What is carbon farming? | Explained

What are some techniques within carbon farming which can reduce greenhouse gas emissions? What are the challenges in implementing such techniques, especially in developing countries such as India? What are some of the global initiatives?

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A worker loads fertilizer into a tank attached to a large drone, preparing to spray it rice fields in Long An province in southern Vietnam's Mekong Delta, on January 2. | Photo Credit: AP

Carbon is found in all living organisms and many minerals. It is fundamental to life on earth and plays a crucial role in various processes, including photosynthesis, respiration, and the carbon cycle. Farming is the practice of cultivating land, raising crops, and/or livestock for food, fibre, fuel, or other resources. It

encompasses a wide range of activities, from planting and harvesting crops to managing livestock and maintaining agricultural infrastructure.

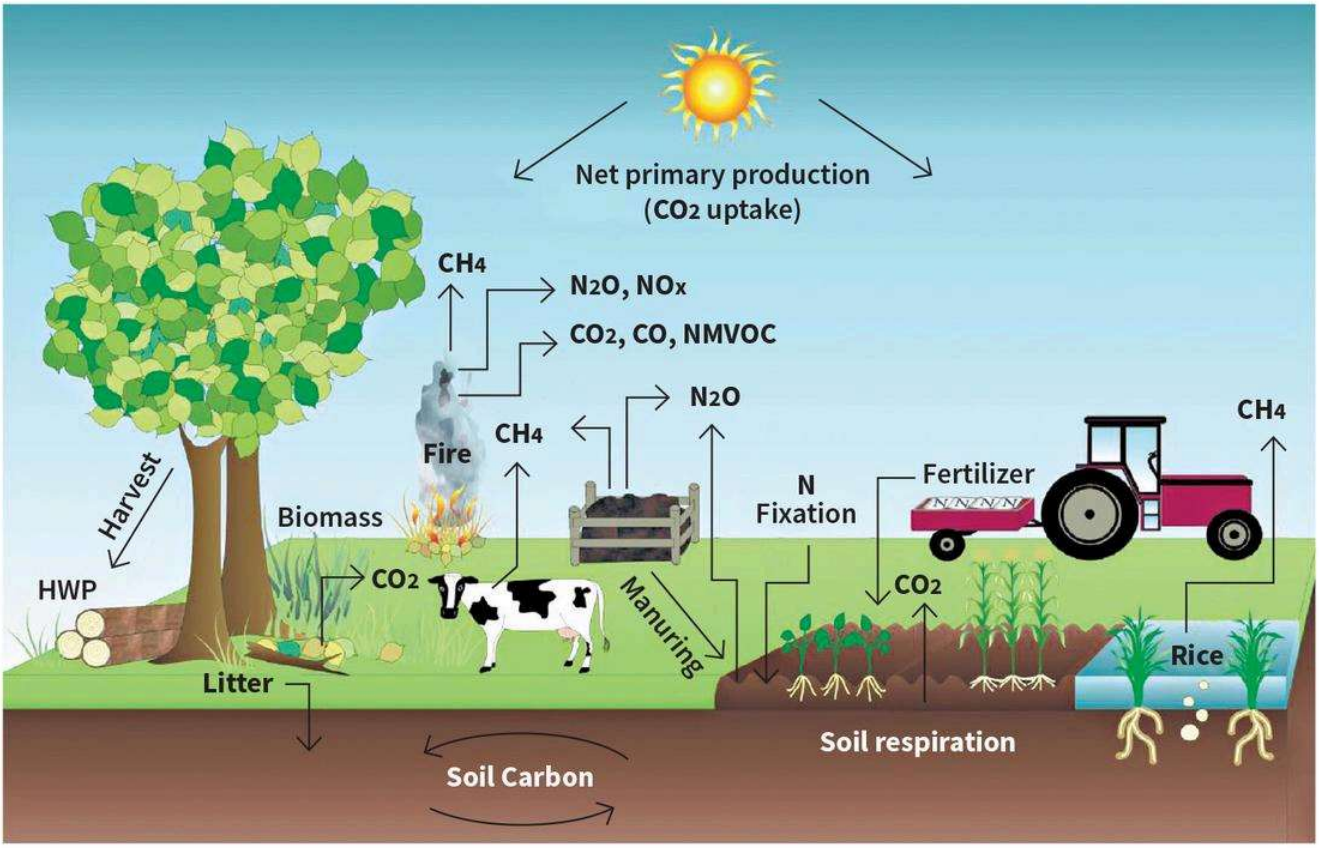
Carbon farming combines these two concepts by implementing regenerative agricultural practices that restore ecosystem health while improving agricultural productivity and soil health, and mitigating climate change by enhancing carbon storage in agricultural landscapes and reducing greenhouse gas emissions. The practice is easy to adopt across various agro-climatic zones. It can also help ameliorate soil degradation, water scarcity, and challenges related to climate variability.

How can carbon farming help?

