



Carbon Farming

Introduction

▪ Carbon:

- It is recognized as a **key energy currency of biological systems**, including agriculture.
- Agricultural production depends on plant photosynthesis to move CO₂ out of the atmosphere and into the plant, where it is transformed into agricultural products: food, flora, fuel or fiber.

▪ Agriculture and Carbon Emissions:

- Agriculture covers more than half of Earth's terrestrial surface and **contributes roughly one-third of global GHG emissions**.
- **Agricultural emissions in India** are primarily from the livestock sector (54.6%) and the use of **nitrogenous fertilisers** (19%).

▪ Carbon Farming:

- Carbon farming (also known as **carbon sequestration**) is a system of agricultural management that **helps the land store more carbon** and **reduce the amount of GHG** that it releases into the atmosphere.
- It involves practices that are known to improve the rate at which CO₂ is removed from the atmosphere and converted to plant material and soil organic matter.
- Carbon farming is successful when **carbon gains** resulting from enhanced land management or conservation practices **exceed carbon losses**.

Methods for Carbon Farming

- **Forest Management:** Healthy forests absorb and hold CO₂ emissions produced from other sources. Carbon offsets can be created by:
 - Avoiding deforestation
 - Permanent land conservation
 - Reforestation and replanting activities
 - Improved forest management
- **Grasslands Conservation:** It includes maintaining native plant life through permanent land conservation and **avoiding conversion of grasslands for commercial development** or intensive agriculture.
- **Mixed Farming:** A climate-friendly strategy of raising livestock and crops together.
 - Rotating cows among pastures allows grasses to **recover from grazing** and the **animals' manure** and the impacts of their grazing **regenerate carbon in soils**.
- **Using Cover Crops:** These crops are **planted to cover the soil** rather than for the purpose of being harvested. They are planted after the harvest of the main crop.
 - They return more carbon to the soil and **sustain soil microbes** that play key roles in carbon storage.
- **Reduction of Soil Tillage:** **Tillage** is normally used to loosen and aerate the soil and to remove

initial weeds.

- However, **tillage increases carbon mineralization** (decomposition of chemical compounds in organic matter) leading to CO₂ emissions from the soil.
- Reducing the soil disturbance is a useful tool to protect soil organic matter.
- **Wetland Restoration:** [Wetland](#) soil is an important natural carbon pool or sink as the wetlands **conserve about 14.5% of the soil carbon** found in the world.

Significance of Carbon Farming

- **Multidimensional Benefits:** Increasing Soil Organic Carbon (SOC) through various methods can **improve soil health, agricultural yield, food security, water quality**, and reduce the need for chemicals.
 - It would not just address carbon mitigation but also **improve other planetary boundaries in peril** such as fresh water, biodiversity, land use and nitrogen use.
- **Offsets Carbon Emissions:** An international initiative called “**4 per 1000**,” showed that increasing soil carbon worldwide by just 0.4% yearly could offset that year’s new growth in CO₂ emissions from fossil fuel emissions.
 - The ‘**4 per 1,000**’ initiative was launched by the France government at the COP21 [Paris climate summit](#) in 2015.
 - The aim of the initiative is to demonstrate that agriculture, and in particular agricultural soils, can play a **crucial role where food security and climate change** are concerned.
- **Acts as an Intermediate Mitigation Strategy:** Increasing soil carbon offers a range of co-benefits along with buying the time before other technologies can help the world transition to a [zero-carbon](#) lifestyle.
- **Helps Restoring Carbon Cycle:** Worldwide, soils are estimated to contain about 10 times the amount of carbon in the atmosphere; far more than what is found in normal vegetation.
 - Carbon farming is seen as a way to help **restore balance within the carbon cycle**.
 - It also helps soil build a **resilience to drought** and increases agricultural productivity in a natural way

Challenge Associated

- **Requires Participation at a Larger Level:** For the overall framework of carbon farming to be successful, it would have to **include sound policies, public-private partnerships**, accurate quantification methodologies and **supportive financing** to efficiently implement the idea.
 - It requires to be done at a scale where measurable carbon capture can be achieved along with maintaining healthy soils that absorb and store carbon.
- **Limited Benefit:** The areas with long growing seasons, sufficient rainfall and substantial irrigation make viable opportunities for carbon farming.
 - However, carbon farming, likely, is more of a **challenge for farmers in hot and dry areas** of the country.
 - Moreover, many farmers may not be able to **afford the cost of implementing environmentally beneficial measures** without some sort of financial assistance.

Way Forward

- **Direct Incentives for Farmers:** The land sector is key for reaching a climate-neutral economy, because it can capture CO₂ from the atmosphere.
 - However, to encourage the **agriculture and forestry sectors**, it is necessary to **create direct incentives for the adoption of climate-friendly practices**, as currently there is no targeted policy tool to significantly incentivise the increase and protection of carbon

sinks.

- **Carbon Credits and Carbon Banks:** The farmers can be rewarded through globally tradable [carbon credits](#) and 'carbon banks' can also be created that would **buy and sell carbon credits from farmers**.
 - These credits could then be sold to corporations needing to offset their emissions.
 - Paying farmers to restore carbon-depleted soils offers a **great opportunity for a natural climate solution** and to stabilize global warming below 2°C.
- **Organic-Carbon Rich Fertilisers:** Fertilisers such as compost and **solid manure with wide C:N (carbon:nitrogen) ratios** will have a **slow carbon turnover** compared to other materials. They should be part of the farming system.
- **Biofuel over Fossil Fuels:** Nearly all biofuel systems (mainly biodiesel and bioethanol) produce fewer GHG emissions than fossil fuels.
 - Using biofuel as a replacement for fossil fuels is an **opportunity for farmers to diversify income, reduce costs, and assist in reducing global GHG emissions** - mainly **carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O)**.

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