygen into the soil, boosting the microbes that convert organic matter into carbon dioxide. The quest to wring every last dollar out of fields has put pressure on farmers to rely on chemical fertilizers. This often leaves fields more bare between growing seasons, allowing carbon to escape into the air. Scientists estimate that cultivated soil has lost 50 to 70 percent of its carbon, speeding up climate change.

That loss has significantly degraded soil health, reducing our ability to grow food. Median crop yields are likely to decline by about 2 percent per decade through 2100, according to the U.N. Intergovernmental Panel on Climate Change. At the same time, the world's population is projected to jump from 7 billion to 9 billion by 2050.

Water availability is also at risk. Currently, 1.6 billion people live in regions facing severe water scarcity; that number is expected to rise to 2.8 billion by 2025. Agriculture accounts for a whopping 70 percent of all water consumption. That's in large part because degraded soil doesn't absorb water efficiently. Instead, water sits on top of the ground and runs off (along with farm chemicals) into nearby waterways, creating toxic nitrogen "dead zones."

Remarkably, though, restoring carbon to the soil is not nearly as complicated as rethinking our transportation systems or replacing coal with renewable energy. Innovative farmers such as Allen already know the recipe.

He and his team place "cover crops" in their fields, planting things like oats, rye and beans between rows of vegetables. This practice keeps carbon, nitrogen and other organic nutrients in the soil. "Keeping as much ground covered with plants as long as possible allows photosynthesis to draw down atmospheric carbon into soils," Allen says. A bare field, in contrast, represents a waste of photosynthetic potential. Allen also composts, limits plowing and avoids synthetic chemicals like nitrogen fertilizers. In combination, these efforts have increased soil organic matter by 3 to 4 percent in just three years. Allen also sells some of his cover crops, adding farm income.

Allen's results are not unusual. Studies have shown that cover cropping, crop rotation and no-till farming could restore global soil health while significantly decreasing farms' carbon footprint. Some scientists project that 75 to 100 parts per million of CO2 could be drawn out of the atmosphere over the next century if existing farms, pastures and forestry systems were managed to maximize carbon sequestration. That's significant when you consider that CO2 levels passed 400 ppm this spring. Scientists agree that the safe level of carbon dioxide in the atmosphere is 350 ppm.

Regenerative farming would also increase the fertility of the land, making it more productive and better able to absorb and hold water, a critical function especially in times of climate-related floods and droughts. Carbon-rich fields require less synthetic nitrogen fertilizer and generate more productive crops, cutting farmer expenses.

So why aren't we instituting policies to encourage this kind of "carbon farming"? For one thing, the science is new and not yet widely disseminated. Additionally, most of the incentives built into America's agricultural policies are based on maximizing yield, often at the expense of soil health.

Current federal policy, for example, limits the growing season for cover crops on the theory that they waste farmers' time and resources on products that can't be sold. Thus, farmers are denied full crop insurance, price supports and subsidies if they grow cover crops beyond a specified period of time. But viewing cover crops as a benefit instead of an impediment to cash crops would be the kind of climate-smart policy we need. And, as farmers such as Allen have learned, some cover crops can also be commercialized.

Giving farmers incentives to switch from synthetic nitrogen fertilizers to organic fertilizers could also lead to healthier soil. Scientists at the University of California at Berkeley working with Marin County ranchers have found that applying a single layer of compost, less than an inch thick, to rangelands stimulates a burst of microbial and plant growth that sequesters dramatic amounts of carbon in the soil — more than 1.5 tons per acre. And research has shown that this happens not just once, but year after year. This is a win-win strategy, both for the climate and the food system, since the additional carbon in the soil means more grass for cattle and more profit for ranchers. If the practice were replicated on half the rangeland area of California, it would sequester enough carbon to offset 42 million metric tons of CO2 emissions.

The possibilities are endless. What if our farmers received federal subsidies not just for bushels per acre, but for carbon sequestered or acres of cover crops planted? Many such changes could be made tomorrow at the agency level; they would not require congressional action. Incentives for carbon farming could also bridge the political chasm between ranchers, farmers and environmentalists. Even those farmers and ranchers who don't believe in climate change desire healthy soil, high productivity and lush grasslands. There is a rich opportunity here to completely realign the politics of agricultural and environmental policy.

America is not there quite yet, but other countries are pointing the way. This year, the French government launched the 4 Per 1000 initiative, the first international effort to restore carbon to the soil. Under the proposal, nations would commit to increasing the carbon in their cultivated lands by 0.4 percent per year. The French calculate that this would halt the annual increase in carbon dioxide emissions. Some emerging soil science estimates that we could store 50 to 75 percent of current global carbon emissions in the soil.

In the United States, when the Dust Bowl crisis of the 1930s literally blew soil across the country, our government responded by implementing agriculture policies to ameliorate the problem. With the stakes even higher today, our politicians can once again enact policies to reward practices that rebuild soil carbon.