

INNOVATION PORTFOLIO:

CIRCULAR ECONOMY

solutions in the cocoa sector

Introducing circular economy solutions and models that have been successfully demonstrated within the framework of the “Circular Economy Cocoa Project” funded by the European Union, co-implemented by Helvetas and CDC over 4 years (2022-2027).





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*View library on
Helvetas Vietnam
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*Watch the project
introduction and
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FOREWORD

Vietnamese agriculture is gradually shifting from pursuing output to creating sustainable value. Amid growing pressure from global green standards and market volatility, traditional farming models not only waste resources but can also hold back growth.

Helvetas Vietnam is committed to advancing circular economy approaches to build sustainable agricultural value chains. Our work not only addresses environmental challenges, but also creates greater product value and higher incomes for businesses and farmers.

With funding from the European Union (EU), the Circular Economy Cocoa Project has achieved encouraging results in supporting Vietnam's cocoa sector in its transition towards circularity through key solutions including:

- Transform agricultural by-products into valuable products such as animal feed, organic fertilizer, biochar, biomaterials, pallets, and clean energy, and more.
- Promoting circular and resource-efficient farming, biological pest and disease control, agroforestry, international organic standards, digital traceability systems.
- Promoting policies, mechanisms and enabling conditions for the circular economy to scale across Vietnam's agri-food sectors.

This publication presents circular models proven effective by the Project in cocoa and other sectors, helping farmers, businesses and policymakers turn compliance pressures into a competitive advantage for Vietnamese agricultural products.



→ BY-PRODUCT
VALORIZATION

→ CIRCULAR
FARMING

→ POLICY
AVOCACY

INTRODUCTION

Circular Economy Cocoa Project

OVERALL OBJECTIVES

Promote regenerative and circular economy business model in cocoa and other agri-food sectors and policies of Vietnam, leading to equitable economic growth decoupled from harmful environmental impacts.



**CIRCULAR
ECONOMY
COCOA**

From Bean to Bar

The project is funded by the European Union (EU) and co-implemented by HELVETAS and the Center for Community Development (CDC) from July 2022 to April 2027.

SCOPE OF INTERVENTION

Implement
regenerative & circular
farming solutions

Support low-emission &
resources-saving processing
clean energy & digitalization

Promote facilitating
policies for circular
economy development

After more than four years of operation, the project has achieved positive results, contributing to building a more sustainable cocoa subsector and strengthening the resilience of businesses and farmers to market fluctuations and climate change. Some key results are as follows:

4000+ people

improved knowledge and
skills in circular economy (CE)

1,200+ people

got more jobs related to
CE products & services

20+

enterprises

convert to CE production &
processing



40%

total national cocoa production
using improved methods

€6 million

Private sector
investment in CE.

04

policies
facilitating CE

FUN FACT

From emissions hotspot to green competitive advantage

THE EMISSIONS 'HOTSPOT' LIES UPSTREAM

Life Cycle Assessment (LCA) data show that most greenhouse gas emissions concentrate upstream, with cocoa farming itself as the single largest emissions hotspot*. Any small improvement at the cocoa farm therefore helps meaningfully cut the carbon footprint of the entire global supply chain.

THE POWER OF BY-PRODUCT MANAGEMENT

Cocoa by-products such as pod husks, pruned branches and leaves can generate greenhouse gases, including methane (CH_4) and nitrous oxide (N_2O), when left to decompose naturally in the field. Turning these by-products into organic fertiliser or biochar offers an effective solution.

Cocoa farming combined with microbial composting can reduce the carbon footprint to just 2.89 kg CO_2 eq/kg of dry beans—significantly lower than conventional farming in Brazil (10.46 kg CO_2 eq/kg) or traditional practices in Colombia (8.0 kg CO_2 eq/kg).*

TURN PRESSURE INTO ADVANTAGE.

Circular farming at the farm level not only helps farmers boost yields — it's a core strategy for Vietnamese businesses to hold their ground in green markets.

- Agroforestry: Turns cocoa gardens into biomass carbon "sinks."
- Biochar: Improves soil and locks away carbon permanently.
- Smart Irrigation & Clean Energy: Minimizes resource use and emissions in operations.

And many more innovative circular economy solutions await in this publication.

CACAO & CARBON FOOTPRINT



**Source: Project's research reports on LCA and Carbon Footprint 2024-2025.*

What can be done with cocoa by-products?

BIOLOGICAL PRODUCTS

- Biochar
- Bioplastics
- Bio-pallets
- Compost

FOOD & BEVERAGES

- Juices, syrups
- Jam, ice cream
- Alcohol, vinegar, yogurt
- Kombucha, husk tea

HEALTH & WELLNESS PRODUCTS

- Herbal tea
- Antioxidants
- Dietary supplements
- Skin care



FISH FARMING

*Manure +
Cocoa pods*

Main product: Fish

By-product: Fish pond water

LIVESTOCK FARMING

*Fermented pods +
Cocoa leaves +
Shade leaves, shrubs*

Main products: Meat, milk.

By-product: Animal manure.



IN VIETNAM

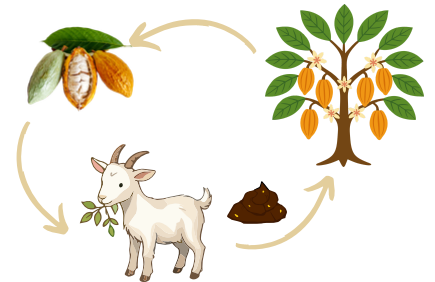
Over 20 CE solutions have been successfully piloted by the EU-Cocoa Project across enterprises, cooperatives, and farming households in the Central Highlands, Southeast, and Mekong Delta regions. These concrete results help confirm that the circular economy is fully viable in Vietnam and truly delivers results.



BY-PRODUCTS FOR LIVESTOCK FARMING

cows, goats, pigs, chickens, fish, etc.

I. CIRCULATORY NUTRITION



CURRENT SITUATION

- By-products of the cocoa sector (such as cocoa husks, pruned branches and leaves, etc.) are often discarded, causing pollution, fungal diseases, and greenhouse gases.
- Rising industrial feed costs are eroding the profits of farmers and farms.

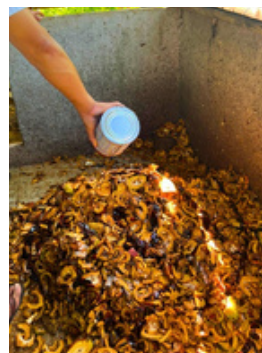
SOLUTION

Fresh cocoa leaves and husks are transformed into nutrient-rich animal feed. Then, the composted manure is used to fertilize the plants, creating a closed and efficient nutrient cycle.



Leaves, fresh pods

Utilizing cocoa leaves as animal feed, or cocoa husks to raise black soldier flies & earthworms, creates a valuable source of protein and fat for livestock farming & fertilizer.



Microbial silage

Fresh leaves and chopped cocoa pods fermented with microbials to stimulate digestion, promote rapid weight gain, and preserve for up to 6 months.



Mixed feed pellets

Mixing cocoa husk powder, corn, cassava, and rice bran with probiotics and then pressing them into pellets creates a nutritious and easily stored food source.



Making biochar

The dried by-products can be processed into biochar to be used as bedding material for deodorizing livestock pens, or mixed into feed to boost the animals' immunity.

Learn the formula and the procedure.



Microbial Silage

Create a stable supply of green fodder



Watch the microbial fermentation process of cocoa husks on YouTube.

COST SAVING

30%

Replaces 30% of conventional green fodder and reduces industrial feed costs for cattle and goats.

BETTER QUALITY

15%

Boosts growth by 15%, improves protein absorption, and yields firm, flavorful meat.

CLEAN ENVIRONMENT

100%

Completely clears fruit husks on-site, cutting off the source of fungal disease transmission in cocoa farm.

Mixing formula

for 100kg of raw materials

Cocoa pods, leaves	97 kg
	+
Molasses (or fine rice bran)	2.5 kg
	+
Table salt	0.5 kg
	+
Microbial preparations*	50-100 ml

*EM concentrate or Biosilo diluted with clean water at a ratio of 1:100



Implementation process

- 01 Chop**

Chop freshly harvested cocoa pods and leaves (same-day harvest) into 2–5 cm pieces. Avoid soggy material; slight wilting is acceptable.
- 02 Mix**

Spread in 15–20 cm layers. Spray the microbial-molasses-salt solution evenly and mix thoroughly.
- 03 Compress**

Pack tightly in a concrete pit or thick PE bag to eliminate air and ensure an anaerobic environment.
- 04 Seal**

Seal tightly with a tarp to protect from sun and rain. Ready to use in 21–30 days; storable for up to 6 months.

