RECLAIM Sustainability!

A data-driven approach to tackle low incomes in the cocoa sector

A case study on pricing and efficiency in Sierra Leone's cocoa sector

Commissioned by the Fair Value Distribution TLG
Developed by Fairfood in collaboration with Solidaridad West Africa

Solidaridad FAIRFOOD TRUSTAFRICA BUSINESS WATCH INDONESIA Ministry of Foreign Affairs

Authors: **Lotje Kaak** and **Mariana Broitman (Fairfood), Andrew Morrison (Solidaridad West Africa) Sandra Fudorova (Akvo).**
Reviewed by: **Hammond Mensah** (Solidaridaridad West Africa), Lotje Kaak (Fairfood)

This is a derivative work of the Commodity Living Income Strategy White Paper, co-authored by Fairfood International and Heifer International. This case-study was commissioned by the Fair Value Distribution Thematic Learning Group, part of the RECLAIM Sustainability! Programme funded by the Dutch Ministry of Foreign Affairs.

DEFINITIONS

CYE (Cost-Yield Efficiency): A methodology that evaluates and categorises the production and operational activities within commodity value chains. It delivers a nuanced assessment, identifying key areas for productivity and cost optimizations.

LIP (Living Income Price): A data-driven pricing mechanism designed to calculate the minimum price required for smallholder farmers to achieve a living income, accounting for production costs, yields, and a decent living margin.

Living Income Benchmark: A location-specific measure of the net annual income needed for a household to secure a decent standard of living, including costs for food, housing, healthcare, education, and unexpected expenses.

Farmgate Price: The price received by farmers for their commodity when it leaves the farm, excluding transportation and post-harvest handling costs.

Median LIP: The midpoint value in the calculated Living Income Price data, representing the price at which half of the farmers would earn a living income based on their production conditions.

Cost Drivers: Key factors that influence the cost of production, including labour, fertilisers, and equipment. Understanding cost drivers helps identify areas where efficiencies can be improved.

Efficiency Segments: Categories of farmers grouped based on their cost-to-yield ratios, enabling comparative analysis of productivity and efficiency levels.

Income Diversification: The process of generating income from multiple sources, such as alternative crops or non-agricultural activities, to reduce dependency on a single commodity and mitigate risks.

Gender Disaggregation: The analysis of data by gender to identify disparities in productivity, costs, and income levels between male and female farmers.

Farm Depreciation: The annualised cost of farm establishment over its productive lifespan, used to calculate accurate production costs.

Implicit Labour Costs: The value of unpaid family labour, often excluded from production cost calculations, but critical for understanding the true cost of farming.

Living Income Gap: The difference between the actual income earned by farmers and the income required to meet the Living Income Benchmark.

Sample Screening: The process of refining data by excluding outliers and ensuring that sample characteristics align with the local agricultural context.

Regional Productivity Benchmark: A reference yield level used to assess the productivity of farmers in a specific region against expected standards.

Farmer-Centric Data Governance: A framework that prioritises farmer participation and ownership in data collection and analysis, ensuring transparency and trust in decision-making processes.

Open-Source Toolkit: A collection of resources, including tools for data collection, analysis, and reporting, designed to facilitate the implementation of LIP and CYE methodologies across supply chains.

1. INTRODUCTION

1.1 Introduction: Why farmer segmentation matters for closing the living income gap

If you were restructuring your company's communications or procurement department, you wouldn't roll out a blanket "capacity building" plan without first understanding your team's different skills, capabilities, and knowledge gaps. You would identify who needs strategic training, who needs operational tools, and where resources will have the biggest impact.

Yet in the sustainability space, this fundamental step — segmentation *before* intervention — is often skipped. Farmers are too often treated as a single, uniform group, and "one-size-fits-all" programmes are deployed across entire regions. The result? Well-intentioned **investments** in capacity building, programme design, research, or on-the-ground interventions that fail to deliver the living income improvements they promise.

Under the 5-year **RECLAIM Sustainability! programme** funded by the Dutch Ministry of Foreign Affairs, the consortium formed by Fairfood, Solidaridad, Business Watch Indonesia and Trust Africa investigated barriers for value to be fairly distributed throughout supply chains, and different models and tools were developed. As we moved from understanding the margins distribution through the Grounds from Sharing Study, developed by Le Basic, to the importance of acknowledging costs of production if we are to talk about supply chain resilience, we now take one step forward towards a practical approach to the topic that is tangible, and can be replicated.

Together with Heifer International, and with support from Akvo, Fairfood has developed the Living Income Commodity Strategy, designed to turn farmer-level data into targeted interventions, procurement strategies, and investment decisions, ensuring that actions are based on actual farmer realities rather than averages or assumptions. In the context of Sierra Leone, a key country within the RECLAIM Sustainability! Programme, this approach also addresses one of the core pillars of national cocoa policy: the need for reliable, segmented data to guide planning, regulation, and investment.

