

## Potential of Carbon Credits in India's Agriculture Sector: Empowering Small Farmers for a Sustainable Future

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### Introduction

India's agriculture sector, which employs millions and supports 60% of the population, faces challenges from climate change, low productivity, and dependence on monsoons. However, the growing carbon-credit market offers a transformative opportunity for India's small and marginal farmers, who make up 86.1% of the farming population and typically hold less than 2 hectares of land (FAO, 2021). By adopting sustainable practices such as agroforestry, conservation agriculture, and water-efficient irrigation, these farmers can generate carbon credits that can be sold in carbon markets. This not only helps reduce greenhouse gas (GHG) emissions but also provides an additional revenue stream, enhancing farmers' climate resilience and economic stability.

### Understanding Carbon Credits in Agriculture

A carbon credit represents a reduction or removal of one metric ton of CO<sub>2</sub> or its equivalent in GHG emissions. Farmers generate these credits by implementing sustainable practices that sequester carbon or lower emissions, such as planting trees or improving soil management. Two main types of carbon markets exist:

1. **Compliance Markets:** Regulated by governments to enforce emission reduction targets. Businesses buy carbon credits to meet their regulatory obligations (World Bank, 2022).
2. **Voluntary Markets:** Operate outside regulatory mandates, where companies voluntarily buy carbon credits as part of their CSR and sustainability goals. These markets offer Indian farmers significant opportunities as they adopt eco-friendly practices to generate credits (Verra, 2024).

### Sustainable Agriculture Practices Eligible for Carbon Credits

Various certification standards, like Verra's Verified Carbon Standard (VCS) and the Gold Standard, support carbon credit generation through sustainable agricultural practices, including:

- **Agroforestry:** Integrating trees on farmland enhances carbon sequestration in soil and biomass, helping mitigate climate change. The Vision 2050 report by CAFRI projects

that expanding India's agroforestry from 28.4 to 53 million hectares by 2050 could significantly boost carbon reduction (CAFRI, 2015).

- **Soil Carbon Sequestration:** Techniques like no-till farming, crop rotation, and organic amendments increase soil carbon storage, creating carbon credits from enhanced soil quality and ecosystem services.
- **Methane Reduction:** Sustainable practices, like improved manure handling and rice field water management, reduce methane emissions in livestock and rice farming, making them eligible for carbon credits.
- **Water-Efficient Irrigation:** Drip and sprinkler systems reduce water use, decrease energy requirements, and indirectly lower emissions, contributing to carbon credits (Gold Standard, 2021).

These sustainable methods can generate carbon credits certified by Verra and Gold Standard, which are valuable in both compliance and voluntary markets, allowing farmers to receive financial benefits for their environmental efforts.

### **Institutional Mechanism for Carbon Credit Projects**

Implementing carbon finance projects in India requires a robust institutional framework to help small farmers generate viable carbon credit volumes. By organizing farmers into Farmer Producer Organizations (FPOs) or cooperatives, the process becomes scalable and economically sustainable. Key institutional roles include:

1. **Panchayat (Village Level):** Panchayats identify farmers for carbon finance participation and raise awareness on sustainable practices. They also help organize farmers into FPOs (CAFRI, 2015).
2. **Block Level Authorities:** Block officers aggregate farmers across Panchayats, register projects, and coordinate Monitoring, Reporting, and Verification (MRV) processes using remote sensing (RS) and Geographic Information Systems (GIS).
3. **District Agriculture Officers (DAOs):** DAOs offer technical support and work with certification bodies like Verra to ensure transparency. They also collaborate with private partners to provide resources for scaling FPO-based projects (World Bank, 2022).

### **Marketing Strategy for Carbon Credits**

An effective marketing strategy is essential to maximize the value of carbon credits. Here are some critical components of the strategy:

1. **Identifying Target Buyers:**  
Large corporations, especially in sectors like energy, manufacturing, and aviation, are prime buyers of carbon credits. These companies seek to offset emissions as part of their CSR and sustainability goals, making them key targets for India's agricultural carbon credits.
2. **Ensuring Certification and Standards:**  
Certification by recognized standards such as Verra and Gold Standard enhances the marketability and credibility of carbon credits. Certified credits attract better prices in the marketplace.

### 3. Leveraging Technology for MRV:

Remote sensing, GIS, and blockchain technology ensure efficient monitoring, reporting, and verification of carbon credits, providing transparency and traceability for buyers. Blockchain, in particular, secures transactions and reduces risks of fraud, building confidence among investors.

### 4. Public-Private

### Partnerships:

Collaborating with government programs and private investors can bring in additional resources for FPOs, making projects more attractive to carbon buyers. Government support also enhances the credibility of the projects.

### 5. Bundling

### Farmers

### for

### Scale:

Aggregating farmers through FPOs or cooperatives allows them to generate significant carbon credits collectively, making the project viable and scalable. This approach also strengthens farmers' bargaining power in the marketplace.



**Fig.** Steps involved in developing a carbon credit mechanism for agriculture sector

## How Carbon Credits Enhance Livelihoods of Small and Marginal Farmers

Carbon finance offers small farmers a unique opportunity to diversify their income sources while promoting sustainable practices. By adopting carbon-eligible agricultural methods, they can generate additional revenue from carbon credits. This income helps them:

- **Invest in Better Farming Inputs:** Carbon revenue allows farmers to invest in quality seeds, soil amendments, and tools that increase crop productivity.
- **Build Climate Resilience:** Sustainable practices, such as agroforestry and conservation tillage, improve soil health and water retention, protecting farms from erratic weather patterns and droughts.
- **Create Economic Stability:** Carbon credits provide an additional income stream, reducing dependency on seasonal harvests and market fluctuations, which is particularly important for marginal farmers.

With institutional support, access to technology, and an effective marketing strategy, carbon credits can transform Indian agriculture. By aggregating small farmers into FPOs and implementing a robust institutional framework, India's agriculture sector can contribute significantly to climate goals while enhancing rural livelihoods.

## Conclusion

The potential of carbon credits in India's agriculture sector is vast, and the benefits for small and marginal farmers are equally promising. By adopting sustainable practices, aggregating into FPOs, and leveraging technology for accurate carbon measurement, these farmers can actively participate in the carbon market. This not only contributes to India's climate goals but also provides farmers with a new income source, improving their resilience to climate and economic challenges. With a supportive institutional framework, India's agriculture sector can lead the way in sustainable carbon finance, offering a model for developing nations worldwide.

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