



## Carbon Farming: A Path to Sustainable Agriculture

For Prelims: [Carbon farming](#), [Carbon sequestration](#), [Agricultural Emissions](#), [GHG Emissions](#), [UNFCCC](#), [Carbon credits](#), Carbon Banks, [Paris Climate Conference](#), [4 per 1000 initiative](#), [Net zero emissions](#)

For Mains: [Agricultural emissions](#), [Carbon farming - significance](#), [Measures that can be taken to encourage carbon farming](#), Carbon as a cash crop for farmers.

Source: TH

### Why in News?

Recently, [carbon farming](#) has emerged as a promising approach to [sustainable agriculture](#).

- It **integrates regenerative farming methods** aimed at enhancing soil health and agricultural yield while also **addressing the challenges of climate change**.

### What is Carbon Farming?

#### ▪ About:

- Carbon farming is an approach to agriculture that focuses on **managing agricultural and forestry practices** to increase [carbon sequestration](#) (the capture and storage of atmospheric carbon dioxide) and reduce greenhouse [gas emissions](#).
  - It aims to **mitigate climate change** by enhancing carbon storage in soil and vegetation, improving soil health, and reducing the **carbon footprint** of agricultural activities.

#### ▪ Need for Carbon Farming:

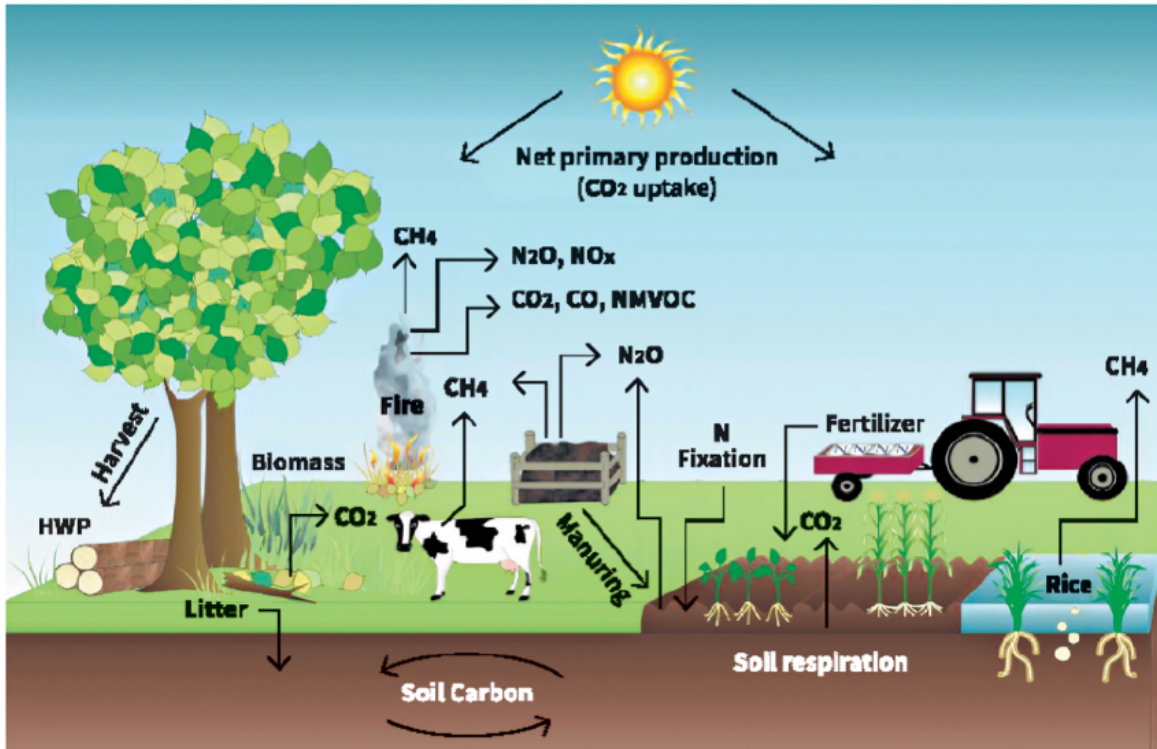
- **Atmospheric CO<sub>2</sub> Buildup:** There is an alarming rise in atmospheric [carbon dioxide levels](#), a major driver of climate change.
  - Carbon farming practices can help in drawing CO<sub>2</sub> out of the atmosphere and storing it for long periods.
- **Carbon Sequestration Potential:** Research published in Nature Climate Change emphasises the potential of agricultural soils to act as significant carbon sinks, effectively removing CO<sub>2</sub> from the atmosphere.
  - Carbon farming practices directly enhance this potential by **creating ideal conditions** for increased [carbon sequestration](#).
- **Soil Degradation:** There is a critical issue of [soil degradation](#) due to conventional farming practices. This degradation reduces the ability of soil to store carbon.

- Carbon farming practices, such as **cover cropping and reduced tillage**, promote healthy soil biology and organic matter content, which significantly **increases the soil's capacity** to capture and store carbon.
- **Regenerative Practices:** Carbon farming practices like compost application can improve soil health, fertility, and overall agricultural productivity.
  - These practices address soil degradation and create a **natural system** that actively pulls down atmospheric CO<sub>2</sub>, contributing to climate change mitigation.
- **Types of Carbon Farming Practices:** These practice help in improved soil health, increased biodiversity, reduced need for chemicals, reduces methane emissions, increases carbon storage in pastures etc.

