Carbon Farming: A New Economic Frontier for Indian Agriculture

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ABSTRACT

Carbon farming is an emerging practice in agriculture that allows farmers to earn income through climate-smart practices that sequester carbon dioxide (CO_2) in soil and biomass (FAO, 2021). This innovative model offers dual benefits: it enhances farm sustainability and creates a new revenue stream via carbon credits (Lal, 2020). As the global demand for carbon offsets rises, Indian farmers stand to gain from adopting conservation tillage, agroforestry, biochar application, and cover cropping (ICAR-NAARM, 2023). Despite its promise, carbon farming in India faces challenges like weak carbon markets, high monitoring costs, and lack of policy support (Government of India, 2023). With proper institutional frameworks and incentives, carbon farming could become a transformative tool in India's climate-resilient agricultural future.

INTRODUCTION

Agriculture is not just a victim of climate change—it can also be part of the solution (Lal, 2020). Among the various strategies emerging globally, carbon farming is gaining momentum. It refers to farming methods that sequester carbon in soils and vegetation, thereby reducing greenhouse gas emissions (FAO, 2021). With carbon markets expanding globally, farmers who adopt these practices can earn carbon credits,

which can be sold to industries seeking to offset their emissions (Indigo Ag, 2023).

In India, where over 50 per cent of the population relies on agriculture, integrating carbon farming can revolutionize rural economies by linking sustainability with profitability (ICAR-NAARM, 2023). As India works toward its net-zero emissions target by 2070, carbon farming could play a crucial role in meeting climate goals while ensuring farmer welfare (Government of India, 2023).

What is Carbon Farming?

Carbon farming includes practices that:

- Increase soil organic carbon
- Promote biodiversity
- Reduce methane and nitrous oxide emissions

Examples of carbon-sequestering practices:

- Conservation tillage (FAO, 2021)
- Agroforestry systems (Lal, 2020)
- Cover cropping and crop rotation (ICAR-NAARM, 2023)
- Organic compost and biochar usage (FAO, 2021)
- Improved livestock management (ICAR-NAARM, 2023)

These methods not only store carbon but also improve soil health, enhance water retention, and increase resilience to climate variability (Lal, 2020).

Economic Potential of Carbon Farming

1. **Carbon Credit Income:**

a. Farmers can earn revenue by selling carbon credits in voluntary or compliance carbon markets (Indigo Ag, 2023).

b. One ton of CO_2 equivalent sequestered may fetch ₹500–₹1,500 depending on market prices (Indigo Ag, 2023).

2. **Reduced Input Costs**: Organic practices and minimal tillage reduce fertilizer and diesel usage (FAO, 2021).

3. **Increased Yields**: Improved soil health results in better crop productivity over the long term (Lal, 2020).

4. **Market Incentives**: Private companies and international NGOs are funding carbon farming initiatives to meet ESG (Environmental, Social, and Governance) goals (Indigo Ag, 2023).

Challenges in Adoption

- **Measurement and Verification Complexity:** Accurately quantifying carbon sequestration requires technical tools like satellite imagery and soil sampling (FAO, 2021; Indigo Ag, 2023).
- **Lack of Awareness:** Most Indian farmers are unfamiliar with carbon credit markets (ICAR-NAARM, 2023).
- **Small Landholdings:** Fragmented farms reduce economies of scale in carbon farming (ICAR-NAARM, 2023).
- **Uncertain Carbon Prices:** Carbon markets are still evolving and can be volatile (Indigo Ag, 2023; Government of India, 2023).

Current Initiatives in India

- **Edelweiss–ICRISAT Carbon Project:** Piloting carbon farming in Telangana and Andhra Pradesh (ICAR-NAARM, 2023).
- **Indigo Ag and Grow Indigo:** Engaging Indian farmers to measure, verify, and

monetize carbon practices (Indigo Ag, 2023).

- **NABARD:** Exploring carbon finance through its climate-resilient agriculture programs (ICAR-NAARM, 2023).

India's carbon market policy, still in draft phase (2023), is expected to give clearer guidelines and incentives for agricultural participation (Government of India, 2023).

Recommendations and Strategies

1. **Policy and Institutional Support**: Government should integrate carbon farming under PM-KUSUM, FPOs, and Agri-Climate Missions (Government of India, 2023).
2. **Digital MRV (Monitoring, Reporting, Verification):** Leverage blockchain and satellite tools for affordable and transparent carbon tracking (Indigo Ag, 2023).
3. **Aggregation through FPOs**: Farmer Producer Organizations can pool small farms to make carbon projects viable (ICAR-NAARM, 2023).
4. **Public–Private Partnerships**: Collaborate with ESG-focused corporations and NGOs to fund and scale carbon farming (Indigo Ag, 2023).
5. **Capacity Building**: Training farmers and extension workers on carbon-friendly practices and carbon markets (ICAR-NAARM, 2023).

CONCLUSION

Carbon farming opens a new economic pathway for Indian farmers by aligning climate action with rural income generation (Lal, 2020). As carbon becomes a tradable asset, agriculture must evolve into a net sink rather than a source of emissions (FAO, 2021). With supportive policy, market linkages, and technology, India can unlock this new green economy frontier (Government of India, 2023). By monetizing soil carbon, Indian farmers can turn sustainability into profitability (ICAR-NAARM, 2023).

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