



## Terms of Reference

### LIFE CYCLE ASSESSMENT FOR COCOA PRODUCTS IN VIETNAM

Project: Circular Economy Cocoa - “From Bean To Bar”

#### 1. GENERAL INFORMATION

##### The context

The circular economy is increasingly recognized as a way of reducing the environmental footprint of production and consumption, attracting increasing attention from consumers, businesses, and policymakers around the world. While the approach is an emerging topic of discussion for government and business in Vietnam, awareness remains low and has not yet triggered a systemic transition from a conventional/linear economy to a more sustainable circular economy. The cocoa sector was selected because it is large and prominent enough to convincingly prove these concepts and achieve meaningful results, but small and cohesive enough to be a pioneering case. Like other agri-food subsectors, challenges exist at the production level (soil degradation and erosion, water pollution, poor product quality), in processing (use of fossil energy, water use, generation of waste), and later in the lifecycle (harmful packaging choices). All of these are driven by a business and policy environment that does not yet recognize or prioritize circular economy models. Cocoa production has the potential to do no environmental harm if properly managed, but best practices are not widespread. Regenerative and circular economy approaches are needed to decouple the growth of Vietnam’s cocoa subsector from increases in carbon emissions, soil erosion, landslides, water pollution, use of hazardous chemicals, and solid waste from environmentally unfriendly packaging. Cocoa enterprises are still not aware of the circular economy but are willing to make the necessary changes if they are shown how it can be done productively and profitably. It is, therefore, essential to have circular economy success cases that convincingly demonstrate how regenerative agriculture and circular economy can be implemented across product lifecycles. A well-documented example, backed by policy, economic and technical research, is a precondition for the adoption of the circular economy by businesses, financial institutions, and policymakers.

##### The Project

To develop and adopt less polluting and more resource-efficient and circular products, processes, and services by MSMEs allowing their integration to global greener value and supply chains. The Project will deal with numerous issues facing the Vietnamese cocoa and wider agri-food sectors. These include phasing out the use of hazardous chemicals in production, reducing the resource intensiveness of

production and processing, introducing environmentally friendly bio-based packaging, and recirculating cocoa waste products as energy sources and raw materials for agricultural inputs and packaging. Digitalization of traceability will also contribute to the growth of efficient, environmentally sound cocoa supply chains.

The expected impact of the Project is that the transition of the cocoa and chocolate subsector to a regenerative and circular economy business model will trigger the uptake of circular economy in the wider agri-food sector and policies of Vietnam, leading to equitable economic growth decoupled from harmful environmental impacts.

The specific objectives include:

- Transition the cocoa/chocolate subsector to regenerative and circular economy approaches at key points of the product lifecycle;
- Leverage change in the cocoa subsector to trigger the uptake of circular economy approaches in the wider agri-food sector;
- Prove the feasibility of closed-loop and circular production, providing an example for others to follow and informing supportive policies.

The expected outcomes include:

- Outcome 1: Cocoa producers and supporting businesses increase productivity and reduce negative environmental impacts through integrated, regenerative and closed-loop production, post-harvesting and trade.
- Outcome 2: Cocoa and chocolate processors decrease environmental footprint through reduced waste and more efficient energy and water use, verified by a management system that applies a digitalized traceability system.
- Outcome 3: Cocoa provides a reproduceable model for uptake of circular economy in the Vietnamese agri-food sector and agri-food policies.

The Project, funded by the European Union and donations, will be implemented by Helvetas Vietnam and the local partner organization CDC (Community Development Center) for 04 years from April 2022 to Mar 2026. Tentative geographical areas of the Project cover 06-07 cacao provinces in Central Highlands (Daklak, Daknong, Lamdong, Gialai) and Mekong Delta (Dongnai, Bentre, and BRVT).

### **Life Cycle Assessment (LCA) approach**

LCA is an international standardized methodology that follows ISO 14040/44 standards and seeks to provide an assessment of the environmental performance of a product or service throughout its life cycle, from cradle to grave: extraction of raw material, production or processing, use, and subsequent disposal (International Standardization Organization, 2006).

## **2. OBJECTIVES**

This Life Cycle Assessment will measure the upstream and downstream impacts of the cocoa sector throughout the value chain, particularly impacts on environmental indicators, such as water use, energy,

climate change, and raw materials. It will also provide a holistic vision of social and ecological interactions and processes that exist in the productive system.

The main objectives of the study are identified below:

- To identify and quantify key environmental impacts along the cocoa's production chain.
- To assess the relative contribution of each stage of production to the identified environmental impacts.
- To suggest some improvement options for relevant stakeholders based on the results obtained.

