Solidaridad

# IBICOF

# Integration Biochar in cocoa farm under the PRO-PLANTEURS project

Solidaridad

## 1. Starting Situation

Cocoa production in Côte d'Ivoire—representing around **40% of the global cocoa supply** and forming a critical pillar of the national economy and rural livelihoods—is increasingly under pressure from climate change and soil degradation. Over the past two years, national cocoa production **declined significantly from approximately 2 million to 1.6 million tonnes**. This decline is driven by multiple interlinked factors including erratic rainfall patterns, increasing **pest and disease pressure, ageing tree stock, and long-term soil fertility loss.** These developments have severe consequences for cocoa-producing households and the country's wider economic stability.

At the same time, cocoa production generates substantial volumes of biomass residues. Cocoa beans correspond to **more than 5 million tonnes of cocoa pods,** yet most of this plant residue is left to decompose in the field. This results in **avoidable greenhouse gas emissions** and represents a missed opportunity to **convert agricultural waste into a valuable soil amendment.**

Meanwhile, **cocoa farmers face rising input costs and reduced yields,** while national efforts to reduce emissions and promote climate-smart agriculture remain constrained by limited public financing, the absence of standardized carbon accounting frameworks, and the high cost of climate-resilient technologies. These **challenges directly threaten productivity, resilience**, and progress toward sustainable cocoa production systems.

This concept note responds to these challenges and aligns with PRO-PLANTEURS' objective of **improving living conditions of cocoa households** through reduced input costs, **restored soil fertility, and strengthened resilience**. It also contributes to GISCO's sustainability targets related to climate resilience and biodiversity protection.

## 2. Project Rationale: Biochar as a Sustainable Opportunity

Instead of leaving cocoa residues to decompose, there is a clear opportunity to valorise this biomass through biochar production. Biochar is an innovative but low-tech solution that **transforms agricultural waste into a stable carbon-rich material** that can be applied to soil. It offers the dual advantage of **improving soil productivity while storing carbon over a long time horizon**.

Importantly, the full agronomic potential of biochar is best achieved when it is **combined with organic inputs such as compost or manure**. When mixed or "charged" with compost, biochar becomes a highly effective soil amendment that improves nutrient retention, supports soil biology, and enhances water holding capacity—making it particularly relevant for degraded cocoa soils and increasingly erratic rainfall conditions.

Transforming cocoa waste into biochar therefore presents a promising pathway to strengthen the sustainability of the cocoa sector by improving soil fertility, increasing resilience, and contributing to national climate mitigation goals.

However, despite its potential, **biochar adoption in Côte d'Ivoire remains limited.** Key barriers include a **lack of empirical evidence under real cocoa farming conditions, limited technical capacity at cooperative and farmer level, and the absence of scalable business and incentive models.** Previous GIZ-supported pilots confirmed technical feasibility and agronomic benefits but highlighted adoption constraints—particularly the lack of clear incentives and simplified carbon quantification mechanisms.

The proposed IBICOF project (Integration Biochar in Cocoa Farm under the PRO-PLANTEURS Project) is designed to address these barriers by **combining field-based evidence generation with practical capacity building, simplified carbon accounting, and an incentive mechanism linked to environmental performance.**

## 3. Methodology and Innovation

The project builds on earlier technical and scientific validation work supported by GIZ and research institutions. The agronomic benefits of biochar are well established, particularly in degraded soils and climate-stressed environments. Biochar contributes to sustainable cocoa production by:

- **Improving soil structure** through increased porosity and aggregation, enabling better root penetration and water infiltration
- **Enhancing water retention capacity**, which is increasingly important under extended dry seasons and drought conditions
- **Increasing nutrient retention and nutrient availability** by improving soil cation exchange capacity (CEC), which supports healthier plants and improved yields
- **Permanently sequestering carbon in soils,** supporting climate change mitigation and reducing net emissions

Despite these proven benefits, the innovation of IBICOF lies in its deliberate focus on adoption and scalability, not only technical validation. The project therefore introduces two major innovation pillars:

### 3.1 Simplified Carbon Accounting and Incentive Mechanism

A simplified and accessible carbon quantification method will be developed to **estimate carbon sequestration achieved through biochar application.** This method will **align with existing national and institutional carbon accounting frameworks** (e.g., Carbon Office MRV requirements). It will form the basis for a results-based incentive mechanism, allowing farmers and cooperatives to be directly rewarded for verified carbon sequestration.

The incentive mechanism will encourage sustained adoption by turning environmental performance into a tangible benefit for farmers.

### 3.2 Technology Transfer and Income-Generating Activities (IGA)

The project will also promote biochar as a local green business opportunity. Women and youth will be specifically targeted (e.g. with dedicated training on biochar production and business management) for training and equipment support to become biochar producers and service providers. This approach aims to strengthen community-based service delivery systems and create stable local income opportunities while ensuring that biochar remains accessible and affordable for farmers.

Together, these innovations ensure that biochar is not treated as a one-off pilot intervention, but rather as an integrated and farmer-driven practice within sustainable cocoa production systems.

## 4. Project Objectives and Expected Impact

### 4.1 Overall Goal

The overarching long-term aim is to **enhance the sustainability and resilience** of cocoa farming households, **improve living income, strengthen cooperative service delivery,** and **promote gender- and youth-inclusive climate resilient economic opportunities** through the production and application of biochar.