Upon opening, it should have a mild, sour scent like pickles and a uniform light yellow or bright green color. Do not feed to livestock if black mold or a foul odor is present.

Mixed feed pellets

Commercialization solution, long-term preservation, balanced nutrition



STORAGE TIME

6-9 MONTH

Easy to store, mold-resistant, and ensures a year-round supply of feed.

EFFECTIVENESS

15-20 DAYS

Improves feed conversion efficiency and shortens the finishing time by 15–20 days.



Mixing formula

Ingredients	Growing phase	Fattening phase
Fine dried cocoa pod powder	20%	30%
Ground corn (maize meal)	35%	40%
Fine rice bran	25%	15%
Cassava meal	10%	10%
Black soldier fly larvae meal (or fish meal)	8%	3%
Livestock probiotics + Trace minerals	2%	2%



Due to natural theobromine content, limit dried cocoa pod powder to max 30% for pigs and chickens, and 40% for cattle and goats to ensure safe, stable growth.

IMPLEMENTATION PROCESS



1 - Dry & grind

Dry/dehydrate cocoa pods until moisture content is <12%, then grind them into a fine powder.

2 - Mix

Mix the ingredients using a horizontal mixer for 10-15'

3 - Press

Place in a pellet press, gently heated (70-80°C) to create hard pellets of the desired size.

4 - Cool & package

The pellets are cooled via a fan system and packed in moisture-proof bags.

Biochar in animal husbandry

Eliminates barn odors and boosts innate immunity

ELIMINATE ODORS

80%

Reduces barn odors (NH_3 , H_2S) by 80%, and drastically reduces respiratory and hoof diseases in livestock.

BOOST IMMUNITY

2%

It helps absorb mycotoxins in the intestines, reducing the incidence of diarrhea in livestock to below 2%.

ENHANCE SOIL



Manure scraped from the floor and mixed with biochar is a premium microbial fertiliser that significantly improves soil health.

APPLICATION 1

Biochar as bedding material for livestock barns

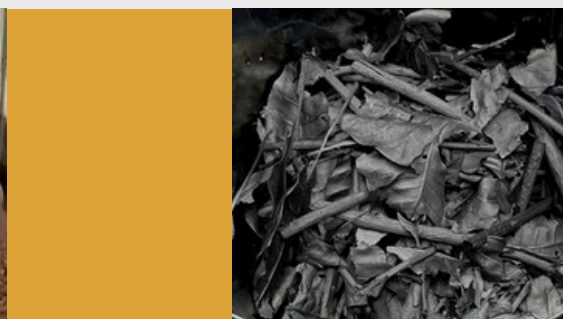
- Dried by-products are pyrolyzed in an oxygen-deprived furnace to produce biochar, which is then crushed into corn-kernel-sized pieces (0.5–1 cm).
- Blend biochar with bedding materials (sawdust or rice husks) at 10–15% by volume, spray with Balasa No.1 inoculant, and spread a biological bedding layer: 40–50 cm for pig pens or 10–15 cm for chicken coops.

APPLICATION 2

Mix biochar into animal feed

- Biochar is ground into a fine powder, similar to flour.
- Mix thoroughly into concentrate feed or pellets at a rate of 0.5% to 1% of the total daily feed weight.

See instructions for making biochar in Part III.



Biochar should be impurity-free and free of ordinary wood ash. It should be porous, lightweight, brittle when squeezed, and free of oil or resin odors.



IMPROVE
SOIL HEALTH

II. SOIL ENHANCEMENT

CURRENT SITUATION

Overuse of chemical fertilisers not only increases costs but also disrupts soil microbial communities, reducing soil fertility and water-holding capacity. Millions of tonnes of agricultural by-products are discarded, wasting valuable resources while potentially becoming reservoirs for pathogens that threaten crop productivity.

SOLUTION

Directly transforming agricultural by-products into high-quality organic fertiliser through microbial composting helps reduce pathogens, return nutrients to the soil, improve soil structure and resilience, and optimise input use.



Composting

Mix fresh cocoa pod husks with manure and Trichoderma, then compost until fully decomposed. Crushed biochar can be added before applying the compost back to the farm to reduce nutrient leaching and improve soil restoration.



Watch composting
process on YouTube.



Raising earthworms with cocoa husks

Mix fresh cocoa pod husks with manure and compost for 2–3 weeks until partially decomposed, then use it to raise earthworms. Vermicompost can be used as a basal fertiliser, while the earthworms can be fed directly to poultry to promote faster growth and improve meat quality.



Learn about the formula and process on the following pages.



Composting solutions

Processing massive quantities of by-products on-site to produce organic fertilizer

REDUCE COSTS

40%

Reduce your annual cost of chemical fertilizers (NPK) by up to 40%.

LAND RECLAMATION



Improves soil fertility, structure, moisture retention, and native microbial activity.

FUNGICIDES

100%

Eliminates fungal disease sources on fresh pods in the field.

Mixing formula

for 1 ton of compost

Fresh (or dried, moistened) cocoa pods	600-700 kg
+	
Fresh manure	200-300 kg
+	
Green leaves, trimmed shade trees.	50-100 kg
+	
Microbial preparations*	1-2 kg

* *Trichoderma antagonistic fungus*
+ *Cellulose-degrading probiotic*



Implementation process

01 Chop & layer

Chop the fruit peel into small pieces, spread a 20cm thick layer of peel and leaves, then spread a 5-10cm thick layer of manure.

02 Add Microbial

Dilute *Trichoderma* with clean water and spray evenly onto the surface of the material layers (*).

03 Pile up & cover

Repeat until the pile reaches 1.2–1.5 m, then round and cover with a dark tarp to retain heat and prevent nutrient loss from rain.

04 Mix

Turn the compost every two weeks. After 45–60 days, it should be dark brown, porous, crumbly, and earthy-smelling—ready for use.



Add water during microbial inoculation to maintain 50–55% moisture (moist but not dripping).

Raising red earthworms with cocoa husks

Creating high-value fertilizer and animal feed sources

PREMIUM FERTILIZER



Vermicompost has a high content of easily digestible nutrients, stimulating strong plant growth.

ECONOMIC EFFICIENCY

100-150^{KG}

One ton of cocoa husks yields 100–150 kg of earthworms for poultry feed or liquid fertilizer.



IMPLEMENTATION PROCESS

1 - Biomass preparation

Compost cocoa pods & cow manure (1:1) as earthworm feed.

2 - Regular feeding

Apply a 5 cm layer of composted feed every 3–5 days.

3 - Maintaining the environment

Keep the rearing beds dark, cool, and maintain stable humidity at 70-80% (light misting).

4 - Double Harvest

After 2-3 months, harvest the worm castings (the top layer) and earthworm biomass for direct feeding to poultry.



Important note

01

Do not feed earthworms fresh cocoa pods directly (they contain a lot of tannins and indigestible substances that can easily kill the worms).

02

Compost chopped cocoa pods with manure for 2-3 weeks to ensure safety before feeding them to earthworms.

03

Avoid direct sunlight and rainwater. Waterlogging will cause anaerobic decomposition, creating foul odors and killing the earthworms.

04

Position the composting area downwind, away from water sources, and near orchards to optimize transportation costs.





III. BIOCHAR

CONTEXT

- Biochar transforms waste into resources, locks in carbon, improves soil, and provides sustainable nutrients.
- The EU-Cacao Project developed two production technologies for small-scale and industrial use, aligned with international standards and optimized for emission control.
- We also trained users on equipment operation and applications of biochar, wood vinegar, and clean heat to maximize economic and environmental benefits.

METHODS OF BIOCHAR PRODUCTION



PYROLYSIS KILN (suitable for small farms)

Using indirect pyrolysis, it produces IBI Class 1–2 biochar and wood vinegar from various by-products. The low-smoke, safe, easy-to-operate system requires only 2 hours of labor per 48-hour batch, with no continuous monitoring.



Watch a pyrolysis kiln & its benefits on YouTube.



GASIFIER FOR AGRIFOOD DRYING (suitable for cooperatives /businesses)

High-temperature gasification (800–1,100°C) uses dry by-products as fuel, with feeding every 2–3 hours. It produces minimal smoke, supplies heat for drying 5–15 tons/batch of agrifood, and simultaneously produces IBI Class 2–3 biochar.



