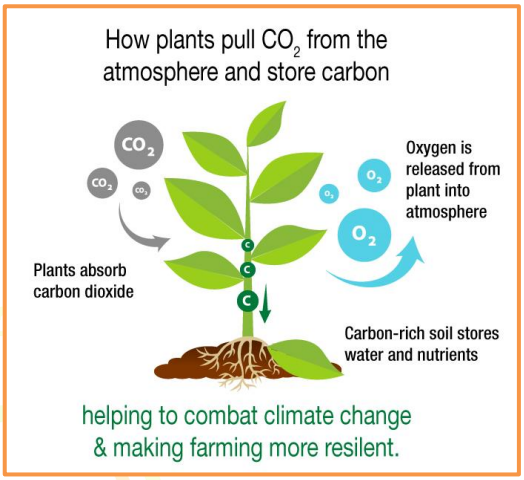
AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 02, Issue: 11 (November, 2025)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

Carbon Farming: How Farmers Can Turn Their Fields into Climate-Saving Ecosystems

*Makey Sri Chakra Naga Vardhan, Ansa P John, B Subhash and Tanya Singh
School of Agriculture, Lovely Professional University, Phagwara, India
*Corresponding Author's email: mscnvardhana@gmail.com

Across the Indian countryside, seasons are shifting in unfamiliar ways. Summers stretch longer, rains become uncertain, and soil seems to tire earlier than before. Farmers are witnessing this transformation firsthand. Yet, amid this challenge lies a powerful opportunity carbon farming, a new approach that transforms agriculture from a source of emissions into a solution for climate restoration.



What is Carbon Farming?

Carbon farming is a smart, climate-friendly approach where farmers adopt improved practices to capture carbon dioxide (CO_2) from the atmosphere and store it safely in soil, trees, and crops. It reduces greenhouse gases (GHGs), improves soil health, enhances biodiversity, and creates opportunities for farmers to earn income through carbon credits. When practiced consistently, it helps to improve soil fertility, boost yields, reduce greenhouse gas emissions, restore degraded fields, create income opportunities through carbon credits. India already stores 30.43 billion tonnes of CO_2-equivalent carbon, and this pool can grow significantly with climate-smart practices.

Why do we need carbon farming now?

Agriculture contributes substantially to GHG emissions:

- **Methane** from cattle, paddy fields
- **Nitrous oxide** from fertilizers
- **Carbon dioxide** from residue burning, machinery, excessive tillage

These gases trap heat, intensifying climate change. Carbon farming flips the narrative by turning farmland into a vast natural carbon "sponge."

The Pillars Of Carbon Farming

To make farms climate-friendly, several proven techniques can be adopted. Each method performs a different role, but together, they create a powerful carbon-capture system.

Practice	What Farmers Actually Do	How It Helps the Soil	How It Helps the Climate	Carbon Impact
1. Conservation Tillage (Reduced / No-Till)	Farmers avoid deep ploughing and disturb the soil as little as possible. Seeds are sown with special machines.	Soil becomes more stable, retains moisture better, and gets richer in organic matter.	Less soil disturbance = less carbon released into the air.	Saves fuel, protects soil, stores carbon for long time.

