

Value chain analysis of cocoa in Sierra Leone

Value chain analyses assist in informing policy dialogue and investment operations. They help the understanding of how agricultural development fits within market dynamics. They permit an assessment of the value chains' impact on smallholders, businesses, society and environment.

The European Commission has developed a standardised methodological framework for analysis (<https://europa.eu/capacity4dev/valuechain-analysis-for-development-vca4d-/documents/methodological-brief-eng>). It aims to understand to what extent the value chain allows for inclusive economic growth and whether it is both socially and environmentally sustainable.

The value chain context

Cocoa is Sierra Leone's most strategic agricultural export, accounting for 63% of agricultural export earnings in 2023, while underpinning the livelihoods and food security of over 120,000 rural households. The sector is dominated by smallholder farmers cultivating typically 1-3 hectare plots under low-input agroforestry systems, many of which are characterised by ageing tree stock and limited farm investment. Land tenure is governed largely through customary systems, with most producers lacking formal land titles.

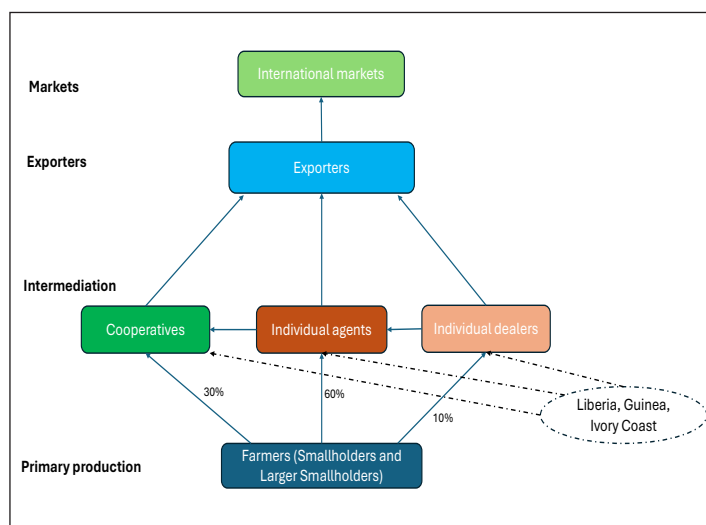


Figure 1. Flowchart of the VC

The value chain is highly export-oriented and liberalised, with the European Union, particularly the Netherlands, serving as the principal market destination. Despite its strong market position and organic production potential, the sector faces significant structural constraints. Cocoa yields remain critically low, averaging only 0.35-0.40 tonnes per hectare, largely due to ageing orchards, weak farm management, and limited access to inputs and finance. Additional challenges include inadequate rural infrastructure, widespread liquidity constraints, climate-related risks, and increasing compliance pressures associated with the EU Deforestation Regulation (EUDR), with fewer than 30% of cocoa farms currently geolocated. These factors collectively constrain productivity, competitiveness, and the long-term sustainability of the sector.

The European Union intervention

The European Union (EU) is the principal destination market for Sierra Leone's cocoa, with the Netherlands accounting for more than 95% of exports. Consequently, sector development and policy priorities are increasingly shaped by evolving EU market requirements, particularly those related to organic certification, sustainability standards, and compliance with the EUDR.

The EU has been an important development partner in the cocoa sector, supporting initiatives aimed at strengthening processing capacity, promoting agroforestry systems, improving certification schemes, and enhancing market access. In collaboration with the Government of Sierra Leone, the EU also commissioned this VCA4D study to provide an evidence base for future policy dialogue and investment decisions. Current and planned interventions focus on improving productivity, strengthening traceability systems, promoting value addition, and supporting EUDR compliance. These efforts are critical for safeguarding continued access to high-value European markets and enhancing the long-term competitiveness and sustainability of Sierra Leone's cocoa sector.

Functional analysis

Production

National cocoa production reached 18,000–19,000 metric tonnes in the 2022/23 season. Yield variability exhibits significant structural stagnation, averaging just 0.35–0.40 tonnes per hectare. This low productivity is driven by ageing tree stocks (40–70 years old), a lack of mineral fertilisers, and weak disease control. The sector rests on over 120,000 smallholder households, divided between smallholders (≤5 acres) and larger smallholders (>5 acres).

Processing, Marketing and Trade

Post-harvest stages, primarily fermentation and drying, are executed manually by smallholders at the farm level. The processing sector lacks industrial scale, with local milling and processing capturing less than 1% of national volume. Infrastructural deficits, including a lack of standardised fermentation boxes and roadside solar drying practices, result in inconsistent quality.