The results of the life cycle assessment will be used as

- (i) a useful resource for the planning of business models, project activities, and partnerships; and
- (ii) a useful source for baseline information and will act as one of the first "case studies" of the Project supporting for Outcome 3.

Data generated from the cocoa life cycle assessment will be used to develop new business models to address the existing problems of the cocoa subsector include:

Production: Conventional cocoa production in Vietnam uses harmful chemicals, is water intensive and causes negative impacts on soil and water quality and biodiversity. Unrealized opportunities exist to sequester CO<sub>2</sub> while improving productivity and resilience in integrated, dynamic production systems with suitable tree-crop/livestock combinations with organic-fertilizer, bio-pesticide, and biochar. Integrated, closed-loop production systems piloted in Vietnam by Puratos Grand Place and producers like Trong Duc Co., Ltd., Thanh Dat Co., Ltd., and Cacao Nong Lam demonstrate how to overcome these environmental issues. These proven techniques are not yet popular due to the low availability of regenerative technologies and the advice and support services to implement them. The project will help producer cooperatives, larger farms and MSMEs to roll out business models that enable labour and resource-efficient closed-loop and regenerative production techniques that support these farms to transform the early parts of the product lifecycle.

Logistics and Post-harvest: Trading of cocoa is logistically inefficient, with beans sometimes moving between three or four intermediaries before arriving at processors. In addition to transport-related CO<sub>2</sub> emissions, this can reduce product quality and makes traceability difficult. In supply chains where cocoa is fermented before being sent to processors, cocoa husks, juice and sweatings from fermentation create large waste streams that can be repurposed for value-added production of biochar, animal feed, or raising black soldier fly larvae for fish or poultry rearing. The project will work with MSMEs trading and fermenting cocoa to rationalize supply chains and transportation, reduce CO<sub>2</sub> emissions or sequester more carbon in soils and recycle waste into productive uses.

Processing: The mid-lifecycle steps of cocoa processing requires large energy inputs, especially for heat during roasting and electricity for operations. Process energy efficiency needs to be optimized and energy sources need to be shifted from conventional main electricity, wood, or liquified petroleum gas to renewable sources such as solar power and carbon-neutral energy from waste. Cocoa bean shell waste streams can also be redirected, ideally as input for bio-based packaging for cocoa and chocolate products.

Packaging: Prototypes of environmental-friendly, recyclable and biodegradable packaging made from cocoa bean shells exist, but poor links between sustainability researchers and industry stalled commercialization. Commercialization and uptake of this technology for packaging cocoa and chocolate will decrease the use of other resources, reduce end of lifecycle impacts and provide consumers with a tangible example of circular economy principles in action.

Traceability: Traceability and documentation of sustainability systems such as Puratos Grand Place's CocoaTrace standard currently use time-consuming paper-based systems and do not cover measuring proper environmental indicators. For other companies, new technology solutions can be adapted and leveraged to meet the traceability needs of producers and companies and can eventually be leveraged to empower consumer decisions.

### 3. SCOPE OF WORKS

This study focuses on life cycle assessments for cocoa-based products produced by cocoa farmers, fermenters, processors, and factories within the project area in Vietnam to assess emissions associated with production and carbon storage in the products throughout their life cycle. This assessment starts from the extraction of raw materials through to processing, transport, use and disposal. The emissions generated from harvesting residuals through decay are omitted, as they are not significant sources.

The Consultant will conduct desk and field research to deliver a comprehensive (LCA) report which commonly includes four following components<sup>1</sup>:

- i. Goal and scope definition: that describes the specific product under study, its function, aspects of the life cycle to be studied and the purpose of the study;
- ii. Life cycle inventory: that includes a detailed account of all the inputs and outputs involved in the defined environmental impact categories;
- iii. Impact analyses: these are organized to enable the evaluation of impacts in commonly used categories (for instance, energy consumption, greenhouse gas emissions, waste products); and
- iv. Interpretation of results: these are reported as informatively as possible wherein the need and opportunities to reduce the impacts on the environment.

### 4. METHODOLOGY

The Consultant(s) are required to propose appropriate qualitative and quantitative research methods for the study. However, the methodology used in principle should follow **the international ISO 14040 series standards**<sup>2</sup> providing the basic requirements and methods for the assessment of the environmental aspects of a product or service in its entire life cycle stages. The EU's ILCD Handbook<sup>3</sup> additionally could be used as a guiding reference.

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<sup>1</sup> Vogtländer and Van der Lugt, 2014.

<sup>2</sup> ISO 14040 is an overarching standard encompassing all four phases of LCA. There are three more standards supplementing ISO 14040. ISO 14041 deals with goal and scope definition and life cycle inventory methods. ISO 14042 deals with life cycle impact assessment methods and ISO 14043 life cycle interpretation methods.