Watch a gasifier demonstration on YouTube.

Learn about the two methods of biochar production in the following pages.



Biochar pyrolysis kiln

Turning by-products into biochar and wood vinegar reduces pollution and creates additional income

CURRENT SITUATION

Agricultural by-products such as cocoa husks, rice straw and coffee husks are often burned, wasting resources and causing pollution. Meanwhile, excessive fertiliser use degrades soil, making it acidic, less able to retain moisture and reducing yields. Farmers also lack affordable, safe solutions to restore soil, manage diseases and improve crop and livestock health.

SOLUTION

The pyrolysis kiln converts agricultural by-products into high-quality biochar (for soil health, higher yields and livestock bedding) and wood vinegar (for pest and disease control and lower pesticide costs). Compact, simple and easy to operate and move, it requires little labour and suits small farms and cooperatives.

+2.5K USD

Income from biochar (\$1.5K/year) and wood vinegar (\$1K/year) allows for a quick return on investment in just 3-5 months.

50%

Save up to 50% on fertilizer & irrigation water costs thanks to biochar's water & fertilizer retention capabilities.

8,8 TONS OF CO₂

Addressing by-products reduces emissions by approximately 8.8 tCO₂e/year/kiln.

+25%

It helps increase crop yield by 25% per year and produces larger fruits.

85%

Reduce pests & diseases with wood vinegar, achieving up to 85% effectiveness (*).

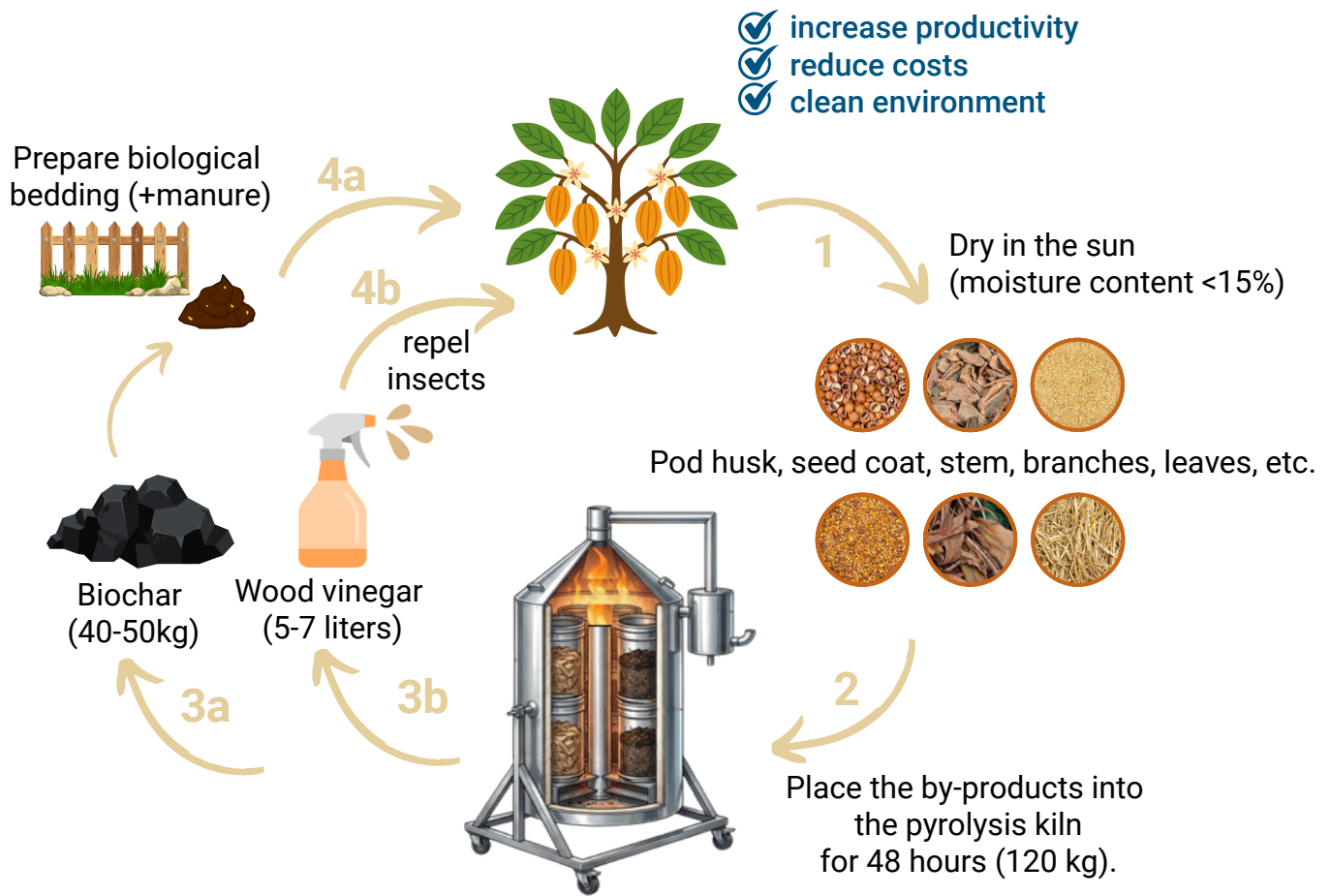


It loosens soil, reduces acidity, and helps absorb heavy metals.



24 farmers and businesses across nine provinces are trialing EU-Cacao Project pyrolysis kilns.

+500 people have been trained in using the kiln and applying biochar & wood vinegar.



FORMULA FOR IMPROVING ACIDIC SOIL CONTAMINATED WITH HEAVY METALS*

0.2 kg biochar + 0.05 kg humic acid + 7.5 kg organic fertilizer + 1.5 kg lime (per tree)

(*) Tested in Vinh Long in 2025, improving soil & plant health & increasing yields by 20–40%.



"I noticed the difference after the first application of biochar. The soil became softer, more porous, and better at retaining water, while the plants grew healthier and produced larger fruits."

- Mr. Nguyen Van Chinh (Phu Tuc, Vinh Long)



"Since using wood vinegar, I've noticed a significant reduction in pests."

- Mr. Nguyen Dinh Thien (Ea Kar, Dak Lak)



CONDITIONS

Available dried by-products

Needs in soil enhancement & pest control.

1 operator

Gasifier for Agrifood Drying

Save on drying costs, utilize by-products, and produce biochar

CURRENT SITUATION

Traditional drying methods are expensive and easily impart a smoky odor to products, while also creating a hot, stuffy, and unhealthy environment. Meanwhile, agricultural by-products are often discarded, causing pollution and waste.

SOLUTION

The Project-supplied Kanai-800 kiln uses gasification to convert by-products into clean hot air for drying, while producing biochar for soil improvement and carbon storage. Operating at Nhat Tam Agricultural Service Cooperative (Ea Kar, Dak Lak), it powers a 4.5-ton drying drum and uses solar energy and local by-products for greater economic and environmental efficiency.

▼▼▼ **40-75%**

Reduce drying fuel costs by 40–75% compared with electric-, gas-, coal-, or wood-fired dryers by using by-products as fuel.

▼▼▼ **37K** ^{USD}

Save up to USD 37,000 per year in drying costs (based on 200 operating days/year).

1/3 

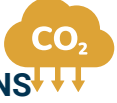
Costs one-third as much as imported models, with a six-month payback period.

26+ _{TON}

Produces ~26 tons of biochar per year.

▼▼▼ **10-15%**

Reduce drying time by 10–15% with continuous operation.