This case study marks the first time the **Living Income Price (LIP)** and **Cost–Yield Efficiency (CYE)** frameworks have been used in Sierra Leone's cocoa sector, a market that is attracting renewed private-sector interest but lacks the farmer-level data needed to design effective interventions.

The aim of this Living Income Commodity Strategy is simple but transformative:

- Understand the *real* production costs, yields, and income gaps of the farmers you are sourcing from.

- Classify and group farmers with similar profiles, just as companies segment their teams, suppliers, or customer bases.
- Develop **targeted interventions** that respond to each group's specific needs and assets.

By segmenting farmers before designing interventions, companies can:

- Back strategies with a higher chance of success.
- Monitor progress more meaningfully.
- Protect and enhance previous investments made to increase resilience, sustainability, and, in some cases, the continuity of supply flows.
- Meet compliance requirements (e.g. EUDR, CSDDD) with stronger, evidence-based claims.

1.2 Context: Why this approach matters in Sierra Leone's cocoa sector

Sierra Leone's cocoa sector is at a turning point. Once neglected during years of conflict and overshadowed by mining, cocoa is now being recognised as a driver of rural development, economic growth, and climate-smart agriculture. Global demand for sustainable cocoa is growing rapidly, but so too are the expectations from new regulations such as the **EU Deforestation Regulation (EUDR)** and the **Corporate Sustainability Due Diligence Directive (CSDDD)** for full traceability evidence that add integrity and credibility to sustainability claims.

For companies sourcing from West Africa, Sierra Leone offers both opportunity and risk. It is already the leading organic cocoa producer in the region, yet faces systemic barriers. Among them, are those ranging from agricultural practices, such as aging farms and farmers with limited replanting, as well as the low adoption of modern tools and practices, to infrastructure, such as fragmented and informal trade systems, and persistent inequalities in land, capital, and market access, particularly for women and youth.

One of the foundational pillars of national cocoa policy is the need for reliable data and statistics to guide planning, regulation, and investment. The current lack of trustworthy, detailed data on farmer yields, income, production costs, and land use is a major constraint. This study addresses that gap by providing:

- Farmer-level cost and income data across **5 key districts**.
- Segmented analysis that identifies **4 different types of farmers** and their respective challenges.
- **2 benchmarking tools** (LIP and CYE) that link farm economics to national development goals.

🔍 *In simple terms: this study helps paint a much clearer picture of what's happening on the ground: what farmers earn, what they spend, and what needs to change.*

This aligns closely with the Ministry of Agriculture's plans to develop better data systems to support planning, decision-making, and compliance with the evolving regulatory requirements of key buyers of Sierra Leonean cocoa.

Significant investments have already been made in resilience, sustainability, and continuity of supply. But without understanding the distinct profiles, capacities, and constraints of the farmers supplying the chocolate sector, these investments risk being misaligned, inefficient, or unsustainable.

This is where LIP and CYE provide a breakthrough. They enable companies and policymakers to move beyond averages and identify distinct farmer segments, understand the cost, yield, and income dynamics shaping each segment, and pinpoint where targeted interventions can create the greatest impact.

1.3 A Blueprint for action – from data to targeted interventions

This approach is not perfect yet. But it is already **replicable, field-ready, and actionable**. This study's aim is to invite peers — in cocoa and other tropical commodity sectors — to plug this methodology into their own programmes, test it against their current approaches, and co-design refinements that make it even more effective.

Developed collaboratively by **Fairfood International** and **Heifer International**, with support from **Akvo**, these tools have already been tested in other commodities and countries under the **RECLAIM Sustainability! programme**. They are designed to turn farmer-level data into targeted interventions, procurement strategies, and investment decisions, ensuring that actions are based on actual farmer realities rather than averages or assumptions.

The regulatory landscape demands this shift. We are no longer simply asked to report risk. Instead, we are expected to understand the realities we report and act on them. Transparency is now a non-negotiable requirement, grounded in high-quality, verifiable data that can withstand scrutiny and reveal where unfairness and inefficiency persist.

The **Fairfood–Heifer methodology** is not a parallel reporting system. It is a practical exercise for field teams, cooperatives, exporters, and buyers. It identifies gaps and maps the levers — yield, cost structure, quality premiums — so local actors can decide on the most relevant next step. Think of it as a service manual for profitable, resilient farm businesses, not an extra spreadsheet to fill in.

By aligning all actors in the supply chain around the same set of facts, this work shifts the conversation from: *"Who is to blame for the gap?"* to *"Which cost driver can each of us tackle first?"*

In Sierra Leone, Fairfood and Solidaridad West Africa, supported by Akvo, applied the methodologies to develop a model to inform action by both private and public sectors, demonstrating that profitability and genuine sustainability are not at odds. By the end of this case study, agricultural officers, exporters,

and European procurement and sustainability teams will have actionable insights to adopt and scale these methodologies within their own supply chains.