Trade flows are highly fragmented, with informal agents handling 60% of output, cooperatives 30%, and individual dealers 10%. Logistics are severely constrained by poor feeder roads, making initial transport reliant on low-capacity motorcycles. The sector is entirely export-driven, with over 95% of volume destined for the Netherlands. Price competitiveness is structurally limited, as the sector operates strictly as a price-taker, with domestic farm-gate prices directly mirroring volatile global futures markets.

Sub-chains

The value chain is differentiated primarily by marketing and aggregation arrangements rather than by distinct processing pathways. The informal agent sub-chain is the

largest, capturing 60% of total volume. Agents act as essential liquidity providers during the lean season, generating 6% of total direct value added. The cooperative sub-chain handles 30% of the volume, focusing heavily on certified organic and Fairtrade exports. However, burdened by certification costs and high overheads, cooperatives capture only 3% of the direct value added. The individual dealer channel handles the remaining 10% of volume, capturing 4% of value added. In some instances, individual dealers will work opportunistically selling to agents and/or cooperates.

Across all segments, primary producers drive economic value creation, generating 68% of total direct value added due to highly labour-intensive cultivation. Conversely, the 20 licensed exporters coordinate international logistics, capturing 20% of the value added through massive scale.

Governance

Institutional governance is heavily liberalised, operating without state monopolies or direct price-setting mechanisms. The Produce Monitoring Board (PMB) functions as the primary regulatory institution, mandated to control physical produce quality and issue export licenses.

The national policy framework includes the 2022 Customary Land Rights Act, empowering communities with Free Prior Informed Consent, yet limited formal registration complicates international compliance. Regulatory oversight regarding environmental and spatial documentation, such as GIS mapping for EUDR, falls outside the PMB's historical capacity, representing a critical institutional gap.

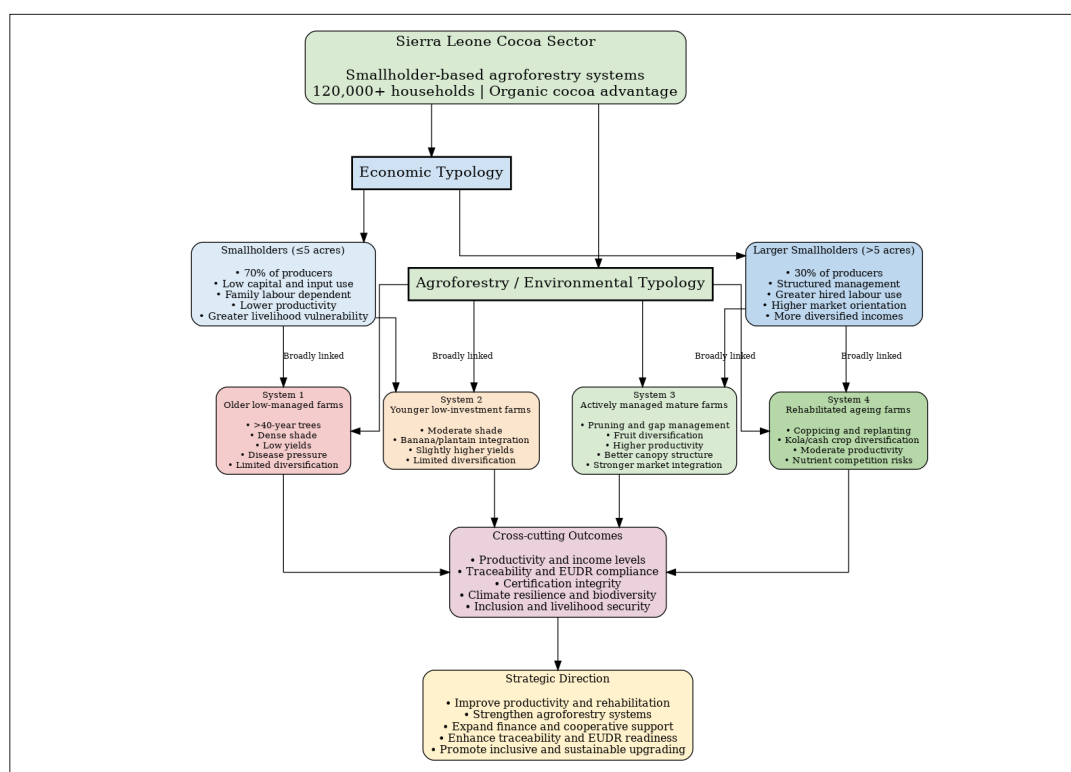


Figure 2. Typology of actors

What is the contribution of the value chain to economic growth?