▼▼▼ **231** _{TONS} 

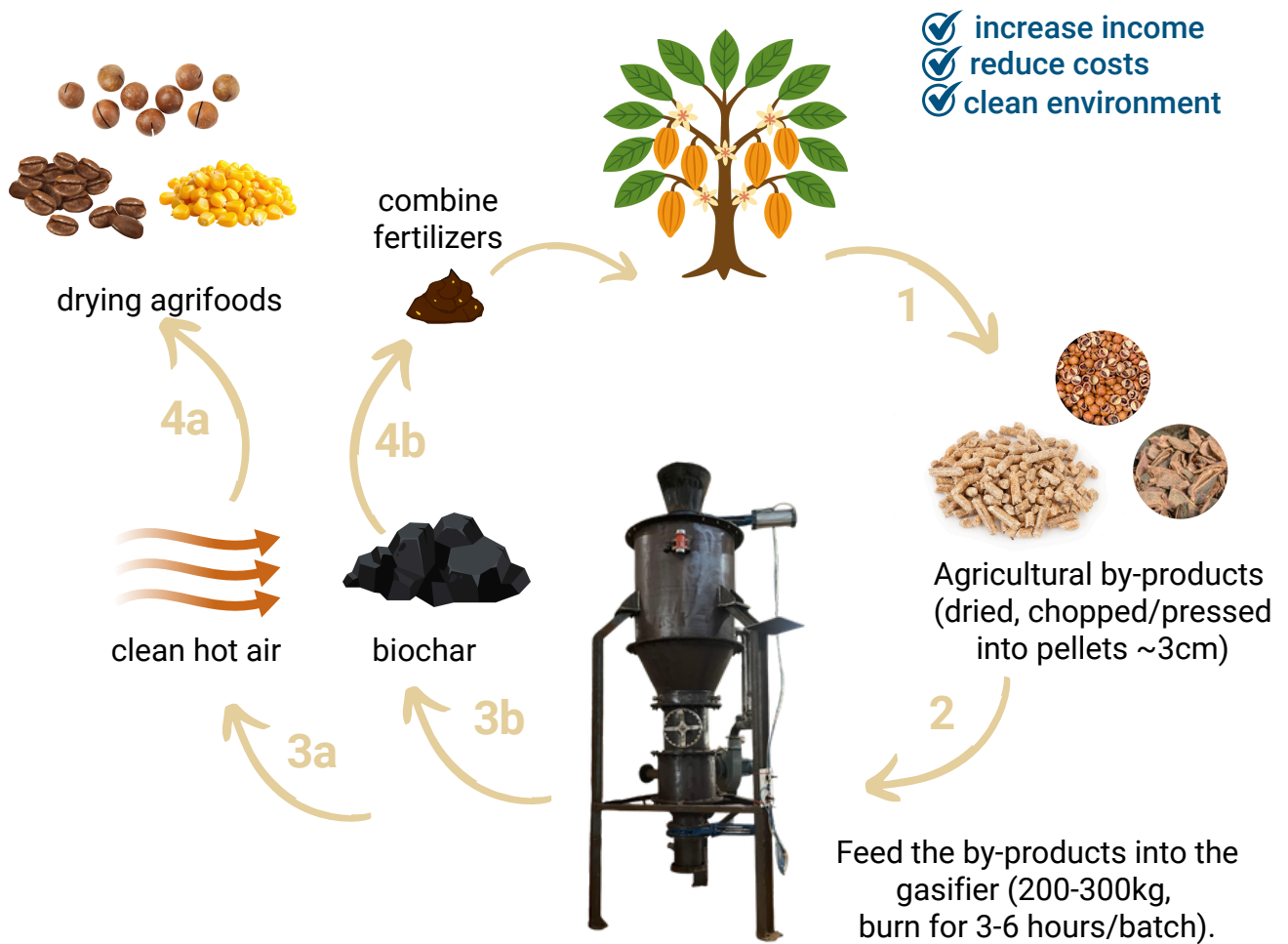
Reducing greenhouse gas emissions by 231 tons per year.



“

My neighbors came to visit the kiln and were surprised to ask me, 'Why isn't there any smoke?'

– Ms. Nguyen Hong Thuong,
Director of Nhat Tam Cooperative



virtually smokeless, odorless

heat generation capacity 1,000 kWh

semi-automatic operation

flexible drying temperature range: 60-300°C

large drying batches of 5-15 tons



- Height 4.2m
- Diameter 0.8m
- Weight 2 tons
- 8mm thick heat-resistant steel
- Power 1.5kW/h
- Load/unload with pneumatic valves.



CONDITIONS

Available dried by-products

Need for continuous, large-batch drying

20m² area



BIOMATERIALS

IV. BIOLOGICAL PRODUCTS

Biomaterial ecosystem from by-products



Watch the introduction
on YouTube.

CURRENT SITUATION

- Vietnam discharges tens of millions of tons of agricultural by-products every year, leading to resource waste and greenhouse gas emissions.
- The packaging and logistics industry relies on natural wood (leading to deforestation) and petroleum-based plastics (causing persistent pollution), creating enormous Scope 3 emission pressure and creating barriers for exporting businesses from global green standards (EUDR, CBAM).

SOLUTION

Converting agricultural waste products (cocoa husks, coffee husks, coconut fiber, etc.) into bio-materials helps reduce the use of non-renewable resources, green the supply chain according to international standards, thereby increasing farmers' income and creating more jobs.



BIO PALLETS

Replace wooden and plastic pallets for export and food storage.



BIOPLASTICS

Replace traditional plastic tableware & consumer goods.



BIOPAPER

Replacing traditional plastic & paper packaging, ensuring food safety.

Learn about different types of biomaterials in the following pages.



Biodegradable pallets

Greening the logistics supply chain



ECONOMY

20%

The cost is 20% cheaper than traditional wooden/plastic pallets.

ENVIRONMENT

34 TON 

1,000 pallets help to isolate the area.
34 tons of CO₂

95%

95% of the ingredients are by-products, perfectly meeting the ESG standards of the high-end market.

Specifications

& international standards

Static load 3,000 kg

Dynamic load 1,500 kg

Weight/sheet 25 kg

Operating temperature 10-50°C

Water-resistant, mold-resistant & termite-resistant.

Fireproof membrane

ISO 6780 certified, suitable for automated warehouses.

Meets international quarantine standards ISPM-15



Production process

01

Collect & Sort

Collect coconut fiber, cocoa husks, and coffee husks from local sources; select compliant materials

02

Grind

Grinding by-products (5-30mm) and dry to achieve a moisture content of <10-15%.

03

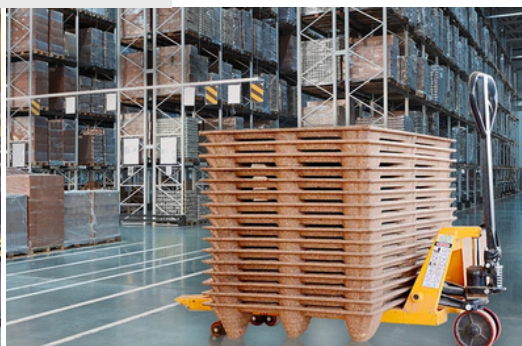
Mix

Homogenize the byproduct powder with 5% bio-adhesive and 1% anti-mold agent.

04

Press

High-pressure hydraulic molding (1.2-2 tons) at 150°C-180°C for 3-5 minutes.



Bioplastics from by-products

Sustainable alternatives to petroleum-based plastics for packaging and consumer goods

The project piloted bioplastics made from by-products to reduce emissions, create new farmer income, and provide a sustainable alternative to conventional plastics.

These solutions can help manufacturers cut fossil-based polymer use by up to 50%, supporting compliance with EU carbon requirements.



COCOA HUSK/COFFEE GROUNDS + PLA

It is industrially biodegradable, suitable for making disposable packaging products such as cups, bowls, plates, spoons, forks, straws, razors, toothbrushes, food wrap, garbage bags, etc.

COCOA HUSK/COFFEE GROUNDS + PP

With a lifespan of up to 5 years, it is recyclable for consumer and household products such as hangers, cups, plates, pens, tables, and chairs.



Production process

01

**Collect
& Sort**

Purchase compliant cocoa husks/coffee grounds from processors.

02

Grind

Grind by-products into fine powder and dry to <10–15% moisture.

03

Mix

Mix the byproduct powder with PP or PLA resin.

04

Press

Heat the material into biodegradable plastic pellets for manufacturing various products.

Chocolate wrapping paper

The combination of art and environment

MAROU
FAISEURS DE CHOCOLAT

Cocoa bean husks generated during roasting and grinding at chocolate factories are milled into fine fibre powder, combined with paper mulberry bark powder, and processed using traditional papermaking techniques to create unique wrapping paper.

The paper retains its natural, rustic surface, with characteristic brown silk-like specks, is soft and smooth, and is very easy to fold for packaging. The EU-Cocoa project successfully supported the printing of the first 2000 trial copies of silk-paper packaging.

This groundbreaking solution helped the Marou Chocolate brand win the "Judges' Favorite Packaging" award at the Prix Épicures de l'Épicerie Fine 2025 held in France.