Behind this study *(for design layout)*

This initiative is a collaborative partnership between **Fairfood International, Solidaridad** and **Akvo,** combining their expertise to address systemic barriers faced by smallholder farmers and create a scalable, replicable model:

- **Solidaridad West Africa** – Efficiency analysis, diversification strategies, and sustainable development. Led the 5-year programme and implementation of mapped interventions.
- **Fairfood International** – Open-source traceability and analytics tools translating impact monitoring into actionable business insights.
- **Akvo** – Data services including collection, cleaning, and analysis, ensuring integrity and robust insights into cost drivers, efficiency segments, and income disparities.

1.4 A tool for evidence-based decision-making

1.4.1 Supporting productivity and profitability goals

A clear overview of the productivity and profitability of cocoa farming currently leaves policy makers as well as private sectors in the dark, hindering initiatives to facilitate, for example, the adoption of improved agronomic and plant health practices towards a more efficient production of cocoa. This case study shows just how varied those realities are. In some cases, the so-called efficient producers achieve high yields with low costs, while others are more vulnerable, spending more but produce less. But as the study shows, many fall into a "low-cost, low-yield" trap that keeps them below the living income threshold.

The LIP and CYE analysis make these differences visible and actionable. They help answer critical questions like:

- Who needs better access to inputs?
- Where should extension services focus?
- Which farmers are best positioned for scale or certification?

> 🔍 ***Think of it as a diagnostic tool: it shows who is thriving, who is struggling, and what kind of support each group needs.***

This supports multiple strategic activities that are needed to improve the country's potential to become a cocoa powerhouse. Data can inform, for example:

- Extension services – by identifying training needs across farmer segments
- Input distribution systems – by highlighting cost constraints and efficiency gaps
- Climate-smart replanting – by showing where low productivity may be linked to aging farms
- Promotion of cocoa farming as a business for the new generation – by providing the kind of information producer organisations and youth initiatives need to turn cocoa into a viable business

1.4.2 Enabling compliance and market differentiation

The LIP methodology also supports the Government's goal to brand and market Sierra Leonean cocoa ("Salone Cocoa") as a traceable, high-quality, and regulation-compliant product. Understanding the true cost of sustainable and dignified cocoa production enables:

- More transparent value chains that meet EUDR requirements
- Stronger claims around fair pricing and ethical sourcing
- Differentiation in global markets, especially for organic or specialty cocoa

> 🔍 ***Put differently: if Sierra Leone wants to be seen as a source of sustainable cocoa, it needs to prove that farmers are being treated fairly. This study helps provide that proof.***

1.4.3 Informing financing models

Finally, the study provides a clear case for the kinds of financing that would support long-term sector transformation. By modelling the income gap and identifying which interventions could close it (e.g. productivity gains, diversification, cost reductions), it helps:

- Build the evidence base for setting up a **national replanting** fund
- Inform the design of **e-credit** schemes for farmer investments
- Prioritise public and donor spending based on where the income gap is most severe

Generated data can ensure that resources go where they are most needed and most likely to generate impact.

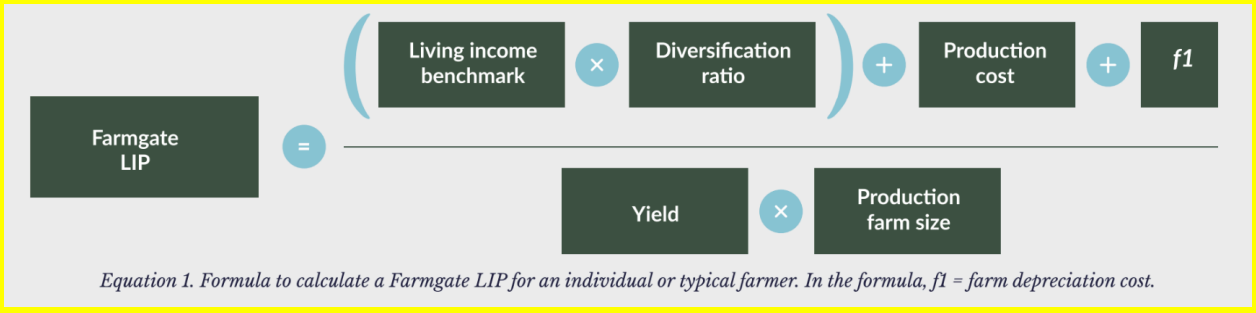
2. METHODOLOGY

This study applies the **Living Income Price (LIP)** and **Cost–Yield Efficiency (CYE)** methodologies to analyse farmer-level income gaps, cost structures, and productivity patterns in Sierra Leone's cocoa sector.