Financial viability of the actors

Financial performance across the value chain is highly uneven. Smallholder and larger smallholder farmers achieve high returns on turnover (82% and 92% respectively, Figure 2) due to minimal purchased inputs. However, these high margins should not be interpreted as high incomes. Low yields, small farm sizes, and limited marketed volumes result in modest absolute profits for most farming households. Downstream actors demonstrate varying efficiency, with individual dealers achieving 37% returns on turnover, while agents and cooperatives operate on tighter 9% margins. Exporters maintain 15% margins but capture immense absolute profits through volume aggregation.

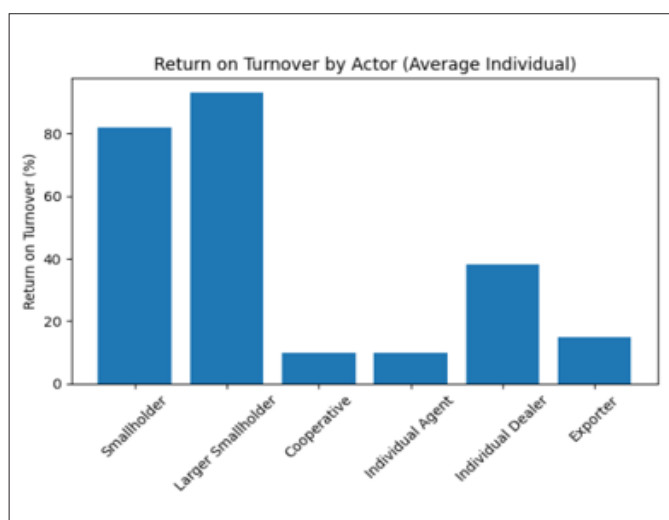


Figure 3: Return on turnover by individual actor

The distribution of direct value added further highlights the central role of primary production in value creation (Figure 3). Smallholder producers account for approximately 45% of direct value added and larger smallholders for a further 23%, meaning that producers collectively generate about 68% of total value added. Exporters capture around 20%, while cooperatives, agents, and dealers together account for the

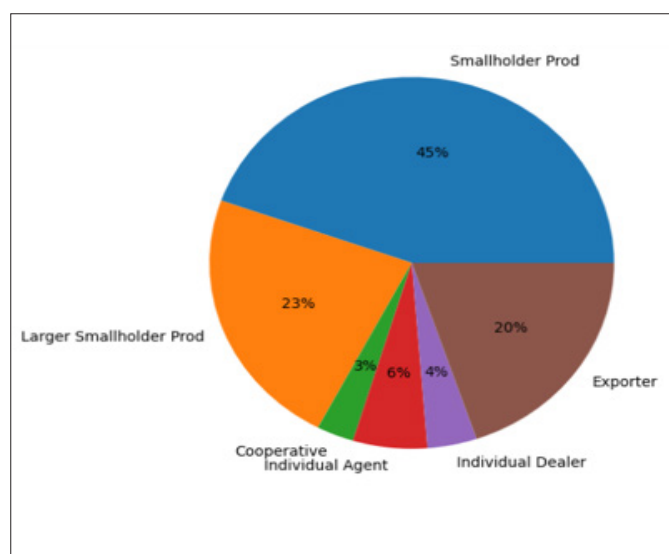


Figure 4. Distribution of direct VA among actors of the VC

remaining 13%. This distribution reflects the labour-intensive nature of cocoa cultivation and the importance of farming households in generating economic value within the sector. while cooperatives, agents, and dealers together account for the remaining 13%. This distribution reflects the labour-intensive nature of cocoa cultivation and the importance of farming households in generating economic value within the sector.

Domestic economic integration is exceptionally high at 88.5%. This demonstrates that nearly all wealth generated is retained within the national economy, driven by a reliance on domestic non-tradeable resources, like rural labour and land, rather than imported capital goods.

Viability in the international economy

Sierra Leone holds strong international competitiveness, highlighted by a Domestic Resource Cost (DRC) ratio of 0.10. This comparative advantage proves the country produces cocoa at a vastly lower domestic resource cost than the foreign exchange it earns.

Export pricing is dictated entirely by global futures markets, leaving the nation as a volatile price-taker. Macroeconomic distortions are minor, with a Nominal Protection Coefficient (NPC) of 0.98, indicating an implicit tax that slightly depresses domestic prices below international parity.