<sup>3</sup> International Reference Life Cycle Data System: <https://eplca.jrc.ec.europa.eu/uploads/ILCD-Handbook-General-guide-for-LCA-DETAILED-GUIDANCE-12March2010-ISBN-fin-v1.0-EN.pdf>

The primary data collection is presumed the major data collection method hence the tools should be prepared and discussed intensively with the Project Manager (Helvetas) and piloted in field.

- The target groups: The most important target groups include the cocoa farmers, cocoa fermenters and cocoa/chocolate processors.
- The target location: 04 provinces include Daklak, Daknong (in Central Highland) and Dong Nai, Ba Ria-Vung Tau (South East Region).
- Sampling: No specific requirement for sampling methods or sample size, the Consultant will propose the most appropriate ones.

The Consultant will work in close collaboration with the Project Manager and representatives of project partners including CDC<sup>4</sup>, cocoa MSMEs<sup>5</sup> and other relevant stakeholders, if necessary. The Consultant could review the literature context, and conduct interviews and discussions with related stakeholders including project partners, the private sector, beneficiaries, relevant donors/NGOs, etc.

## **5. REQUIRED QUALIFICATIONS**

The consulting firm/team is suggested to be comprised of more than one consultant.

The main responsibilities of the team leader are:

- Develop the methodology for the research based on providing a robust evidence-base.
- Provide overall strategic guidance and be responsible for the overall study process.
- Develop the structure of the data template and list of needed data for LCA modeling.
- Allocate tasks to the team members, supervise and guide the team members in implementing their tasks and be responsible for the overall quality control of the study.
- Coordinate with project partners and other stakeholders.
- Write the LCA final report.

The team leader should have the following qualifications:

- A specialist with significant professional experience in the implementation and application of Life Cycle Assessment.
- Minimum of a Master's degree qualification in environmental (or relevant) sciences and minimum of 10 years experience in conducting environmental or value chain studies under agricultural and/or environmental programmes.
- Extensive quantitative and qualitative work, data analysis and modeling.
- Proficiency with LCA impact categories and their equivalences to translate into something tangible for non-technical stakeholders.
- Proficiency in and the use of LCA software (GaBi, SimaPro or OpenLCA).
- Understanding cacao production and processing technologies, sustainable development and agricultural policies in Vietnam (would be an advantage).
- Understanding circular economy and regenerative agriculture (is preferred).

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<sup>4</sup> Community Development Center (CDC)

<sup>5</sup> Including Puratos Grand Place, Trong Duc Cocoa Co. Ltd

- Very good communication skills and professional working efficiency in English.

Other team members should be:

- A specialist in environmental and agricultural sciences or other relevant expertise.
- Excellent experience and knowledge of academic research on environmental impacts.
- Familiar with LCA standards and methods.
- Understanding raw materials and agricultural supply chain.
- Understanding cacao production and processing technologies (is helpful).
- Very good communication skills and professional working efficiency in English and Vietnamese.

## 6. DELIVERABLES

The Consultant is supposed to deliver on time and of good quality the following deliverables, in English:

- A full set of cleaned data collected during the LCA process, both quantitative and qualitative.
- A final LCA report meeting the ISO standard requirements<sup>6</sup> of how the results of an LCA should be documented. The final report should be reviewed and approved by the Project Manager of HELVETAS Vietnam.
- A presentation (Powerpoint) to summarize key fact findings and recommendations.

## 7. SUGGESTED TIME:

The timeframe for this consultancy is between December 10<sup>st</sup>, 2022 - March 10<sup>th</sup>, 2023 including both desk research and field travels. The consultant must ensure the completion of the entire study deliverables within this timeframe.

## 8. FINANCIAL AND FIELD TRAVELS:

Financial proposal should be prepared in the unit of actual working days with the proposed rate of each individual consultants.

The field travel plan of the consultants would be proposed in the Technical Proposal and attached to the contract afterward. Travel costs including airfare, airport taxi and ground travel, per diem and accommodation for field trips will be supported by the Project subjected to EU-based cost norms.

Candidates, who are interested in this work, please send your Technical & Financial proposal and the team CVs to [helvetas.vietnam@helvetas.org](mailto:helvetas.vietnam@helvetas.org) and [tuan.nguyen@helvetas.org](mailto:tuan.nguyen@helvetas.org) by **November 30, 2022**.

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<sup>6</sup> ISO 14040:1997: "The results of the LCA shall be fairly, completely and accurately reported to the intended audience... The results data, methods, assumptions and limitations shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities and trade-offs inherent in the LCA-study. The report shall also allow the results and interpretation to be used in a manner consistent with the goals of the study."