The sections below explain each methodology in detail, along with the data collection process, quality controls, and study limitations. To understand the rationale for analysing the interplay between production costs, yields, and sustainable pricing, access the White Paper[1], or read the Frequent Asked Questions about the methdology.

2.1 Living Income Price (LIP)

The Living Income Price (LIP) is a farmer-level price floor that represents the minimum farmgate price required for a household to earn a living income from cocoa. The LIP methodology takes into account both the production realities and household needs of farmers. It is composed of the following components:



Equation 1. Formula to calculate a Farmgate LIP for an individual or typical farmer. In the formula, f1 = farm depreciation cost.

- **Living Income Benchmark**: A national or regional figure that estimates the annual income needed for a decent standard of living, adjusted for household size and inflation.
- **Diversification ratio**: The share of household income that comes from cocoa. A higher ratio indicates greater dependency on cocoa to meet household needs.
- **Cost of production**: Actual costs incurred by the farmer in producing cocoa, including inputs, labour, and depreciation.
- **Yield and farm size**: The quantity of cocoa harvested per hectare, and the size of land used for cocoa production.
- **Depreciation**: The annualised value of investments such as tools or farm establishment costs.

[1] Marie, A, Gilman, C, Miralles, Isa, (2024): The Commodity Living Income Strategy White Paper.

The LIP provides a transparent and data-driven benchmark for sustainable procurement and can be calculated at farmgate, cooperative, or FOB levels. In this study, the focus is on the **farmgate LIP**.

2.2 Cost-Yield Efficiency (CYE)

The CYE framework segments farmers based on two key indicators: the cost to produce one kilogram of cocoa (USD/kg) and yields/productivity (kg/ha). Following previous applications of this metrology, farmers are categorised into four groups based on their cost-productivity ratio. As a new addition to this study, this data was also segregated by the 5 researched regions.

This segmentation provides a more nuanced view of farming dynamics and helps identify which groups can benefit from specific interventions, such as training, input subsidies, or pricing mechanisms. It also enables the calculation of segment-specific LIPs and income gaps.

2.3 Data collection and sampling

Primary data was collected from 500 cocoa farmers in five districts: Kailahun, Kenema, Kono, Bo, and Pujehun. Data collection took place in March and April 2025, with fieldwork conducted by Solidaridad West Africa and supported by Fairfood's analytical framework. Each district contributed 100 farmer interviews, except Kenema, where 89 farmers were included due to incomplete surveys.

Geographic and demographic representativity was a core consideration, and sampling ensured the inclusion of various certification statuses, age groups, and cooperative affiliations.

BOX: ***Sampling realities in the Sierra Leone context***

The sampling plan for this study targeted ***30% women*** *and* ***50% certified farmers****, based on the fragmented farmer lists available. While the target for women was met, only* ***22.4%*** *of the sample*

was certified. This outcome illustrates the difficulty of conducting purposeful sampling when farmer records are incomplete or inconsistent.

It also highlights a broader challenge for future studies: in contexts where farmer-level information and documentation are limited, achieving representative samples across key characteristics can be difficult. This not only affects the accuracy of baseline data but can also limit the precision of segmentation and intervention design.

2.4 Data quality and cleaning

Data quality was monitored using a real-time tracking dashboard that provided supervisors with key insights, including GPS locations, survey durations, and the volume of data collected by each enumerator. Standardised data cleaning procedures were applied to identify and remove outliers. Values more than three standard deviations from the mean were flagged and replaced. Additional thresholds were agreed with Solidaridad to ensure local validity, and farmers with implausible production costs or revenues (as validated against local benchmarks) were excluded. Visualisations, such as plots comparing the cocoa farm size to kilograms produced, ensured consistency by highlighted outliers and flagged potential issues. Data collection supervisors could then contact enumerators directly to clarify or resolve unusual data entries, ensuring accuracy and consistency.

The overall data quality was reasonable, as multiple issues emerged, and will be described through the analysis. Among them, it's worth noting that limitations around labour cost reporting and off-farm income were noted and are addressed in the discussion section.

To ensure reliability and relevance, we filtered the dataset based on three criteria: only farmers with complete income and harvest data for the previous season were included, and farms had to be geolocated with GPS coordinates.

2.5 Informed consent

Ensuring that farmers consent to data collection and understand how their data will be used is a core principle of this approach. Prior to data collection, each participant, or the household's primary decision-maker, was read a statement explaining the purpose of the data collection and its intended use. After hearing the explanation, farmers could decide whether they wanted to proceed. Informed consent was recorded only if they chose to continue, and no data was collected if they opted out. The principles guiding ethical data management and farmer trust can be consulted here.