Severe structural disadvantages threaten this viability. Over 95% of exports are highly concentrated in the Netherlands, exposing the sector to severe geopolitical and regulatory risks. Critically, profound mapping and traceability deficits put the sector at catastrophic risk of violating the EUDR, potentially blocking future access to its primary international market.

Functionally, the value chain is a liberalised, export-driven system constrained by critically low smallholder productivity and minimal farm investment. While most value is created at the farm level, profitability remains constrained by low productivity and small scale. Strong international competitiveness and high domestic integration underpin growth, but market concentration, weak financing systems, and emerging EUDR compliance requirements pose significant risks to long-term sustainable growth.

Is the economic growth inclusive?

Distribution of income among actors

Economic growth within the value chain is highly unequal, evidenced by a Gini coefficient of 0.62. The distribution of Net Operating Profit (NOP) reveals that smallholder producers capture approximately 43% of total profits, while larger smallholders account for a further 24%. Together, producers receive around two-thirds of total operating surplus generated within the value chain. Exporters, despite representing just 0.02% of all actors, capture 20% of the total NOP. Cooperatives, agents, and dealers collectively account for the remaining 13%.

While the concentration of profits among producers may appear positive, it masks important welfare concerns. Much of the income retained at farm level represents returns to unpaid family labour rather than genuine economic surplus. Consequently, high profit margins coexist with low household

incomes, low productivity, and widespread liquidity constraints.

Job creation and employment

The value chain generates 26,466 Full-Time Equivalent (FTE) jobs (based on 200 working days per year), with employment concentrated almost entirely in primary production. Most jobs are temporary or seasonal (25,868 FTEs), while permanent positions remain limited, offering few opportunities for skills development and career progression. Women account for around 40% of total employment but are concentrated in lower-paid and less secure activities, facing persistent constraints in access to land, finance, and productive resources. Employment quality is generally low, characterised by informal labour arrangements, limited social protection, and low returns to labour, which contribute to declining youth interest in the sector.

The value chain generates broad participation but structurally unequal outcomes, highlighted by a 0.62 Gini coefficient. Income is concentrated as operating surplus rather than formal wages, leaving smallholders vulnerable. Employment is extensive but largely informal, seasonal, and low-paid, with systemic gender disparities preventing truly inclusive economic growth.

Is the value chain socially sustainable?

The following figure and table provide an overview of the main social consequences of VC activities across six strategic domains.

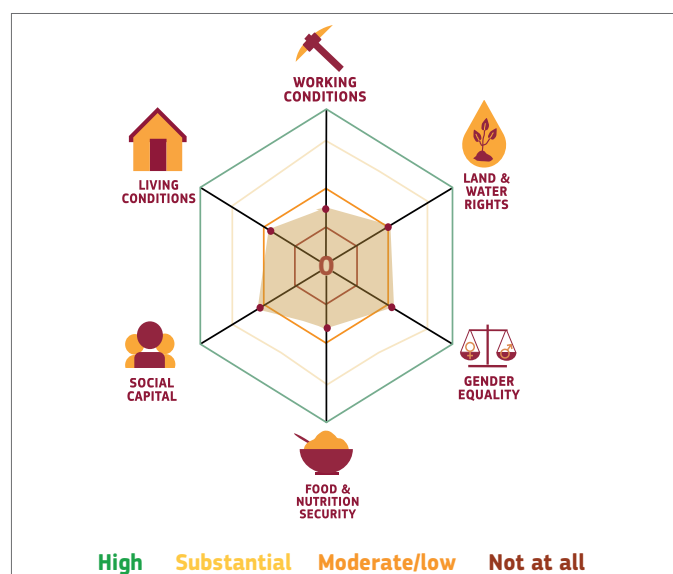


Figure 5. Social profile of the value chain

The cocoa value chain remains socially unsustainable despite progress in land governance, social capital, and cooperative participation. Low and volatile producer incomes continue to drive vulnerability, contributing to indebtedness, poor working conditions, food insecurity, and limited household resilience. Gender inequalities further restrict women's access to land, income, and decision-making. Strengthening income stability, market transparency, cooperatives, rural services, gender equality, occupational safety, and food security support should be key policy priorities.

