

# Carbon Markets and Indian Farmers: Prospects and Challenges

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Carbon markets present a unique opportunity for Indian farmers to improve soil health, increase yields, and earn additional income while contributing to global climate goals. Carbon markets are trading systems where carbon credits are bought and sold. These markets enable companies or individuals to offset their greenhouse gas (GHG) emissions by purchasing carbon credits from entities that remove or reduce GHG emissions. One carbon credit equals one tonne of carbon dioxide (CO<sub>2</sub>) or an equivalent amount of another greenhouse gas that has been reduced, sequestered, or avoided. When a credit is used to offset emissions, it becomes an "offset" and is no longer tradable.

## India's Carbon Credit Trading Scheme (CCTS)

To meet India's ambitious climate targets and accelerate the decarbonization of its economy, a robust National Framework for the Indian Carbon Market (ICM) is developed. This framework established a reliable National carbon credit trading platform to support entities involved in reducing greenhouse gas (GHG) emissions. By assigning a market value to emission reduction efforts, the framework will provide financial incentives for organizations undertaking decarbonization projects.

In June 2023, the Government of India established the Indian Carbon Market (ICM) by notifying the Carbon Credit Trading Scheme (CCTS), which laid the foundation for carbon trading in the country. The CCTS provides guidelines for Indian entities to track and trade carbon credits and outlines the development of both a voluntary carbon market (baseline-and-credit system) and a compliance carbon market (cap-and-trade system) (Singh and Chaturvedi 2023). In July 2024, the Indian government introduced comprehensive regulations for the planned compliance carbon market under the Carbon Credit Trading Scheme (CCTS). These regulations outline the key design features of the compliance mechanism, representing a major step forward in developing India's carbon pricing framework (BEE).

The Indian Carbon Market Framework includes two key components

## Types of Carbon Markets

There are two main types of carbon markets:

**1. Compliance Markets:** Established through national, regional, or international regulations or policies. A governing body sets emission limits for industries (e.g., steel or energy). Companies that exceed their emission limits must purchase credits to remain compliant, while those that emit less can sell their excess credits to others. This creates a financial incentive to reduce emissions.

## 2. Voluntary Markets

Operate without any legal obligation to reduce emissions. Companies or individuals buy carbon credits to meet corporate sustainability goals or reduce their environmental footprint voluntarily. Credits are supplied by private entities developing carbon projects or government-backed programs certified by carbon standards. Demand comes from corporations, individuals, and market traders looking to profit from price changes.

## Compliance vs. Voluntary Carbon Credit Trading

Aspect	Compliance Markets	Voluntary Markets
Regulation	Government-regulated	Self-motivated, no legal obligation
Emission Limits	Set by a governing body	No set limits
Incentive	Financial penalty for exceeding limits	Sustainability goals and reputation
Trading	Companies can sell excess credits or buy to cover overages	Companies or individuals buy to offset emissions

Together, these mechanisms offer a comprehensive strategy for reducing emissions across the Indian economy.

## How Carbon Credit Trading Works

### 1. Create

A project developer (e.g., a farmer planting trees) conducts a Baseline Emissions Assessment (BEA) to measure the carbon reduction potential. A Project Design Document (PDD) is prepared, detailing how emissions will be reduced or sequestered, along with monitoring and execution plans.

## 2. Issue

An independent verifier reviews the PDD and confirms eligibility for carbon credits. After approval, a standards body (e.g., Verra) officially issues the credits and records them.

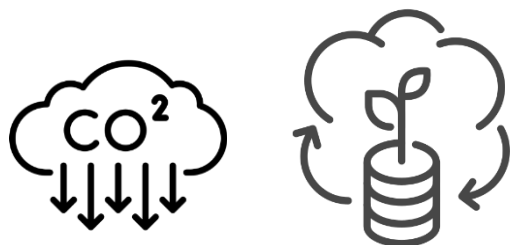
## 3. Trade/Retire

The project developer can sell the credit to a company seeking to offset emissions. Once claimed, the credit is retired from the market and no longer tradable.

### How Indian Farmers Can Benefit from Carbon Credits

Many Indian farmers face declining profits and poor soil health. Carbon markets offer a way to improve soil health while generating additional income. To enhance soil carbon content and improve yields, farmers can adopt these techniques:

- **Cover cropping** – Keeping land covered year-round.
- **Residue mulching** – Recycling bio-waste into the soil.
- **Using manure, compost, and bio-fertilisers** – Boosting soil organic matter.
- **Crop rotation and intercropping** – Enhancing biodiversity and soil structure.
- **Reducing chemical use and flood irrigation** – Preserving soil balance and reducing runoff.