A simple implementation of carbon farming is rotational grazing. Others include agroforestry, conservation agriculture, integrated nutrient management, agro-ecology, livestock management, and land restoration.

Agroforestry practices — including silvopasture and alley cropping — can further diversify farm income by sequestering carbon in trees and shrubs. Conservation agriculture techniques such as zero tillage, crop rotation, cover cropping, and crop residue management (stubble retention and composting) can help minimise soil disturbance and enhance organic content, particularly in places with other intense agricultural activities.

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



Source: 'Carbon farming – Making agriculture fit for 2030', a study for the European Parliament's committee on Environment, Public Health and Food Safety

Integrated nutrient management practices promote soil fertility and reduce emissions by using organic fertilizers and compost. Agro-ecological approaches such as crop diversification and intercropping have benefits for ecosystem resilience. Livestock management strategies including rotational grazing, optimising feed quality, and managing animal waste can reduce methane emissions and increase the amount of carbon stored away in pasture lands.

What are the challenges to carbon farming?

While carbon farming does offer numerous benefits, its effectiveness varies depending on multiple factors — geographical location, soil type, crop selection, water availability, biodiversity, and farm size and scale. Its usefulness also depends on land management practices, sufficient policy support, and community engagement.

Regions with long growing seasons, sufficient rainfall, and substantial irrigation are best suited to practise carbon farming because they provide the best conditions in which to sequester carbon, through vegetation growth. In regions with adequate rainfall and fertile soil, the potential for carbon sequestration through practices like agroforestry (integrating trees and shrubs with crops) and conservation agriculture (minimising soil disturbance) may be particularly high.

On the other hand, carbon farming can be challenging in hot and dry areas where the availability of water is limited, and prioritised for drinking and washing needs. Limited water availability can hinder the growth of plants, thus restricting the potential for sequestration through photosynthesis. For example, practices like cover cropping, which require additional vegetation between main crop cycles, may not be viable due to the added water demand. Moreover, selecting which plants to grow also becomes crucial because not all species trap and store carbon in the same amounts or in an equally effectively manner. Fast-growing trees and deep-rooted perennial grasses tend to be better at this task — but on the flip side, these types of plants may not be well-suited to arid environments.

Further, the adoption of carbon farming practices may require financial assistance for farmers to overcome the costs of implementing them. In the context of developing countries like India, small-scale farmers may lack the resources to invest in sustainable land management practices and environmental services. In sum, while carbon farming holds promise as a mitigation strategy, addressing these challenges is essential to realise its full potential in combating climate change.

What are some carbon farming schemes worldwide?

In recent years, the practice of carbon trading in the agriculture sector has become important around the world, but especially in the U.S., Australia, New Zealand, and Canada, where voluntary carbon markets have emerged. Initiatives like the Chicago Climate Exchange and the Carbon Farming Initiative in Australia demonstrate efforts to incentivise carbon mitigation activities in agriculture. The processes range from no-till farming (growing crops without disturbing the soil) to reforestation and pollution reduction.

Initiatives like Kenya's Agricultural Carbon Project, which has the World Bank's support, also highlight the potential for carbon farming to address climate mitigation and

adaptation and food security challenges in economically developing countries.

The launch of the '4 per 1000' initiative during the COP21 climate talks in 2015 in Paris highlights the particular role of sinks in mitigating greenhouse-gas emissions. As the oceans and the atmosphere are filled with carbon, and they approach their saturation points, we must manage the remaining carbon budget of 390 billion tonnes or so wisely.

What are the opportunities in India?

As climate change intensifies, climate-resilient and emission-reducing agricultural practices can benefit from adaptation strategies. Agriculture is crucial in this endeavour.

Grassroots initiatives and pioneering agrarian research in India are demonstrating the viability of organic farming to sequester carbon. In this regard, agro-ecological practices in India could yield significant economic benefits, with the potential to generate $63 billion in value from approximately 170 million hectares of arable land. This estimate includes an annual payment of around ₹5,000-6,000 per acre for farmers to provide climate services by adopting sustainable agricultural practices.

Regions with extensive agricultural land, such as the Indo-Gangetic plains and the Deccan Plateau, are well suited to adopt carbon farming whereas the mountainous terrain of the Himalayan region is less so. Coastal areas are prone to salinisation and have limited access to resources, thus limited the adoption of traditional farming practices.

Further, carbon credit systems can incentivise farmers by providing additional income through environmental services. Studies have shown agricultural soils can absorb 3-8 billion tonnes of CO2-equivalent every year over 20-30 years. This capacity can bridge the gap between feasible emissions reductions and the indispensable stabilisation of the climate. So carbon farming could also be a sustainable strategy to mitigate climate change and enhance food security in India.

But scaling it up requires concerted efforts to address several challenges, including limited awareness, inadequate policy support, technological barriers, and an enabling adoption environment. Yet promoting carbon farming is in India's interests — to mitigate climate change while improving soil health, enhancing biodiversity, and creating economic opportunities for its adopters.