Working conditions	Highly informal with formal contracts restricted to exporters. Producers face high occupational hazards, long hours, reliance on intra-household child labour, and severe indebtedness to informal buyers during seasonal cash shortages.
Land and water rights	Customary tenure provides perceived local security, but most producers lack formal titles. This disconnect complicates EUDR compliance, limits transparent compensation, and creates unequal land ownership, disproportionately disenfranchising women farmers.
Gender equality	Women execute ~40% of labour but control fewer resources, operate smaller farms, and lack decision-making power. Heavy domestic workloads compound structural exclusion from higher-value trading and leadership roles.
Food and nutrition security	Income instability creates an average 4.8-month food shortage, peaking in August ("hungry month"). Food security relies on purchasing imported rice via exploitative informal credit, resulting in poor dietary diversity and chronic nutritional vulnerability.
Social capital	Locally strong but institutionally weak. Cooperatives aggregate only 30% of cocoa volume and have limited bargaining power over price formation. Trust is undermined by fragmented informal markets, price asymmetry, and poor transparency in premium distribution.
Living conditions	Rural services are severely deficient. Cocoa income frequently covers health and education fees. Poor feeder roads restrict mobility, while inadequate WASH infrastructure and low literacy persistently limit resilience and living standards.

Is the value chain environmentally sustainable?

Total impact on areas of protection

The environmental impacts of the aquaculture VC are measured through Life Cycle Assessment (LCA) considering three areas of protection: resource depletion, ecosystem quality and human health. LCA results also show the VC's impact on climate change.

Total impact on areas of protection

- Climate change: Agroforestry acts as a net carbon sink (-7 to -15 t CO₂e/ha/yr) if it replaces low-canopy systems. However, clearing secondary forest generates a massive carbon debt. Low yields (≤ 0.35 t/ha) exacerbate the per-kilo carbon footprint but conversely also increases carbon sequestration per kilo. This represents a trade-off between environmental sustainability and profitability. Soil remains the main carbon stock and should not be discounted.
- Dedicated, consistent and targeted shade management and proper composting can help stabilise yields.
- Human health: Major Health impacts stem from global warming if deforestation occurs. In the absence of deforestation, 60% of the health impact is driven by fine particulate matter formation from husk burning and transport exhaust.
- Ecosystem quality: Terrestrial global warming from land-use change drives 73-99% of ecosystem damage, across different case studies whereby the relative difference in impact score follows emissions due to land use change.
- Resource depletion: The impact of mineral resource scarcity is negligible, but fossil resource scarcity is driven entirely by transport logistics and LPG-fuelled mechanical drying.

Impact per value chain stages and sub-chains

- Cultivation: This is the absolute environmental hotspot. Land Use Change (LUC) determines the vast majority of climate, ecosystem, and health impacts. Organic practices accumulate carbon, but husk

burning and organic compost production and application generate potent N₂O and methane emissions.

- Transport: Transport accounts for the bulk of fossil resource scarcity in sun dried cocoa. Poor rural roads (in some cases requiring diversion) and long transit distances to the Freetown port increase fuel emissions and localized particulate pollution.
- Drying (Processing): Sun-drying is low-impact. Conversely, mechanical drying (using LPG) represents a major hotspot, increasing the carbon footprint by up to 0.3 kg CO₂e/kg dry beans and raising fossil resource use by 450%.
- Export: Atmospheric contamination (PAHs/heavy metals from roadside or mechanical drying but crucially deposition of pesticide residue) risks shipment rejections, compounding export-stage emissions.

Biodiversity

- Land use pressure: Critically low cocoa yields demand more land to maintain output volumes, increasing the pressure to clear adjacent secondary forests and bushland.
- Ecosystem fragmentation: Multi-story agroforestry can support bird and mammal diversity comparable to degraded forests. However, indiscriminate/aggressive shade management can alter this succession by removing epiphytes, undergrowth, and upper-canopy trees to prevent monkey crop-raiding and reduce excessive shade.
- Conservation frameworks: Existing buffer zones and sacred groves are highly valuable and should be protected. EUDR compliance (for larger farms) mandates exact polygon geolocation, but irregular smallholder farms complicate the protection of contiguous habitats and increase risk adjacent carbon leakage risks.
- Protecting existing forests is paramount. Strategies include compliance to EUDR (zero deforestation value chain, geolocation, traceability and legality), adopting advanced composting to boost yields on existing plots without expansion, and retaining structurally complex, native shade canopies. As many long-established cocoa plots are nearing replacement age, it is important that the significant loss of carbon during replacement is offset by new high canopy systems.

