Farmers for Forests | AI and drone-based measurement of trees and carbon stocks

About the Organization

Farmers For Forests, is a **section-8 company** working to help **smallholders** by **doing the Agroforestry plantation**, deforestation prevention, using the AI for the transparent monitoring and **connecting it to the Carbon Market.**

Currently F4F working with 25000+ households, across 6000+ acres of farmland and 500,000 acres of forest land in Maharashtra and Gujarat. Over next 3 years, we are planning to scale our impact up to 1 million acres and make **50,000 smallholders' climate resilient.**

Problem Statement (use case specific)

As **30% of India's land is degraded and 80% of smallholders have been affected** by climate change in the last five years, **agroforestry** can address both of these challenges. Agroforestry improves soil health, increases green cover, enhances biodiversity, and raises farmer income by 2–3 times, reducing income uncertainty. However, the **scale of agroforestry is limited due to high initial costs.**

The **carbon market has the potential to finance large-scale agroforestry implementation,** but **traditional monitoring methods** are manual, time-consuming, and based on small representative samples, **leading to a lack of full visibility, transparency and trust among carbon buyers**. AI-based drone data monitoring increases transparency and trust in the carbon market, enabling the scaling of agroforestry implementation.

AI Solution Description

Our AI solution is an **end-to-end digital MRV platform** using drone imagery and machine learning. It **detects and classifies trees, estimates height, canopy, and carbon stock with high accuracy,** and quantifies uncertainty for reliable carbon reporting. It serves multiple stakeholders:

- **Farmers** earn from the fruit produce and verified carbon revenues.
- **Carbon project developers and NGOs access** low-cost, transparent monitoring.
- **Carbon buyers** gain trust and traceability and increase in the pool of carbon finance thereby impacting farmers on larger scale.

Tools and techniques Used

Key AI techniques, tools, and platforms used include:

- **Detectron-2 (Meta)** for tree crown detection and tree species classification, re-trained on 50,000+ Indian samples.
- **Machine Learning models** for estimating DBH from tree height and canopy and Gaussian Processes for biomass uncertainty quantification.
- **Cloud-based APIs** and web dashboards for data visualization and integration (GeoTIFF, COCO JSON, Shapefiles).

Key Features of tech solution

- Our model achieves over **90% accuracy,** even for **trees as young as one year**.
- The entire technology stack is **open source**, ensuring transparency and adaptability.
- Results from tree detection and carbon stock estimation have been **independently verified and published in a white paper.**

Overall, the solution is **accurate, affordable, robust, and scalable**—making advanced MRV accessible for large-scale agroforestry and carbon projects.

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Impact (Qualitative and Quantitative)

- Currently, the solution supports **25,000+ households and covers 6,000+ acres** of plantations implemented by Farmers for Forests.
- It is also being used by **12+ organizations** engaged in agroforestry and forest restoration, collectively benefiting **10,000+ households and covering over 5,000 acres.**
- The transparent monitoring system has helped attract more carbon finance, **doubling implementation scale each year and increasing carbon credit prices** by **2–3x** due to enhanced data quality and trust
- **Farmers' incomes** have increased up to **three times**, from the fruit produce and carbon credit.

Plan for roll-out and sustainability

- The solution is **already deployed here,** allowing anyone to upload drone data and get results.
- Currently, the solution is used internally for F4F implementation and the pilot is ongoing with **12+ organizations across India and beyond** to test the solution and extend its usability. We are planning to **convert some of the Pilots to large scale implementation,**
- As the solution has been developed using **philanthropic capital**, it is **open source**, and going forward, organizations will pay for data collection, data analysis, and cloud and maintenance costs—ensuring the solution remains **cost-effective and sustainable** at scale.

Additional documents

- White Paper Published on the Solution.
- Video of the solution and demo of how it is helping Farmers.
- Presentation which will provide the high-level overview of the solution.

User Testimonials - "We have done plantations on more than 6,000 hectares, but we were not able to assess the exact impact or demonstrate it to carbon buyers. Your solution will help us do that and achieve higher carbon prices."
— Team Member, Cognisphere Solutions (Partner Organization)