Drinks made from cocoa pulp

The new product adds value to cocoa by-products



CURRENT PROBLEM

- During the cocoa bean separation process, the mucilaginous pulp is often not utilized effectively, resulting in a waste of a resource rich in natural sugars.
- Cocoa-based wine and beverage processing facilities lack standardized procedures and market orientation.

SOLUTION

The EU-Cacao project supports Nhat Tam Agricultural Service Cooperative (Ea Kar, Dak Lak):

- Standardize the production process from collecting the cocoa mucilage → pasteurization → fermentation → bottling → quality control.
- Develop operating guidelines, traceability records, and hygiene procedures to enhance the stability of cocoa liqueur and fermented cocoa drinks.
- We provide consulting services on brand development, packaging, product positioning, and market orientation to enhance commercial value.



Alcoholic beverages and fermented drinks made from cocoa pulp are positioned as local specialties and souvenirs, targeting tourists and consumers who appreciate local products, thus enhancing brand value.

Automatic irrigation & fertigation system

Advanced technology helps save resources and increase farming efficiency.

CURRENT PROBLEM

The Central Highlands region frequently faces severe water shortages during the dry season, directly threatening cocoa yields and the sustainability of cocoa plantations. Traditional flood irrigation methods waste water resources, wash away nutrients in the soil, require a large workforce, and increase fungal diseases due to uncontrolled humidity in the canopy.

SOLUTION

The water-saving drip/sprinkler irrigation system, integrated with automatic nutrient fertilization using Israeli technology, will be implemented in 50 cocoa-growing households belonging to Nhat Tam Cooperative (Ea Kar, Dak Lak) starting in October 2025, with support from the Thien Tam Fund (Vingroup), the EU-Cacao Project, and contributions from participating households.

This technology helps deliver dissolved nutrients precisely to the active root zone, promoting deep and extensive root development, while keeping the canopy dry, preventing weeds and fungal diseases, and improving cocoa yield and quality.

30-50%

Save 30-50%
of irrigation water.

80%

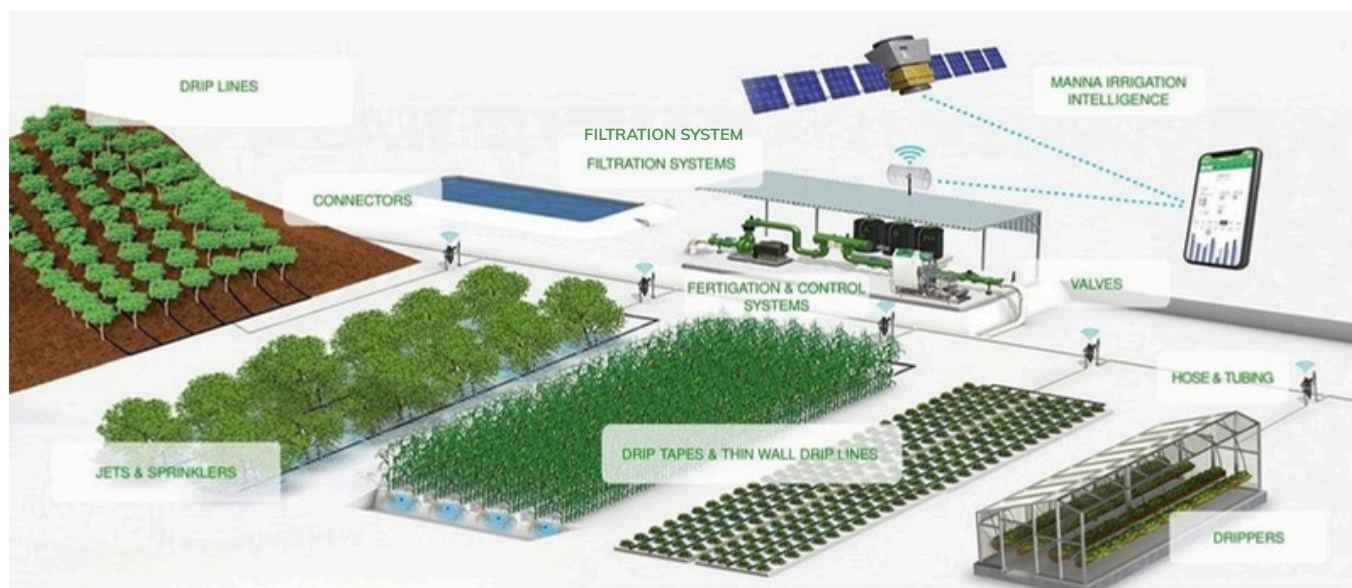
Reduce labor costs for
irrigation and fertilization
operations by up to 80%.

90%

Reduces outbreaks of fungal
diseases and weeds by 90%.



Farmers have received in-depth training, mastered the technology, and can operate it confidently.



This smart irrigation system utilizes artificial intelligence and is manufactured by Rivulis (Israel).

IMPLEMENTATION PROCESS

1 - Check the power source

Maintain a pressure difference below 0.5 bar between the central & filter systems.

2 - Dissolving fertilizer & absorbing nutrients

Dissolve inorganic fertilizer and use a Venturi injector to control nutrient dosing.

3 - Localized distribution

Water & nutrients are delivered through LDPE pipes to pressure-compensating nozzles for each tree.

4 - Draining and Cleaning

Flush with clean water for 5–15 minutes; the final valve automatically removes sediment.

Key Features

01

Rivulis pressure-compensating nozzles: Insect-resistant, self-regulating flow for uniform irrigation across all terrains, including slopes.

02

Durable material: Branch pipes are made from UV-resistant virgin LDPE, ensuring a long lifespan.

03

Smart center: High-capacity disc filter combined with Venturi for precise fertilizer delivery to the root zone.

04

Protection system: Anti-water hammer air release valve, self-cleaning end drain valve.

05

Biological anti-clogging: Flushing removes algae and mold, preventing clogging and costly repairs.

Solar-powered pumping system

Clean energy solutions help save on irrigation costs.

CURRENT PROBLEM

During the dry season, the cost of electricity and fuel for pumping water to irrigate cocoa plantations increases, reducing farmers' profits. When the power grid is down, irrigation is also interrupted, affecting plant growth. Furthermore, the increased use of fossil fuels increases greenhouse gas emissions, making it difficult for cocoa products to meet the sustainable development requirements of the international market.

SOLUTION

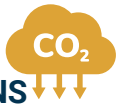
The hybrid water pumping system combines solar power, battery storage, and grid electricity to provide a stable power supply for the pumps. The system automatically prioritizes solar power, storing excess electricity in the batteries and switching to grid power when needed, ensuring continuous irrigation even during low sunlight or power outages. This solution helps reduce operating costs, save energy, and reduce greenhouse gas emissions.

▼▼▼ **2\$** /DAY

Save ~2 USD on electricity bills per day (approximately 730 USD per year)

▼▼▼ **100%**

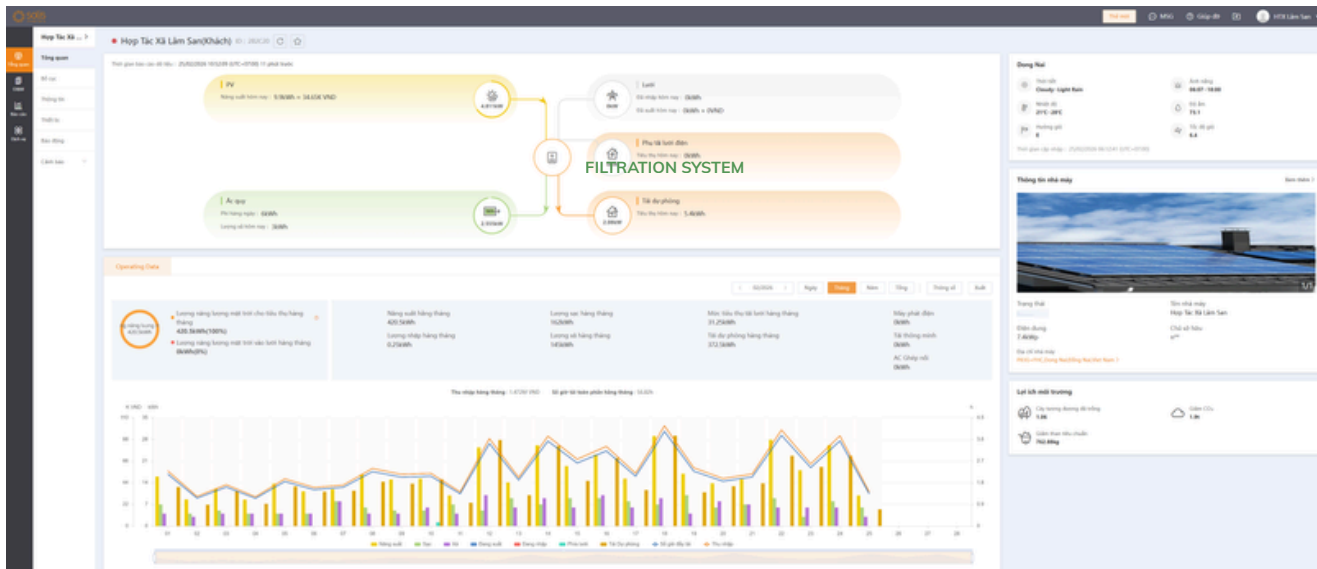
Reduce electricity costs for irrigation by 100% on sunny days, and combine this with battery storage so it can be used when it's dark.