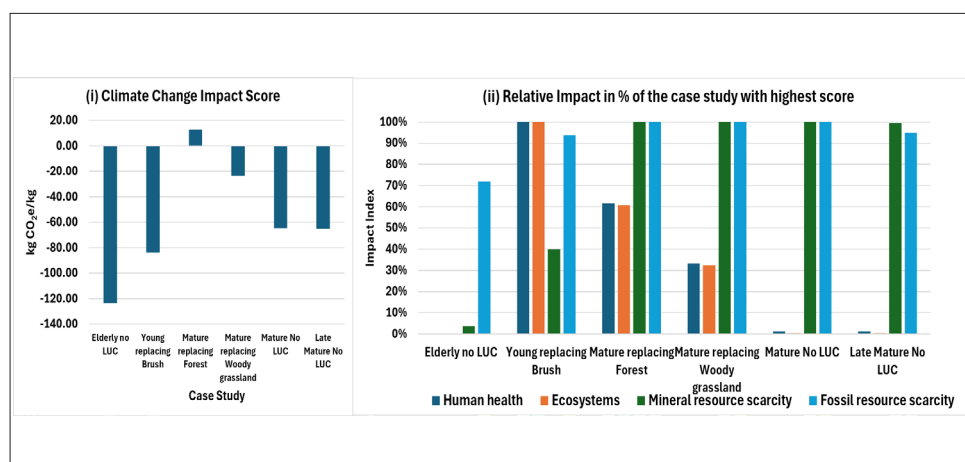


Figure 6: (i) Carbon Footprint of sun-dried coco at port per case study (based on farm age and previous land use) and (ii) Health, Ecosystem and Resource Scarcity scores relative to the case study with the highest impact.

Environmental sustainability is highly conditional, especially considering what existed before the cocoa farms. Agroforestry provides vital carbon sequestration and biodiversity benefits, provided it does not replace secondary (or indeed primary!) forests. Severe threats include land-expansion pressures driven by low yields, fossil-fuelled mechanical drying, and roadside or pesticide related atmospheric contamination. Effective EUDR compliance, improved organic management (including better use of residues) and better assessments of contamination risk can help capitalise on the strengths of organic cocoa and reduce risks.

Main findings and recommendations

Strengthen Production and Governance Foundations

- **Rehabilitate Farms:** Increase productivity through replanting, pruning, and bio-inputs (e.g., vermicompost) to prevent land expansion. Ensure extension services are re-designed to equitably reach women.
- **Empower Cooperatives:** Strengthen the Department of Cooperatives. Build cooperative autonomy so they can engage directly in export, reducing smallholder reliance on exploitative exporter-led financing.

Enhance Financial Resilience and Investment

- **Provide Seasonal Liquidity:** Develop formal, low-cost financial instruments (warehouse receipts, revolving funds) strictly timed for the “hungry month” (July–August) to break the cycle of distress sales and informal debt.
- **Scale VSLAs:** Professionalize Village Savings and Loan Associations (VSLAs) and integrate them with formal finance, specifically targeting women-led enterprises to bridge gender gaps in resource control.
- **Fund Climate Adaptation:** Channel blended finance into climate-smart shade management and low-emission infrastructure to counter rising heat and erratic rainfall.

Improve Market Access and Trade Competitiveness

- **Ensure EUDR Compliance:** Urgently scale up farm-level geolocation (polygons) and internal control systems. The Produce Monitoring Board (PMB) mandate must expand beyond physical quality to include digital data management and GIS auditing.
- **Protect Organic Integrity:** Implement stringent cross-border monitoring to block non-compliant, non-organic cocoa inflows from neighbouring countries that threaten national certification.
- **Mitigate Contamination Risks:** Deploy localized pesticide and PAH risk checklists. Prevent cocoa beans from being dried near roadsides or stored near agrochemicals to meet the EU’s zero-tolerance residue limits.
- **Invest in Community Processing Units (CPUs):** Pilot cooperative-linked solar drying and centralized fermentation hubs. This will standardize quality, mitigate fossil-fueled mechanical drying emissions, and improve domestic value capture.



Value Chain Analysis for Development (VCA4D) is a tool funded by the European Commission / INTPA and is implemented in partnership with Agrinatura. Agrinatura (<http://agrinatura-eu.eu>) is the European Alliance of Universities and Research Centers involved in agricultural research and capacity building for development. The information and knowledge produced through the value chain studies are intended to support the Delegations of the European Union and their partners in improving policy dialogue, investing in value chains and better understanding the changes linked to their actions. VCA4D uses a systematic methodological framework for analysing value chains in agriculture, livestock, fishery, aquaculture and agroforestry. More information including reports and communication material can be found at: <https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d->

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