A new weapon in the carbon fight

The ability of soils to sequester carbon as a win-win strategy must be recognised by policymakers

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It is not usual to think of soils in the context of climate change. Policy is usually focussed on reducing greenhouse gas (GHG) emissions from the electricity sector, transport and industry. There has, however, been a renewed interest in understanding how soils can serve as a sink for carbon dioxide since atmospheric concentrations of carbon dioxide have crossed 410 parts per million and oceans are already turning acidic. Besides, increasing soil carbon offers a range of co-benefits and this would buy us time before other technologies can help us transition to a zero-carbon lifestyle.

Significant carbon pools on earth are found in the earth's crust, oceans, atmosphere and land-based ecosystems. Soils contain roughly 2,344 Gt (1 gigatonne = 1 billion tonnes) of organic carbon, making this the largest terrestrial pool. Soil organic carbon (SOC) comes from plants, animals, microbes, leaves and wood, mostly found in the first metre or so. There are many conditions and processes that determine changes to SOC content including temperature, rainfall, vegetation, soil management and land-use change.

Many benefits

Increasing SOC through various methods can improve soil health, agricultural yield, food security, water quality, and reduce the need for chemicals. Changing agricultural practices to make them more sustainable would not just address carbon mitigation but also improve other planetary boundaries in peril such as fresh water, biodiversity, land use and nitrogen use.

Currently, the world is on a path to be about 3°C warmer than pre-Industrial times even if there was follow through on all the commitments made at the Paris climate conference in 2015. The aim of the global community is to try and stay below 1.5°C, which is a very tall order since current average temperatures are already about a degree higher.

Approaches to increase SOC include reducing soil erosion, no-till-farming, use of cover crops, nutrient management, applying manure and sludge, water harvesting and conservation, and agroforestry practices. Rattan Lal from Ohio State University estimates that an increase of just 1 tonne of soil carbon pool of degraded cropland soils can increase crop yield by several kilograms per hectare. Moreover, carbon sequestration in soils has the potential to offset GHG emissions from fossil fuels by up to 15% annually. In contrast, it has been estimated that SOC in India has reduced from 30% to 60% in cultivated soils compared with soils that are not disturbed.

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Soil and agriculture

After the changes undertaken as part of the Green Revolution, crop yields increased for several decades, but there has also been a dramatic increase in the use of chemicals – pesticides, herbicides and fertilizers. Still, agricultural yields have begun to drop in many places for a variety of reasons primarily related to degraded soils. Industrial changes to agriculture have led to a range of adverse effects: loss of biodiversity, elimination of beneficial microbes and insects, reduction in yield, contamination of water bodies and soils, and increasing toxicity and deaths from chemical use in farm households.

India has a large number of successful sustainable agricultural practices that are consistent with ecological principles. These include natural farming (or as the Japanese farmer Masanobu Fukuoka calls it, 'do-nothing farming'), permaculture and organic farming. Personal and online reports indicate that the improvements to soil health and profits occur rapidly. But the knowledge and innovations of farmers who have successfully experimented with these methods must be considered in research and policy.

The number of farmers in organic farming has been increasing steadily, but many are simply deploying regular agriculture with natural substitutes for chemicals. Up to a third of rainfed farmers simply do not have the means to add chemicals, and are organic by default. Many States have some sustainable farming, with Madhya Pradesh reportedly having the highest acreage.

Lessons for India

Many of these practices have come into their own over several decades – through the efforts of farmers and sometimes with support from local groups – and the time is long past where these are regarded as outlandish alternative methods. Given that these techniques can contribute to relieving a range of challenges, State-level policy makers need to understand better the successes on the ground in India's different agro-climatic zones

They also need to identify what kinds of support are needed by farmers with small holdings to transition from existing practices. Not paying attention to the successes of our own farmers has partly contributed to the agrarian crisis the country now faces.

India's population will continue to increase through at least the middle of the century and we need to be able to grow more food, grown in less land and in more severe weather conditions. We ignore our own farmers' successes at our own peril.

The Parliamentary Standing Committee on Agriculture in its 2016 report in fact recommended "revision of the existing fertiliser subsidy policy and promotion of organic fertilizers". The government has been promoting a Soil Health Card scheme to measure the health of the soils in different parts of the country and in each farm. There is little policy support for natural farming and the alternatives. The fertilizer lobby, extension services, and the many agricultural scientists – unschooled in agroforestry and ecological methods – would oppose changes but these practices that integrate good management of soil, water and land provide a host of benefits. The ability of soils to sequester carbon is a win-win strategy for farmers, people and for climate change and it is time we stopped ignoring these at the policy levels.

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