2.5 Limitations

While the dataset provides strong insights, several limitations are acknowledged:

- **Temporary labour costs** were inconsistently reported, likely due to recall issues and limited record-keeping.
- **Verification of land ownership** was not used as a selection criterion in this study, but we recommend making it part of future research.
    - The absence of this verification limited the ability to assess security of tenure, which can influence investment decisions and long-term productivity.
- **Off-farm income** and **remittances** were likely underreported, which may have led to an incomplete picture of household income diversification.
    - **Household labour costs** (e.g., family labour) were excluded, potentially underestimating total costs.
    - The cost of household labour is commonly excluded from Living Income studies, as it is assumed that the profit farmers make from selling cocoa is in itself a return on their investment and payment for their labour. Including household labour would therefore lead to 'double counting'.
    - However this means that the cost of cocoa production does not include the value of all labour needed.
- **Literacy and data understanding** varied across the sample, limiting the depth of some responses.
- **Gender and youth segmentation** is somewhat constrained by sample size.

Despite these limitations, the data was confirmed as robust and defensible by local experts.

3. DATA ANALYSIS AND FINDINGS

Behind every data point in this chapter is a farmer — someone tending a few acres of cocoa in the humid green of Sierra Leone, often with ageing trees, worn tools, and little capital to invest. Many work mostly by hand, relying on family labour, and face seasonal shortages of paid workers. Women and youth remain underrepresented in leadership and certification, while most farmers lack formal land titles.

This chapter provides the foundation for the intervention modelling in Chapter 4. The analysis is based on farmer-level cost, yield, and income data collected in five cocoa-producing districts: **Kailahun, Kenema, Kono, Bo, and Pujehun**. It also flags Sierra Leone–specific operational realities that shaped both data collection and interpretation — critical for anyone sourcing from, or planning investments in, the country's cocoa sector.

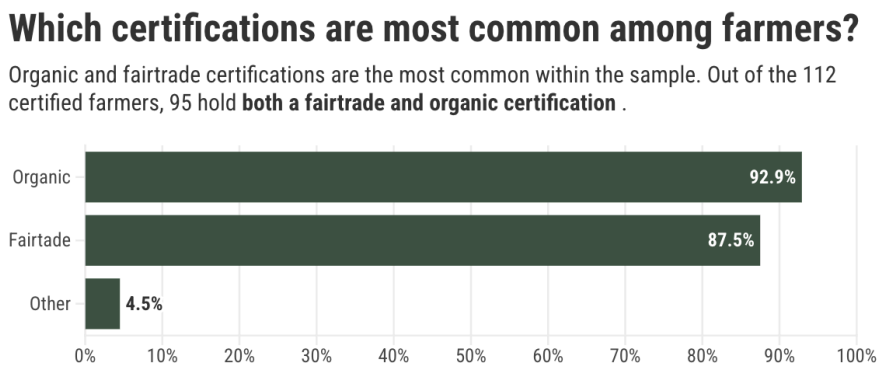
Key research goals guiding this analysis:

- **Estimate the price gap** between current farmgate prices and the Living Income Price (LIP), disaggregated by district and key demographic variables.
- **Identify groups of farmers** with similar productivity and cost-efficiency patterns, to support tailored intervention design.
- **Model interventions** — such as yield improvements, cost reductions, and diversification — that could close the living income gap (Chapter 4).

By moving beyond averages to profile distinct farmer "personas," this chapter gives procurement teams, sustainability managers, cooperatives, and policymakers a clear, evidence-based picture of **who their farmers are, what they produce, what it costs them, and where there is room to act.**

3.1 Sample snapshot

- **Gender balance:** 31.2% of respondents were women, (meeting the target but still below desired parity for representation in lists and leadership roles).
- **Certification**: 22.4% of farmers were certified (mostly with both Fairtrade and Organic)
- **Age**:Majority over 45 years, pointing to generational challenges in the sector. Only 22.5% were youth (aged 35 or younger)
- Nearly 50% were cooperative members (99% unpaid, median fee for others: 150 SLE)
    - The country is currently the leading producer of organic cocoa production in West Africa:
-



BOX 1: Crop diversification and income sources

- Cocoa is the primary cash crop for most farmers, but **diversification is common**.
    - **Cocoa = 83% of income** [2]
    - Approximately **86.2%** of farmers grow and sell other crops, mainly banana, palm, cola, followed by cassava and rice
- **Off-farm income sources** account for only 5%, and include petty trade, artisanal mining, transport services, and remittances from family members.
- **Cocoa dependency** ranges from below 40% (diversified households) to above 80% (specialised cocoa farmers).

Although income diversification remains limited, it plays a strategic role in resilience, especially where cocoa production is constrained.

3.2 Production costs and labour realities

- Median production cost: **USD 0.31/kg – among the lowest observed in West Africa**.
- Average cost of production per kilogram **varies significantly by district**, with lowest costs in Kenema and Kailahun and highest in Kono.