### Direct and Indirect Benefits

1. **Direct Benefit** – Farmers can earn cash incentives for the carbon they sequester: One carbon credit earns approximately INR 780 at current market rates. Large corporations may offer higher rates, up to INR 2,000 per credit. Farmers practicing regenerative techniques can sequester 1–4 credits per acre.
2. **Indirect Benefit** – Improved soil health, including:

- Higher water retention
- Lower soil density
- Better nutrient availability
- Increased water infiltration
- Lower surface temperature

### 1. Adopt Regenerative Agriculture Practices

Nonprofits and Farmer Producer Organizations (FPOs) play a key role in promoting these practices among farmer groups. Adoption takes time and may initially lead to lower yields, requiring support.

### 2. Partner with an Agri-Tech Company

Companies like Boomitra, Nurture.farm, CarbonX, and Carbon Count help farmers list and trade carbon credits in voluntary markets.

### 3. Verification and Trading

Third-party bodies like Verra verify the credits. After approval (within 8–12 months), credits are sold, and incentives are distributed to farmers and FPOs.

### Regulatory Framework

To implement the Indian Carbon Market, the government introduced amendments to the Energy Conservation (Amendment) Act, 2022.

### Key Provisions

The Central Government is empowered to “Specify Carbon Trading Schemes” under Clause (w) of Section 14 of the Act. The amendment enables the issuance of carbon credit certificates by agencies designated by the Central Government. Each carbon credit certificate will represent the reduction or removal of one tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e) from the atmosphere.

The Central Government has officially notified the Carbon Credit Trading Scheme (CCTS) to govern the compliance market.

### Challenges in Farming-Based Carbon Credits

1. **Verification and Additionality** – Accurately proving that increased soil carbon levels are due to new practices is complex.
2. **Delayed Payouts** – It can take 12–18 months from project listing to receive payments.
3. **Small Landholdings** – With the average farm size just over one-hectare, small farmers may not earn enough credits to justify costs.

4. **Lack of Awareness** – Many farmers are unaware of carbon credit programs and their benefits.
- Solutions and Opportunities**
1. **Raise Awareness** – Educate farmers about carbon credit programs and benefits
  2. **Growing Market** – Demand for carbon credits could rise 15-fold by 2030 (McKinsey), boosting market prices.
  3. **Improved Verification** – Technology is making carbon measurement and verification faster and more accurate.
  4. **Group Participation** – FPOs help reduce individual farmer costs and risks by pooling projects.
  5. **Policy Support** – Aligning government schemes with carbon credit programs can simplify participation:
  6. **Regular soil carbon testing**-Integration with organic and regenerative farming policies

**Carbon Credit Startups in India**

In India, a growing number of carbon trading startups are helping farmers generate income by monetizing their carbon sequestration efforts through carbon credits. These startups enable farmers to adopt sustainable agricultural practices while creating new revenue streams from the carbon credits earned. Listed below are a few start-ups offering services to farmers ranging from advisory, input supplies, traceability, trading and compliances.

Startup	Services offered
TRST01 Prevents Green Washing	Robust technology platform for end-to-end traceability with immutability
Farmex Agritech – Builds Portfolio Through Data Intelligence	A platform building, managing, and assisting farmer portfolios through digital technology and data intelligence
Organic Ledger – Brings Trust in Organic	Blockchain and IoT help track every aspect of the organic product from its birth to its shelf.

Real Forest – Monetize Carbon Credit	Agroforestry based social networking app, that digitizes the agro forest of farmers and landowners
Grow Indigo	Connecting farmers with voluntary carbon markets, helping them become agents of positive change while generating additional income.
Boomitra	Partners with local organizations that work with farmers to adopt residue management and enhanced cropping practices.
Varaha	Helps farmers follow sustainable and regenerative farming practices for emission reduction and soil organic carbon sequestration.
nurture.farm	customize farming solutions and provide personalized guidance both on-field via operators and online via app.

Adeeth and Vijesh (2024) have enlisted the following key policy insights for carbon farming in India

**Promote Inclusivity**

Policies should adopt differential pricing to encourage the participation of small farmers and marginalized caste groups in carbon farming projects. Projects that demonstrate greater social inclusivity should receive higher payments to reflect their broader societal benefits.

**Strengthen Communication and Training**

Require project developers to provide clear, consistent communication and regular training sessions to support the effective adoption and long-term success of regenerative farming practices.

**Remove Financial Barriers**

Establish mechanisms to guarantee timely payments to farmers, helping to prevent disadoption caused by financial strain.

**Foster Institutional Collaboration**

Promote partnerships with national and international research centers to design projects that maintain or improve yields, ensuring economic and environmental viability.

**Enhance Monitoring and Accountability**

Develop and enforce robust monitoring frameworks to uphold additionality and permanence principles, increasing the credibility and long-term impact of carbon farming projects.

**Conclusion**

In conclusion, India's robust carbon market reforms, combined with the global shift toward carbon pricing, will enable farmers to embrace sustainable farming practices along with earning additional income. The successful implementation of the CCTS can attract foreign investment, drive technological innovation, and generate employment opportunities. This would accelerate India's shift to a low-carbon economy, strengthen its position as a leader in global

climate action, and highlight its commitment to sustainability.

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