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Soil Carbon Sequestration to Mitigate Carbon Dioxide Emissions

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In lots of ways, carbon is existence. A chemical detail, like hydrogen or nitrogen, carbon is a simple building block of biomolecules. It exists on the planet in strong, dissolved, and gaseous paperwork. for example, carbon is in graphite and diamond, however can also combine with oxygen molecules to shape gaseous carbon dioxide (CO2). The build-up of carbon dioxide and other 'greenhouse gases with in the atmosphere can entice warmth and contribute to weather alternate. Carbon dioxide is the maximum typically produced greenhouse fuel and it produced both in nature and via human activities. man-made carbon dioxide can come from burning coal, natural fuel and oil to produce electricity. Biological carbon dioxide can come from decomposing natural be counted, woodland firesand different land use adjustments. Carbon sequestration is the system of capturing and storing atmospheric carbon dioxide. it is one technique of lowering the amount of carbon dioxide within the environment with the aim of reducing international climate change.

Sources of Carbon Dioxide Emissions

There are both natural and human sources of carbon dioxide emissions. Natural sources include decomposition, ocean release and respiration. Human sources come from activities like cement production, deforestation as well as the burning of fossil fuels like coal, oil and natural gas.

Role of Agriculture in Global Warming

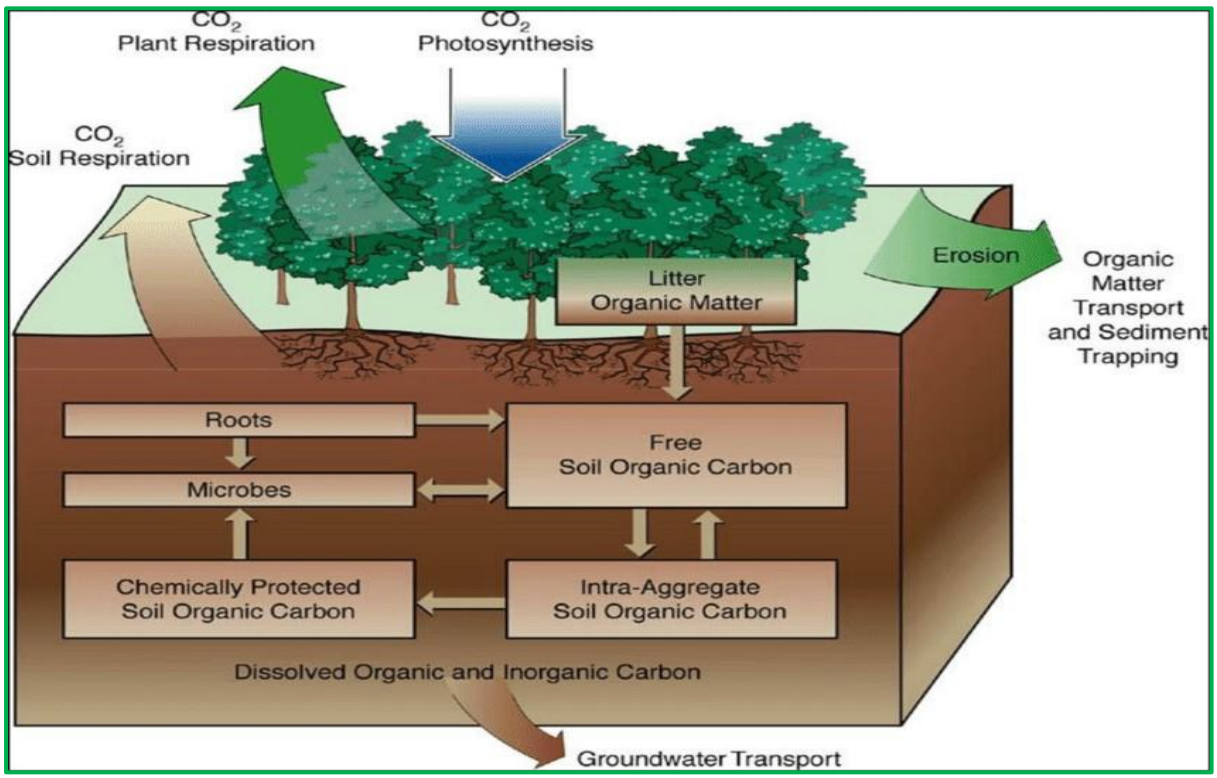
Agriculture occupies a larger portion of global land area (about 35%) than any other human activity. Because of its scale and intensity, agriculture emits a large quantity of greenhouse gases into the atmosphere. It presently accounts for about 25% of the CO2, 50% of the CH4 and 70% of the N2O released globally via human sources. However, because farmlands are intensively managed, farmers can, to some extent, control the amounts of these gases released. For example, by choosing different practices, it may be possible to reduce emissions. Farmlands may, in fact, even be made to absorb more gases than they emit, thus helping to absorb CO2 emitted from fossil fuels and restore air quality. This is of importance with regards to C, because when this occurs the land acts as a ''sink'' or storehouse for C.