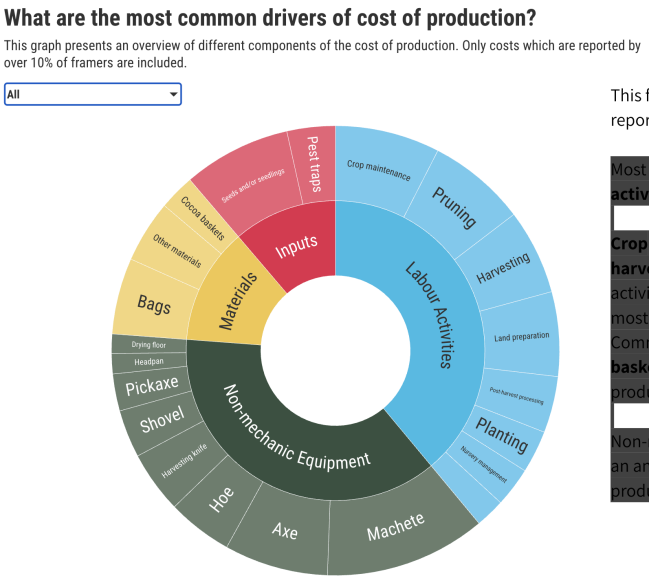
Key cost drivers include:

- **Labour** (permanent and temporary): The largest single expense for most farmers, yet, none of them reported having costs for permanent labour. Hiring is complicated by seasonal labour shortages and high wage demands during peak harvest.
    - Crop maintenance (56.2%), pruning (52.8%), harvesting (45.6%)

[2] **Cocoa Varieties:** Most farmers cultivate **Ghana Hybrid cocoa**, followed by other hybrid types such as **Amelonado**, **Amazon**, and **Native** varieties. Less common varieties include **Mercedes** and **Cameroon Hybrid**.

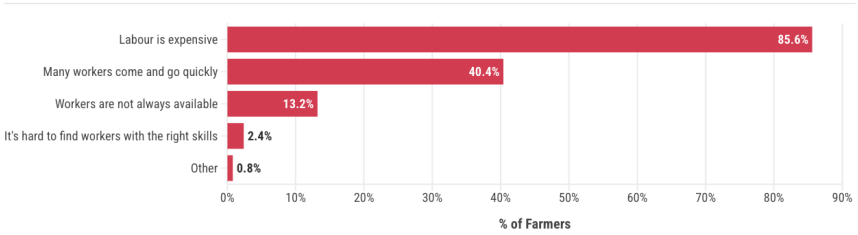
- **Inputs** (fertilisers, pesticides): Use is low overall due to cost and access constraints.
    - Especially seeds and seedlings (57.8%) Main constraints reported were High price of inputs (22.6% of farmers); Lack of access to desired inputs (~10%); Low quality of inputs (7.6%) and Occasional unavailability or lack of information on where to buy them.
    - **Depreciation of materials, or non-mechanical tools (e.g., machetes, axes), is a noted cost due to their short lifespan and poor quality (depreciation cost).**
- **Transport**: Particularly high for farmers in remote areas due to poor road conditions.

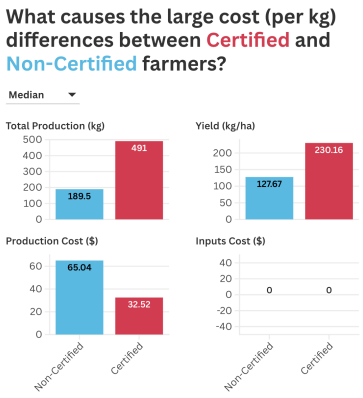
Labour challenges:



- Limited mechanisation means most work is manual, increasing labour needs during harvest.
- Temporary labour cost reporting was inconsistent, partly due to recall issues and lack of written records.
- Household labour - family labour - is not costed, following Living Income study best practice, but this can understate true production costs.

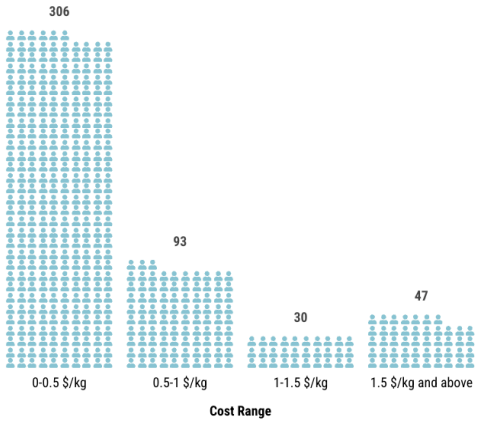
These constraints not only affect production costs but can also delay or limit yield-improving practices, which has implications for intervention design discussed in Chapter 4.