2. Cover Crops	Farmers grow extra crops (like legumes, grasses) between main seasons instead of leaving the field empty.	Protects soil from erosion and adds natural nutrients and organic matter.	Plants absorb CO_2 and store it in the soil through their roots.	Better soil fertility, less need for fertilizers, more carbon in soil.
3. Agroforestry (Trees + Crops Together)	Farmers plant trees along with crops or on farm boundaries.	Tree roots improve soil structure and increase long-term soil carbon.	Trees capture a large amount of CO_2 and store it in wood and soil.	Extra income from wood, fruits, fodder + high carbon storage.
4. Alternate Wetting & Drying (AWD) in Rice	Farmers allow paddy fields to dry for a few days before re-flooding. They use a simple tube to check water level.	Healthy roots, less nutrient loss, and improved soil aeration.	Flooded rice emits methane; AWD reduces methane by 25–30%.	Saves water, reduces emissions, and maintains yield.
5. Improved Livestock Feeding & Manure Management	Feeding animals quality fodder and properly storing/using cow dung in biogas units.	Biogas slurry adds stable carbon to the soil and improves fertility.	Better feed reduces methane from animals; biogas reduces need for firewood/LPG.	Clean energy, less pollution, richer soil, lower methane emissions.
6. Crop Residue Recycling (No Burning)	Farmers mix straw/stubble into soil, use it as mulch, or convert it to compost/biochar.	Adds organic matter, increases water retention, and boosts microbial life.	Burning releases CO_2, methane, and smoke; recycling prevents all these emissions.	Healthier soil, cleaner air, and improved carbon storage.
7. Biochar Application	Farmers burn crop waste in low-oxygen pits to create charcoal-like powder and mix it with soil.	Biochar stays in soil for decades, improving fertility and water-holding capacity.	Biochar holds carbon in a very stable form that does not escape easily.	Long-term carbon storage + major soil improvement.
8. Crop Diversification & Intercropping	Growing two or more crops together (like maize + cowpea or millets + legumes).	Roots of different plants enrich soil at different depths and improve nutrients.	More plant cover = more carbon captured and stored in soil.	Higher total yield, better soil health, increased biodiversity.

India's Potential: Numbers That Inspire

If widely adopted, carbon farming can help India:

- sequester **52 million tonnes** of carbon annually
- reduce dependence on chemical fertilizers
- improve soil fertility nationwide
- strengthen drought resilience
- boost farmer income through carbon credits

The Carbon Credit Opportunity: A New Earning Stream

Carbon credits formalize the value of climate-friendly practices. For every 1 tonne of CO_2 reduced or absorbed, a farmer earns 1 carbon credit, which can be sold in national or international markets. This can become a supplemental income source for Indian farmers, especially if carbon trading becomes simpler and more farmer-friendly.

Government Support: Policies that Strengthen the Future

India is actively promoting climate-smart agriculture through:

- Carbon Credit Trading Scheme (CCTS)
- National Green Hydrogen Mission
- CCUS (Carbon Capture, Utilization & Storage)
- National Agroforestry Policy
- Amrit Dharohar for wetland carbon conservation
- Nagar Van Yojana for urban greenery

These initiatives encourage both large and small-scale adoption of carbon farming.

Challenges on the Path Ahead

Even with great potential, carbon farming faces hurdles Initial cost of adopting new systems, Limited awareness among small farmers, Need for skilled monitoring and verification, Carbon price fluctuations, Difficulty in accessing carbon markets individually. Stronger extension services, financial incentives, cooperatives, and digital platforms can bridge these gaps.

A Greener Tomorrow Begins with the Soil

Carbon farming is more than a technique it is a long-term vision. It nurtures the soil, empowers the farmer, cleans the air, and strengthens India's stand against climate change. With the right push, India's fields can evolve into vast carbon sinks that nourish both the planet and the people.

References

1. Olim, S. T., Nickoloff, A., Moffat, L. J., Weaver, A. J., & Eby, M. (2025). Mitigating anthropogenic climate change with aqueous green energy. *Scientific Reports, 15*(1).
2. Dhillon, B. S., & Sohu, V. S. (2024). Climate change shocks and crop production: The food grain bowl of India. Indian Journal of Agronomy, 69(1), 1–10.
3. Gatkal, N. R., Nalawade, S. M., Sahni, R. K., Walunj, A. A., Kadam, P. B., Bhanage, G. B., & Datta, R. (2024). Present trends, sustainable strategies and energy potentials of crop residue management in India: A review. Heliyon.
4. Kumar, N., Bahadur, R., Yadav, S. K., Singh, S. P., Singh, A., Baheliya, A. K., & Kumar, D. (2024). Productivity and profitability of rice (Oryza sativa) influenced by customized fertilizers under rice–wheat cropping system. Indian Journal of Agronomy, 69(1), 11–16.
5. Nugrahaeningtyas, E., Lee, J. S., & Park, K. H. (2024). Greenhouse gas emissions from livestock: Sources, estimation, and mitigation. *Journal of Animal Science and Technology*, *66*(6), 1083.
6. Patel, M. R., & Panwar, N. L. (2023). Biochar from agricultural crop residues: Environmental, production, and life cycle assessment overview. *Resources, Conservation & Recycling Advances*, *19*, 200173.