▼▼▼ **8-9** TONS 

This reduces CO₂ emissions by approximately 8-9 tons per year, equivalent to planting over 400 mature trees.



** Data from a 3-hectare cocoa irrigation system at Lam San Cooperative (Dong Nai), powered by 16 solar panels and battery storage.*



The cloud-synchronized solar irrigation system automatically stores real-time emission data. This is a green example that helps agricultural products meet sustainability standards to expand into high-end international markets.

OPERATIONAL PROCEDURE

1 - Harnessing Solar Energy

Solar panels convert sunlight into direct current (DC) electricity.

2 - Smart Power Supply

The hybrid inverter powers the pump, stores excess energy, and draws from the grid when needed.

3 - Irrigation operation

The pump delivers water directly to the tree roots through drip irrigation.

4 - Remote Monitoring

Records electricity generation, battery status, and CO₂ emission reductions.

Specifications

01

Solar panel system: 16 next-generation solar panels, 610 Wp/panel, total capacity nearly 10 kWp.

02

Battery storage: With a capacity of 14.3 kWh, it stores electricity and maintains a stable power supply for the system.

03

MPPT controller: Optimizes solar power output for efficient pump operation.

04

Monitoring system: Enables remote monitoring via SolisCloud.



Monitor SolisCloud regularly for battery or inverter issues, and clean solar panels periodically to maintain optimal output.

Biological pest & disease control

Effective treatment of black rot disease and mosquito bugs

PROBLEM

Pests and diseases such as cocoa black pod disease and cocoa mirid cause significant damage to cocoa yield and quality. The rainy season exacerbates disease outbreaks, leading farmers to use more chemical pesticides. This increases production costs, contributes to environmental pollution, affects cocoa bean quality, and poses risks to farmers' health.

SOLUTION

The EU-Cacao project successfully tested an integrated biological control model for cocoa black pod disease (*Phytophthora palmivora*) and cocoa mirid (*Helopeltis* sp.) in two cocoa plantations in Dak Lak.

In addition to helping control pests and diseases, the use of biological control products can improve soil microbial health and help maintain a more favorable soil pH.

Recommended formula

Controlling black rot disease

Biolacto EM – Apply 2 times

Nano silver

TRIBE (ketomium)

TRISA

Effectiveness **80%-85%**

Cocoa mirid control

Mineral Oil DS 98.8 EC (0.5%)

Bt + entomopathogenic fungi + NPV

TRIBE (ketomium)

Neem oil

Effectiveness **65%-70%**



Agroforestry models

Developing a multi-layered cocoa agroforestry system in line with international standards



PROBLEM

Climate change, extreme weather and soil degradation are reducing yields and resilience in many cocoa-growing areas. Meanwhile, monocropping and informal intercropping often lack shade trees, have low biodiversity and depend on a single source of income, making farmers more vulnerable to market and climate fluctuations.

SOLUTION

The EU-Cocoa Project has supported the development of three agroforestry models suited to different ecological regions—the Central Highlands, Southeast and Mekong Delta—applying the principles of the Rainforest Alliance 2020 Standard.

The models combine cocoa with timber trees, fruit trees and native species to create a multi-layered ecosystem, helping improve productivity, protect natural resources and strengthen climate resilience.

The components of the three Project models are carefully designed and arranged in space and time (multi-layered, diverse, intercropped and rotated) to maximise synergies, reduce competition and improve the efficiency of land, light, water and nutrient use.

Why choose agroforestry?

Benefit	 Farmer	• Diversified income streams from cocoa, fruit trees, and timber. • Reduce risks from weather and price fluctuations. • Improve soil health and maintain long-term productivity.
	 Businesses	• Establishing a stable raw material supply area. • Meeting sustainable development standards • Reduce supply chain risks and enhance brand value.
	 State	• Contributing to the protection of land and water resources. • Increase tree cover and conserve biodiversity. • Implement greenhouse gas emission reduction targets.



Agarwood + cocoa model in Binh Dinh

- Upper layer: Agarwood, Ford's ironwood
- Middle layer: Cocoa, Pigeon pea
- Lower layer: Rose Myrtle, Melastoma, fig



Coffee + cocoa model in Lam Dong

- Upper layer: Rosewood, Mahogany, Cinnamon, Black senna
- Middle layer: Durian, Avocado, Pigeon pea, Leucaena
- Lower layer: Cocoa, Coffee
- Ground cover: Pinto peanut



Coconut + cocoa model in Kien Giang

- Upper layer: Coconut, Melaleuca, Tamanu
- Middle layer: Mango, Orange, Jackfruit, Guava
- Lower layer: Cocoa
- Ground cover: Pineapple, Pinto peanut, Ginger, Turmeric
- Aquatic plants: Lotus, Water lily, Cattail

Agroforestry model based on RainForest Alliance standards

01

Coverage & Layering

≥15% of farm area under natural vegetation.
Encouraged to maintain a multi-layered cropping system.

02

Biodiversity

Conserve and restore ecosystems, native vegetation, and wildlife.

03

Social responsibility

No child or forced labour; ensure workers' rights, fair wages, safety, and decent working conditions.

04

Environmental management

No conversion of natural forests/natural ecosystems since 1 January 2014; protect buffer zones and manage water, waste, and energy.

Organic standards farming

Supporting businesses in obtaining USDA/NOP, JAS, and EU Organic certifications

PROBLEM

The international market increasingly favors certified organic cocoa, yet many Vietnamese growing regions still fall short of USDA, EU Organic, and JAS standards due to chemical inputs and weak management systems, limiting product value and export potential.

SOLUTION

The EU-Cacao Project supported businesses in developing cocoa supply chains aligned with USDA, EU Organic, and JAS standards through assessments, training, process improvement, and documentation.

Businesses and farmers can combine closed-loop systems with technical solutions—organic fertilizers, biocontrol, and water-saving irrigation—to support standardized practices.

BETTER INCOME



Organic products command higher prices and offer greater opportunities to enter export supply chains.

SOIL ENHANCEMENT



Organic farming improves soil structure & earthworm populations, reduces acidity & compaction, and promotes healthier plants with fewer pests and diseases.