Certification effect: Certified farmers consistently achieve lower costs per kg and higher yields than non-certified farmers — efficiency appears linked to bundled training and input support.

How many farmers belong to each cost range?

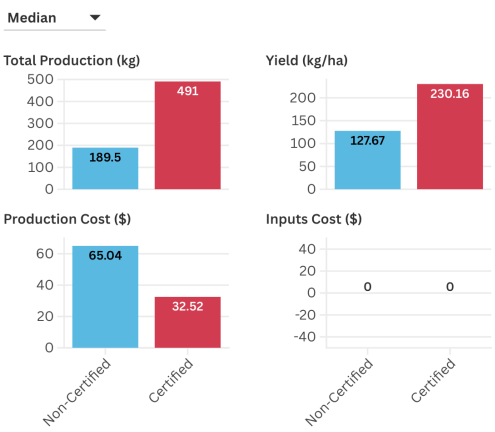


3.3 Productivity Snapshot

Median yield is 144 kg/ha: low but with significant district variation.

- Certified farmers average ~100 kg/ha more than non-certified farmers.
    - Certified farmers generally fall into the first two (lower) cost ranges, with 96% of farmers producing a kilogram of cocoa for less than one dollar.
    - Nearly 60% of certified farmers produce cocoa for **less than $0.50/kg,** the highest proportion of all analysed segments.
    - On the other hand, **non-certified farmers** are overrepresented in the **highest cost bracket:**
        - 12% fall into this range
        - Only 58% produce for less than $0.50/kg
    -
- Women slightly outperform men on yield; age differences are negligible.
- **Youth farmers** are more likely to produce cocoa at **less than $1/kg**
- Male and female farmers show **similar distribution** across cost ranges
    - Around 65% of both genders produce cocoa in the lowest cost bracket
- The differences are more pronounced and statistically significant between certified and non-certified farmers: **Certified farmers** are most efficient:

What causes the large cost (per kg) differences between Certified and Non-Certified farmers?



A key finding from this analysis is that certified cocoa farmers consistently outperform their non-certified counterparts.

There are multiple statistically significant differences between certified and non-certified farmers. These include differences in yields, land size, and total production cost.

Certified farmers spend less on producing cocoa, with the median non-certified farmer spending twice more than a certified farmer. It is the

combination of considerably lower total production cost and significantly higher yields that drives the cost per kg of cocoa down for certified farmers.

Differences in input cost are not statistically significant and rather minimal, however they are the only type of cost that is higher for certified farmers. Fertiliser use is minimal in the context of Sierra Leone and if done, then by certified farmers only, which helps explain both the low values and the difference.

District-level cost profiles

(Visual to be added)

- **Kono**: highest concentration of high-cost producers
- **Bo & Pujehun**: mid- and low-cost segments dominate
- **Kailahun & Kenema**: skewed toward the lowest cost segment
    - In **Kenema, higher cost ranges are absent**

3.4 The LIP Gap: how far farmers are from a Living Income

The Living Income Price (LIP) provides a concrete benchmark for the minimum price farmers need to receive at the farmgate to earn a living income from cocoa, based on their actual costs and yields. Rather than relying on generic reference prices, this approach ties price setting directly to the farmer's reality: how much land they have, how productive it is, how much they spend, and what a decent standard of living costs in Sierra Leone.

The LIP in this study was calculated using farmer-level data and the following inputs:

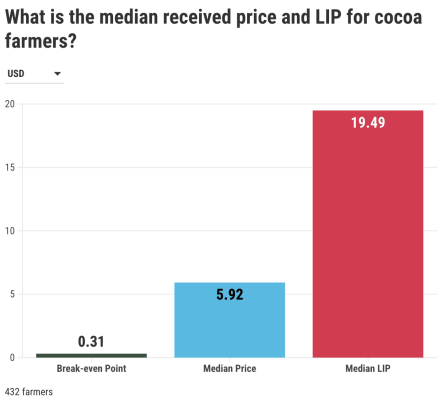
- **Living Income Benchmark** of 9,803 New Leone per month (USD 426), adjusted for each household's size[3]
- **Diversification Ratio**, or the share of total household income from cocoa (average: **83%** across the sample)
- **Cost of Production**, including reported cash expenses (e.g. inputs, labour, tools)[4], and **depreciation** of non-mechanised tools and farm investments

[3] The Study from KIT Institute indicated that a reference household of seven members in the Eastern Province of Sierra Leone, comprising four adults and three children, needs to earn NLe 9,803 per month (equivalent to 4261 USD) or 117,636 NLe annually (equivalent to 5,112 USD), to achieve a basic but decent standard of living. (Living Income Benchmark for the Eastern Province and Living Income Reference Price for the cocoa sector in Sierra Leone (2024).