### 4.2 Specific Objectives

The project has three interlinked objectives:

1. **Valorisation of cocoa waste** into biochar to improve soil fertility, nutrient availability, and water retention.
2. Climate change mitigation through **carbon sequestration**, supported by the development of a simplified carbon accounting methodology.
3. **Capacity building and farmer empowerment,** with a focus on enabling women and youth to lead biochar-related income-generating activities.

### 4.3 Expected Outcomes and Indicators

The project is expected to generate positive impacts at farm, cooperative, and community level:

- **Improved soil fertility and enhanced cocoa productivity** through biochar-based soil amendments
- **Reduced dependence on chemical fertilizers** and **lower input costs**

- **Increased resilience of cocoa systems** to drought and climate stress
- **Measurable climate mitigation outcomes** through long-term carbon storage
- Strengthened local green economy through new service and enterprise models led by women and youth
- **Foundation for future carbon-credit opportunities** that can benefit farmers collectively

Progress will be measured through outcome indicators including:

- 30% of pilot beneficiary farmers correctly producing and applying biochar
- 10–15% improvement in yield and soil health, based on soil moisture measurement, CEC analysis, and plot-level yield tracking
- 1,000 tonnes of $CO_2e$ sequestered, linked to one operational incentive mechanism
- 3 biochar-related micro-enterprises led by women and youth

## 5. Project Approach, Work Packages and Key Activities

To ensure adoption, sustainability, and scalability, the project will be implemented through three complementary components.

**Component 1: Adoption**

**Objective:** Encourage adoption by rewarding performance and developing a scalable carbon business model, while ensuring farmers adopt biochar primarily for its agronomic benefits.

Building on Solidaridad's existing biochar pilots (carbon accounting, dMRV, aggregation and incentive design), this component will position carbon payments as a bonus that strengthens long-term adoption and sustainability.

Key activities include:

- **Establishment of demonstration plots** comparing farmer practice vs. farmer practice + biochar
- **Monitoring of yield and soil moisture** performance
- **Training of farmers** via cooperatives on biochar application through GAP modules
- **ToT approach and farmer field days** to showcase results
- Integration of **biochar modules into cooperative training materials** (leaflets, visual aids, practical guides)
- **Identification of a "Biochar Champion"** in each cooperative to support peer learning and scaling

Under this component, Solidaridad will closely work with cooperatives (e.g. for target farmer selection (at least 30% women) and identification of "Biochar Champions" (at least 50%

women)) and implement the project activities through cooperatives in order to strengthen their technical capacities, ownership and long-term anchoring of project benefits.

**Component 2: Incentives / Carbon Business Model**

**Objective:** Strengthen adoption through direct incentives linked to environmental performance.

Key activities include:

- **Development of a simplified carbon quantification method** ($CO_2$ per metric tonne of biochar applied)
- **Integrate dMRV** to track biochar production, aggregation, and plot-level application
- **Alignment with national MRV frameworks** and Carbon Office requirements
- **Design and pilot an incentive package** for farmers/cooperatives (cash transfers and recognition scheme) in two cooperatives
- **Develop a carbon business model**, including aggregation mechanisms and revenue distribution principles
- **Clarify and test financing pathways** (buyer-financed insetting/CSR co-funding and/or external carbon credits) with defined actor roles
- **Documentation of lessons learned** and development of a scalable incentive model for replication

This component will also strengthen engagement with value chain actors such as cocoa traders, processors, and chocolate companies who benefit from improved sustainability performance and can co-finance incentive schemes as part of their climate and CSR commitments.

**Component 3: Income-Generating Activities (IGA)**

**Objective:** Create long-term sustainability through local biochar enterprises and service provision models.

Key activities include:

- **Awareness raising and rapid market research** to stimulate interest among women and youth groups (including VSLA structures)
- **Training and equipping women and youth** for biochar production and marketing
- **Development of small business models** integrated into Rural Service Centres (RSC) and cooperative structures
- **Integration of dMRV** (digital Monitoring, Reporting and Verification) to support traceability and carbon accounting
- **Establishment of logistics solutions** (transporting biomass from farms to kilns, and biochar back to farms for application)

- **Support for market access** through linkages between biochar producers, cooperatives, and farmer networks

This component ensures that biochar becomes locally available at scale and provides economic incentives for sustained community-level uptake.

## 6. Next Steps and Outlook

The integration of biochar into cocoa production systems through the IBICOF project offers a tangible, scalable, and multi-benefit response to Côte d'Ivoire's pressing cocoa sector challenges. It addresses soil degradation, climate vulnerability, and limited economic opportunities through an approach that combines agronomic improvement with climate mitigation and inclusive local entrepreneurship.

To move rapidly from concept to implementation, the following immediate steps are proposed:

- **Finalize partnership agreements and define roles and financial contributions from key stakeholders** including GIZ, Solidaridad, the Conseil du Café-Cacao (CCC), and private sector actors.
- **Develop and validate the detailed MRV protocol**, in collaboration with BMC and relevant research institutions, ensuring that carbon accounting remains simple, credible, and applicable at farmer level.
- **Select pilot sites and establish baseline data**, including soil health indicators, yield performance, and current residue management practices.

Successful implementation of IBICOF will generate strong field evidence and an operational incentive model, laying the foundation for scaling biochar adoption through cooperatives and national cocoa sustainability programs. In the long term, the project can establish a financially viable and farmer-led model for climate-smart cocoa production that strengthens livelihoods while contributing to national and global climate goals.