STEPS TO OBTAIN INTERNATIONAL ORGANIC CERTIFICATION

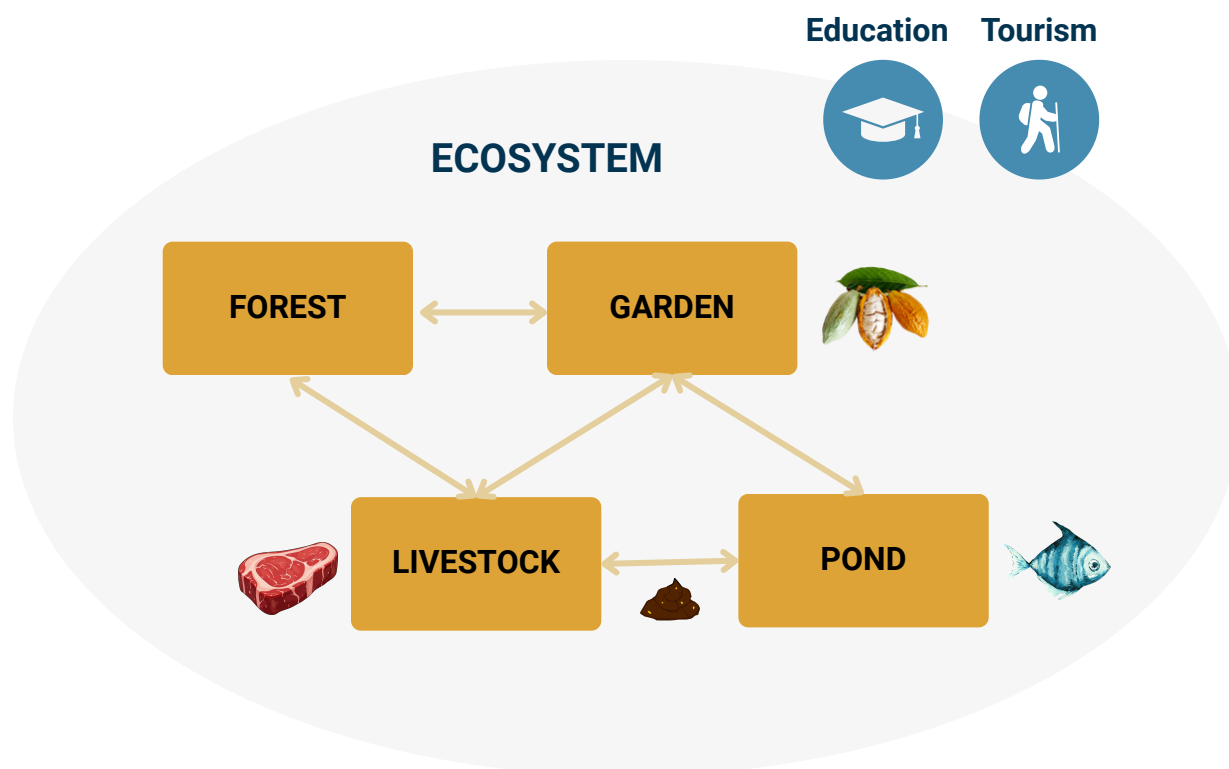
1**Comprehensive assessment***Soil/water quality, buffer zones.***2****Training on organic farm management & processing***Inputs management & farming log.***3****Establish internal control & quality management system.***Transparency & traceability***4****Complete documentation & prepare for certification***Application documents*

- No prohibited inputs, including chemical fertilizers and non-approved pesticides or herbicides.
- Prevent contamination risks from neighboring farms.

Model of circular cocoa farming

An example of sustainable agricultural ecosystem

The project's experts proposed a model for a cocoa plantation based on circular agriculture, building a closed-loop agricultural ecosystem of Garden – Pond – Livestock – Forest combined with a composting facility and by-product processing area, transforming all waste from one chain into input resources for another, aiming for sustainable organic farming and increased economic value.



A circular farming model in Di An (Ho Chi Minh City) by the Nguyen Van Hoang household.





1 - GARDENS & FORESTS

This is the area for growing cocoa and intercropped plants. It is the center of the farming household and the main source of income.

Taller trees/intercropped plants will provide shade for the cocoa, while low-lying shrubs help retain moisture and increase nutrients in the ground cover.



2 - FISH POND

This area provides irrigation water for cocoa during the dry season and collects surface water during the rainy season. Excess plant matter or animal manure is used as fish feed, and then nutrient-rich pond water (from fish waste and leftover feed) is pumped back to irrigate the cocoa plants.



3 - COMPOSTING AREA

This is a compost production facility using materials from cocoa plantations, including cocoa tree by-products and cover crops, livestock manure from goat/cow barns, etc.



4 - LIVESTOCK SHELTERS

Utilize plant waste from cocoa plantations and pruned branches and leaves as animal feed; and collect livestock manure as input material for composting facilities and fish ponds.



5 - COCOA BEAN FERMENTATION AREA

This is where the fermentation boxes and measuring equipment used in the cocoa bean fermentation process are located.



6 - DRYING AREA

This area includes greenhouses and drying racks for drying cocoa beans, or drying yards for cocoa pod shells used to make biochar.



7 - KITCHEN AREA / GASIFIER

An anaerobic stove/pyrolysis biochar kiln or gasifier is installed, using dried cocoa husks and by-products as fuel. The heat from the stove/kilns is used for cooking or drying agricultural products, and the resulting biochar is mixed with compost to fertilize the cocoa plantation, helping to improve soil quality.



8 - AREA FOR PRODUCING COCOA BY-PRODUCTS

This is a place where by-products from cocoa trees and intercropped plants are produced. The pulp from cocoa beans is pressed to make wine, vinegar, and fermented beverages. Cocoa husks or fruits from intercropped plants are used to make jam, dried fruit, etc.

Digital traceability system

Supply chain transparency - Enhancing business competitiveness

CURRENT SITUATION

Many cocoa businesses still manage data using paper documents or fragmented spreadsheets, making it difficult to manage sourcing areas, trace origins, and meet the requirements of export markets.

SOLUTION

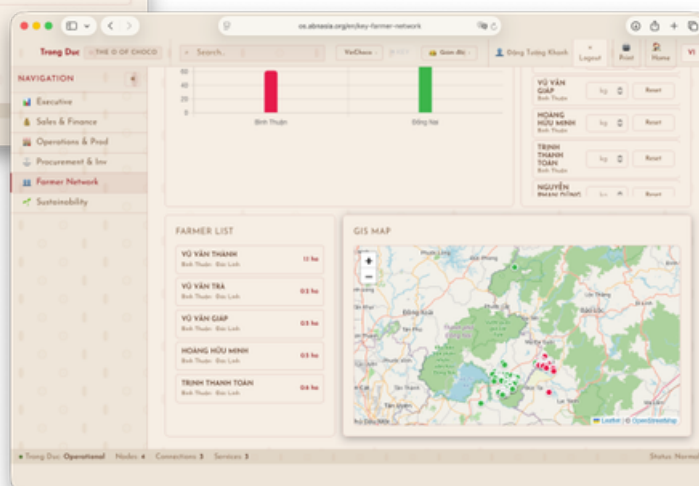
The EU-Cacao Project supports businesses in developing household data management systems and traceability, integrating farm data, digital maps, production records, and tracking tools across web and mobile platforms. The solution standardizes data, improves management efficiency, and strengthens readiness for international markets.

The system has been implemented at Trong Duc Cocoa Co., Ltd. (Dong Nai).



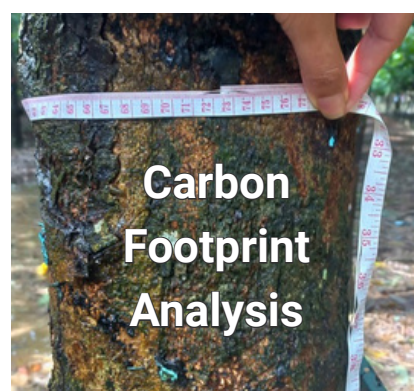
- Farm household and plantation area profiles on a digital map (GIS).
- Production data is updated on mobile devices.

- Information on procurement, processing, and traceability is provided for each product batch.
- Centralized reporting, statistics, and data management.



Other solutions

In addition, the EU-Cacao Project also demonstrated several other solutions for the cocoa industry and replicated in other agrifood sectors such as coffee, cashew, and coconut.



Policy initiatives & institutional development

Macro-level impacts of the Project

- The project has partnered with the Government in launching the National Action Plan on Circular Economy (January 2025), which outlines a strategic direction for efficient resource use, reuse of by-products, and innovation in agricultural products, helping Vietnamese agriculture approach global climate goals.
- The project has developed policy publications (in collaboration with the Institute for Agricultural and Environmental Policy Strategy - Ministry of Agriculture and Environment):

Framework for Circular Economy in Agriculture



A roadmap for integrating the circular economy into farming and Agricultural business, emphasizing closed-loop production and enhancing the value of by-products.

Green Taxonomy Standards and Guidelines



A set of criteria for classifying and proposing incentives for green investments, helping financial institutions and businesses. Access to resources for sustainable development.

- Standardizing national training materials (in collaboration with the National Agricultural Extension Center):



Develop a circular economy guidance document system for the cocoa, coffee, and rice value chains. This document will be widely disseminated through the national agricultural extension system to bring practical knowledge directly to cooperatives and smallholder farmers.

- Introducing and testing new cocoa varieties:



Significant contributions were made to the research, selection, and official registration with the Ministry of Agriculture and Environment of 05 new high-yield cocoa varieties, bringing the total number of cocoa varieties permitted for circulation by the state to 16, contributing to the diversification of genetic resources and improving productivity and quality for farmers.