One of the main options for greenhouse gas (GHG) mitigation identified by the IPCC is the sequestration of carbon in soils. Since the breaking of agricultural land in most regions, the carbon stocks have been depleted to such an extent, that they now represent a potential sink for CO2 removal from the atmosphere. Improved management will however, be required to increase the inputs of organic matter in the top soil and/or decrease decomposition rates. There are two main types of carbon sequestration: biological and geological.

Scientists are exploring new ways to remove and store carbon from the atmosphere using innovative technologies. Researchers are also starting to look beyond removal of carbon dioxide and are now looking at more ways it can be used as a resource.

Ways to Carbon Sequestration

Geological sequestration: Geological carbon sequestration involves the separation and capture of carbon dioxide (CO2) at the point of emissions followed by storage in deep underground geologic formations. This is also referred to as carbon (or CO2) capture and storage (CCS). It involves trapping CO2 within a cavity in the rock underground. These cavities are either large man-made cavity, such as caverns and mines orthe pore space present within rock formations and also binding it chemically to another substance in the ground.



Ocean sequestration: The ocean is the largest sink of atmospheric CO2 (about 7 petagrams (Pg) per year) (1 Pg = 1 gigaton = 1015 g). Dissolved CO2 (passively entering the ocean via diffusion from the atmosphere) has already acidified the surface ocean, the most productive region of the ocean. Ocean carbon sequestration (OCS) is a method to distribute CO2 more evenly throughout ocean depth and minimize surface ocean impacts. There are two major methods of OCS – direct injection and ocean fertilization (promoting photosynthetic fixation of CO2 by ocean organisms).

Terrestrial sequestration: Terrestrial carbon sequestration is the process through which CO2 from the atmosphere is absorbed by trees and plants through photosynthesis and stored as carbon in soils and biomass (tree trunks, branches, foliage, and roots.

Management techniques for Carbon sequestration: Various management techniques can be used to increase carbon sequestration in soils. Large uncertainties are associated with quantifying the impact of the various crop management practices on greenhouse gas emissions. Further, the spatial and temporal scales involved in quantifying greenhouse gas emissions from, and C sequestration in, agro-ecosystems make it very difficult to obtain accurate estimates of the GHG emission or C sink values. The uncertainty about future climatic conditions is also a complicating factor because the magnitude of the effect engendered by many of the crop management practices that may be adopted to reduce

greenhouse gas emissions are so dependent on climate and weather as they influence primary productivity and thus C inputs into the soil.

Main Agronomic and Related Practices to Increase SOC Sequestration

1. Adoption of no-tillage (NT) or minimum tillage.
2. Adoption of environmental and soil health friendly farming systems.
3. Incorporation of cover crops.
4. Use of mulch either in the form of crop residues or synthetic materials.
5. Minimization of soil and water losses by surface runoff and erosion.
6. Adoption of integrated nutrient management practices for the increase of soil fertility.
7. Use of organic amendments.
8. Promotion of farm forestry.

Impacts of Carbon Sequestration

1. About 25% of our carbon emissions have historically been captured by Earth's forests, farms and grasslands. Scientists and land managers are working to keep landscapes vegetated and soil hydrated for plants to grow and sequester carbon.

2. As much as 30% of the carbon dioxide we emit from burning fossils fuels is absorbed by the upper layer of the ocean. But this raises the water's acidity, and ocean acidification makes it harder for marine animals to build their shells. Scientists and the fishing industry are taking proactive steps to monitor the changes from carbon sequestration and adapt fishing practices.

High levels of fossil fuel combustion and deforestation have transformed large pools of fossil carbon (coal and oil) into atmospheric carbon dioxide. Strategies aimed at reducing CO2 in the atmosphere include soil carbon sequestration, tree planting, and ocean sequestration of carbon. Other technological strategies to reduce carbon inputs include developing energy efficient fuels, and efforts to develop and implement non-carbon energy sources. All of these efforts combined can reduce CO2 concentrations in the atmosphere and help to alleviate global warming