

Quarterly Viewpoint

FROM THE DESK OF RATTAN LAL

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Global Carbon Sink Capacity

There exists a strong interest among media and some industry regarding the amount of carbon (C) that can be sequestered in the soil, and what fraction of anthropogenic emissions (11 GtC for 2018) can be offset through soil C sink. There are at least as many answers to the question as are the number of “experts” willing to respond. Indeed, there are a lot more “myths” but fewer facts about this timely and critical question. Most of the available information shows that soil C sink capacity of managed ecosystems (e.g. croplands, grazing lands, mine lands) can offset about 15-20% of the anthropogenic emissions. Whereas this answer can be disappointing to some who have high hopes on this strategy, it can also raise the eyebrows of others who often argue that soil C sequestration is a “pie in the sky.” Some recent publications show that total soil C sink capacity, based on the estimate of historic C loss through past land use and soil degradation processes, is 100-130 GtC. The technical potential rate of global C sequestration, if everything is done as it should be for site-specific biophysical and socio-economic conditions, is about 2.5 GtC/yr. Even if the actual rate of C sequestration is about 50% of the maximum, the historic C loss can be re-sequestered within a century.

These simplistic and back-of-the-envelope calculations do not consider some other options of the terrestrial C sequestration. Notable among these are: 1) sequestration of inorganic C in soil, including formation of secondary carbonates and leaching of bicarbonates into the groundwater, and 2) C sequestration in biomass of trees and other perennial vegetation.

Whereas the terrestrial sequestration cannot offset the ever-increasing anthropogenic emissions from fossil fuel combustion and land use conversion (e.g., deforestation, drainage of wetlands), it is a critical strategy with numerous co-benefits. For instance, improvement in soil health is essential to advancing several Sustainable Development Goals (SDGs) of the U.N. In particular, SDG #2 (Zero Hunger), SDG #13 (Climate Action), and SDG # 15 (Life on Land) can only be realized if soil health is restored through sequestration of soil organic carbon.

Because only a small fraction of the anthropogenic emissions can be offset by soil C sequestration, humanity must also focus on decarbonization of the economy by developing non-carbon fuel sources (e.g., wind, solar, hydro, geothermal, nuclear, bio). By 2050, fossil fuels should be a minor contributor to the world's energy demand.

Thus, soil C sequestration is a bridge to the future. It buys humanity some time until the no-C fuel sources take effect. It is also a low-hanging, cost-effective, natural solution that lies underfoot, and is based on the power of soil. It is also a truly win-win-win option because it advances three critical SDGs.

Sincerely,



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