List of Project Partners

MSMEs implementing circular economy solutions

- Puratos Grand-Place Vietnam Co., Ltd.
- Marou Chocolate Joint Stock Company
- Trong Duc Cocoa Company Limited (VINCHOCO)
- Nhat Thong Dak Lak Agricultural Company Limited
- Nhat Tam Agricultural Services Cooperative
- Dong Tien Agricultural Cooperative
- Thien Loc Phat Agricultural Cooperative
- Nam Truong Son Cocoa Company Limited
- Vung Tau High-Tech Agriculture Company Limited (Baria Chocolate)
- Lam San Agricultural Cooperative
- Phuc An Khang Medicinal Herbs Cooperative
- TrueCoop Organic Cashew Cooperative
- Vinh Hiep Company Limited
- 2-9 Dak Lak Import-Export Company Limited (Simexco)
- OLAM Company Limited
- Mascopex Joint Stock Company
- Asia Coconut Processing Joint Stock Company (ACP)
- GreenCoco Food Company Limited
- Mekong Delta Agricultural Products Import-Export Company Limited
- Thuan Phong Agricultural Products Processing Company Limited



List of Consultants

Technical support for Project solutions

#	SOLUTION	CONSULTANT	ORGANIZATION
1	Microbial silage solution	Prof. Dr. Duong Nguyen Khang	Ho Chi Minh City University of Agriculture and Forestry
2	Mixed feed pellets		
3	Biochar in animal husbandry		
4	Composting		
5	Raising red earthworms		
6	Biochar pyrolysis kiln	Dr. Vu Duong Quynh, Dr. Tran Viet Cuong, MSc. Dinh Quang Hieu, MSc. Phan Huu Thanh	Institute of Agricultural Environment & Ha Tinh University
7	Gasifier for drying agrifoods	MSc. Duong Van Truc, MSc. Pham Quoc Khanh, Ho Viet Cuong	Saigon Water and Environment Company Limited www.sawaen.com
8	Biodegradable pallets	Assoc. Prof. Dr. Pham Huy Tuan, MSc. Pham Ngoc Sinh, Assoc. Prof. Dr. Huynh Dai Phu	HCMC University of Technology and Education, HCMC University of Technology - VNU-HCMC, HCMC University of Technology
9	Bioplastics from by-products	Veritas Vietnam Joint Stock Company https://airxcarbon.com & https://airxcoffee.com	
10	Chocolate wrapping paper	Kobayashi-Ohta Label Vietnam Co., Ltd.	

#	SOLUTION	CONSULTANT	ORGANIZATION
11	Cadmium reduction in cocoa farming	Assoc. Prof. Dr. Nguyen Ngoc Minh, Dr. Vu Duong Quynh, Dr. Tran Viet Cuong, Dr. Nguyen Duc Xuan Chuong, M.Sc. Bui Thi Hue	Vietnam National University, Hanoi; Institute of Agricultural Environment; University of Agriculture and Forestry, Ho Chi Minh City.
12	Automatic irrigation and fertigation system	Kaizen Agriculture Co., Ltd. https://kaizenagri.com	
13	Solar-powered pumping system	NISU Engineering Co., Ltd. https://nissusolar.com	
14	Agroforestry solutions	Dr. Nguyen Duc Xuan Chuong, Dr. Truong Van Vinh, MSc. Nguyen Van Hoang	Ho Chi Minh City University of Agriculture and Forestry
15	Biological pest and disease control	Dr. Le Mai Nhat, Dr. Tu Thi Tuyet Nhung, MSc. Nguyen Hong Tuyen, MSc. Vu Dinh Cuong	Institute of Plant Protection; Center for Organic Agriculture Development Support (CODAS)
16	Farming according to international organic standards.	MSc. Bui Thanh Tung, MSc. Vu Dinh Cuong	Center for Organic Agriculture Development Support (CODAS)
17	Circular cocoa farming	Dr. Pham Hong Duc Phuoc	Independent expert
18	Digital traceability	MSc. Nguyen Thanh Son	ABN Asia
19	Integrated livestock farming model	Prof. Dr. Duong Nguyen Khang	Ho Chi Minh City University of Agriculture and Forestry
20	Carbon Footprint Analysis and Carbon Neutralization Roadmap	Dr. Dinh Sy Khang, Assoc. Prof. Dr. Le Huu Toan, Dr. Dinh Thi Nga, Dr. Le Huu Quynh Anh	Sustainable Development Strategy Consulting Company Limited (SDSC)

ABOUT HELVETAS

HELVETAS was founded in Switzerland in 1955 and is a leading European development organization, with offices in Switzerland, Germany, and the United States. Today, HELVETAS operates in nearly 40 countries.

In Vietnam, HELVETAS has been active since 1995. Over the past 30 years, it has successfully implemented more than 40 development projects in Vietnam, with a combined budget of approximately US\$90 million, benefiting nearly 3 million people nationwide.

HELVETAS Vietnam focuses on sustainable agroforestry, biodiversity conservation, community-based ecotourism, and inclusive economic development in response to climate change.

Our lasting impact is driven by experienced, multidisciplinary teams combining deep local knowledge with international expertise. Through transparent, accountable, and results-oriented approaches, HELVETAS Vietnam has built strong partnerships with government agencies, experts, businesses, and farmers across Vietnam.

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ABOUT CDC

The Community Development Center (CDC) is a community development organization headquartered in Buon Ma Thuot City, Dak Lak Province. Established in 2010, CDC's mission is "Connecting knowledge, serving the community," with a focus on strengthening community capacity and improving livelihoods and quality of life.

Over the years, CDC has implemented programs and projects across Vietnam, focusing on sustainable agriculture, capacity building, technology transfer, livelihood development, support for vulnerable groups, and value chain linkages. Its programs have contributed to capacity building for approximately 5 million farmers nationwide.

CDC has extensive experience working with development organizations and international partners on sustainable agriculture and circular economy initiatives.

CONTACT



Mr. Bach Thanh Tuan

Director

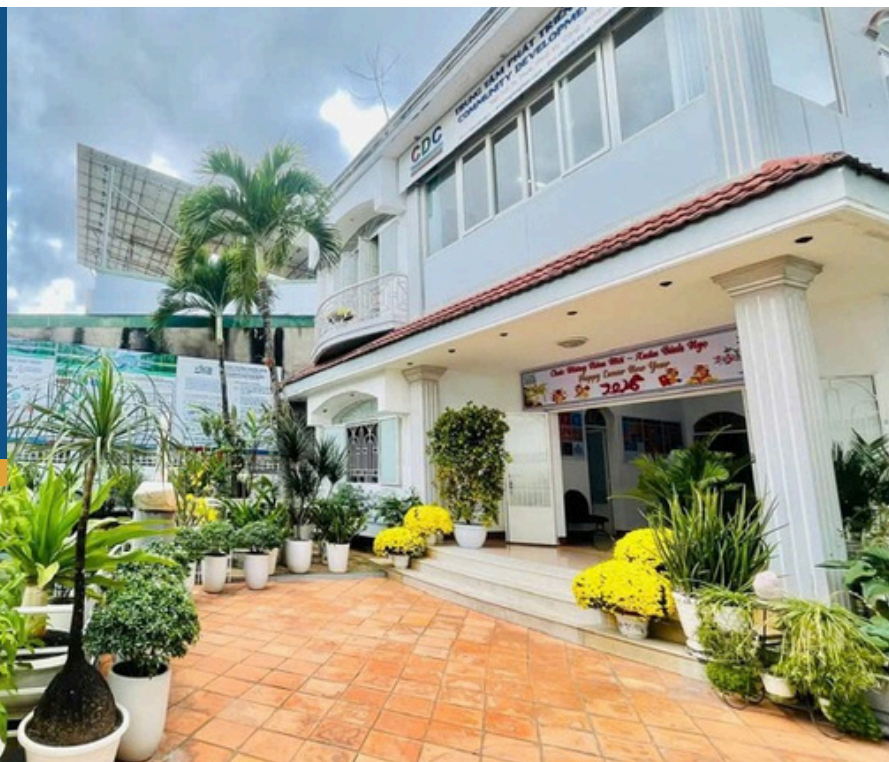
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View the Project documents on the Helvetas website.



Watch the project introduction and solutions on YouTube.



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ECONOMY SOLUTIONS
HAVE BEEN SUCCESSFULLY
DEMONSTRATED
IN VIETNAM.**