Practice	Description
<b>Rotational Grazing</b>	Planned movement of livestock between pastures
<b>Agroforestry</b>	Integrating trees and shrubs into agriculture
<b>Conservation Agriculture</b>	Practices like zero tillage, crop rotation, cover cropping
<b>Integrated Nutrient Management</b>	Focuses on organic fertilizers and compost
<b>Agro-ecology</b>	Integrates ecological principles into agriculture
<b>Livestock Management</b>	Strategies like rotational grazing and improved feed quality
<b>Land Restoration</b>	Practices like reforestation and wetland restoration



# The process of emitting and removing greenhouse gas emissions in managed farmland



## Best Practices Worldwide

- Efforts such as the **Chicago Climate Exchange** and **Australia's Carbon Farming Initiative** incentivize **carbon mitigation** in agriculture through practices like **no-till farming**, reforestation, and pollution reduction.
- **Kenya's Agricultural Carbon Project**, backed by the [World Bank](#), showcases how carbon farming can help economically developing nations tackle climate change, enhance food security, and adapt to its impacts.
- The initiation of the **'4 per 1000' initiative** during the **2015 COP21** climate talks in Paris underscores the specific importance of sinks in reducing greenhouse gas emissions.

## What are the Challenges Associated with Carbon Farming?

- **Standardisation and Certification:** A report by the [Food and Agriculture Organization \(FAO\)](#) highlights the **lack of standardised methodologies** for measuring carbon sequestration in agricultural soils.
  - This makes it difficult to **verify carbon credits** generated through carbon farming practices.
- **Lack of Awareness and Extension Services:** A report by the Government of India's [NITI Aayog](#) highlights the **limited awareness** among Indian farmers about carbon farming practices and their benefits.
- **Small Landholdings and Short-Term Focus:** There is the dominance of **small and fragmented landholdings** in India. This can make large-scale implementation of carbon farming practices more challenging.
- **Policy and Regulatory Frameworks:** A report by the [Confederation of Indian Industry \(CII\)](#) emphasises the **need for robust policy and regulatory frameworks** to incentivize carbon

farming practices in India.

- **Financial Incentives and Market Access:** A research paper published by the Indian Council for Research on International Economic Relations (ICRIER) underlines the importance of **providing financial incentives** like subsidies or carbon credit schemes to encourage farmer adoption of carbon farming practices.
  - Limited access to carbon markets also poses a challenge.
- **Other Challenges:**
  - **Hot and Dry Areas:** Limited water availability **restricts plant growth** and carbon sequestration potential.
  - **Water Prioritization:** Water scarcity for drinking and washing needs limits agricultural practices.
  - **Challenges with Cover Cropping:** Additional water demand may make practices like **cover cropping unviable**.
  - **Plant Selection:** Not all plant species are **equally effective at trapping** and storing carbon, especially in arid environments.

## Way Forward

- **Climate Change and Agriculture:** Climate-resilient and emission-reducing agricultural practices can benefit from adaptation strategies.
  - Agriculture plays a crucial role in mitigating climate change.
- **Viability of Organic Farming in India:** Grassroots initiatives and agrarian research in India demonstrate the viability of [organic farming](#) for [carbon sequestration](#).
- **Economic Potential of Agro-ecological Practices:** Agro-ecological practices in India have the potential to generate USD 63 billion from about 170 million hectares of arable land.
  - Farmers could receive an annual payment of around ₹5,000-6,000 per acre for providing climate services through sustainable agricultural practices.
- **Regional Suitability for Carbon Farming:** Regions like the **Indo-Gangetic plains** and the Deccan Plateau are well-suited for carbon farming.
  - The mountainous terrain of the Himalayan region and coastal areas face challenges like **salinisation** and limited resources, limiting the adoption of traditional farming practices. Therefore, these areas can be **utilised for carbon farming** after **capacity building**.
- **Role of Carbon Credit Systems:** [Carbon credit systems](#) can incentivise farmers by providing additional income through environmental services.
  - Agricultural soils have the capacity to absorb 3-8 billion tonnes of CO<sub>2</sub>-equivalent annually over 20-30 years, bridging the gap between feasible emissions reductions and climate stabilization.

### **Drishti Mains Question:**

Q. Explain the concept of carbon farming and discuss its potential in mitigating climate change. How can carbon farming be integrated into agricultural practices in India? What are the challenges and opportunities associated with promoting carbon farming?

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

### **Prelims:**

**Q. What is blue carbon? (2021)**

**(a)** Carbon captured by oceans and coastal ecosystems

(b) Carbon sequestered in forest biomass and agricultural soils

(c) Carbon contained in petroleum and natural gas

(d) Carbon present in atmosphere

**Ans: (a)**

**Q. Which of the following statements best describes "carbon fertilisation"? (2018)**

(a) Increased plant growth due to increased concentration of carbon dioxide in the atmosphere.

(b) Increased temperature of Earth due to increased concentration of carbon dioxide in the atmosphere.

(c) Increased acidity of oceans as a result of increased concentration of carbon dioxide in the atmosphere.

(d) Adaptation of all living beings on Earth to the climate change brought about by the increased concentration of carbon dioxide in the atmosphere.

**Ans: (a)**

**Q. Which one of the following statements best the term 'Social Cost of Carbon'? (2020)**

**It is a measure, in monetary value, of the -**

(a) long-term damage done by a tonne of CO<sub>2</sub> emissions in a given year.

(b) requirement of fossil fuels for a country to provide goods and services to its citizens, based on the burning of those fuels.

(c) efforts put in by a climate refugee to adapt to live in a new place.

(d) contribution of an individual person to the carbon footprint on the planet Earth.

**Ans: (a)**

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**Mains:**

**Q.** What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification. **(2021)**