[4] The **Depreciation** of non-mechanised tools and farm investments was not quantified this, especially also because the Solidaridad team mentioned that a lot of the tools are free provided by cooperatives.

- **Land area** under cocoa cultivation
- **Yield per hectare**

🔍 *In simple terms: we calculate how much money a farmer needs per year, then divide that by how much cocoa they produce. That gives us the minimum price per kilo they would need.*



The **median farmgate LIP** across the sample is **USD 19.49/kg**, almost four times the median farmgate price reported by farmers for May 2025 (USD 5.92/kg).

On the left, the minimum price farmers need to earn to cover the cost of production per kg of cocoa (**break even point**). The discrepancy between these three prices mirror the context of Sierra Leone: **one of low cost but also low yields.**

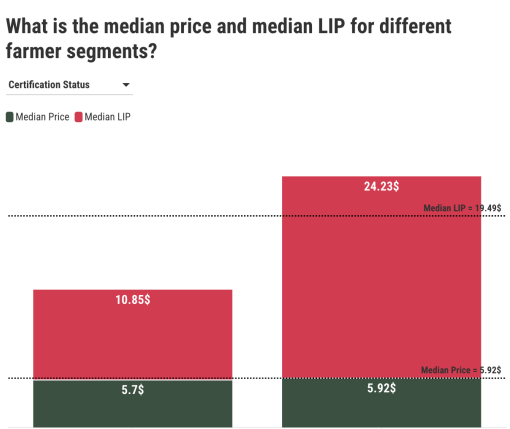
This reinforces a critical insight: low costs alone do not ensure decent incomes. Once farmers produce less, they need to earn more per kg to reach the benchmark, which causes the LIP to increase. **Without productivity improvements, even the most frugal farmer will struggle to reach a living income.**

Regional variation is significant:

- **Pujehun** – Highest LIP: USD 35.30/kg (smallest plots, lowest yields).
- **Kailahun** – Lowest LIP: USD 13.57/kg (highest yields, larger plots).
- Other districts fall between these extremes, underscoring the need for regionally tailored strategies.

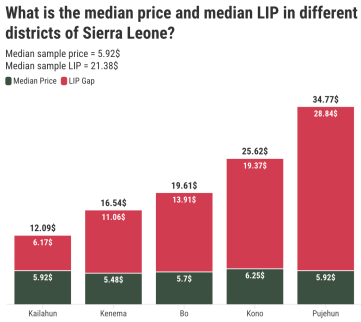
Group differences:

- **Women** have higher LIPs than men (USD 21.12 vs. 19.31) despite slightly higher yields — smaller land sizes are the main driver.
  🔍*This points to structural inequality in land access, not farm performance, as the key issue affecting women's income potential.*



- **Certified farmers** have the lowest LIP (higher yields, larger plots, better efficiency). On average:
  - They yield almost a 100 kg/ha more than non-certified farmers

    - They cultivate 1 hectare more of cocoa
    - They have lower total costs per kg due to better production efficiency
- The LIP difference is statistically significant
  🔍*This indicates that certification is associated not only with better market access, but also with higher yields and improved cost-efficiency.*
- **Age** has minimal effect; youth and non-youth have similar LIPs, though youth tend to farm smaller plots.
    - Though yield differences are negligible, youth farmers typically manage smaller plots, and may lack capital or family support to scale production
      🔍 *This suggests that age-based interventions should focus on enabling youth to scale operations sustainably.*



Zooming into the Regional disaggregation of LIP

The LIP varies widely across Sierra Leone's cocoa-growing districts due to differences in yield, land size, and cost structures.

Pujehun – Highest LIP: $35.3/kg

- Farmers have the **smallest cocoa plots** (median land size: 0.81 ha, half the sample median)
- Low yields and small farms drive the LIP dramatically higher
- Even with low costs, the **volume of cocoa is insufficient** to meet income needs

Kailahun – Lowest LIP: $13.57/kg

- Farmers in Kailahun report the **highest yields** across all regions
- They also have larger average landholdings
- The combination of **higher productivity** and **larger scale** significantly reduces the price required to meet a living income

This gap analysis reinforces the importance of designing **regionally tailored strategies** for price, production support, and farmer services. Even in the most productive districts, current prices are far from sufficient to meet living income needs, and in the most constrained areas like Pujehun, the shortfall is severe.

3.5 Farmer typologies and key patterns: a cost-yield efficiency assessment

Using CYE analysis, farmers were grouped into four profiles based on cost per kg and yield, revealing a highly diverse set of realities among farmers in Sierra Leone.

We categorised farmers into four broad segments - call it personas - based on their productivity and cost-efficiency. This segmentation reveals a striking pattern: while **costs are generally low**, there is **wide variation in yield**, leading to different levels of efficiency and risk.

1. **Low cost / Low Yield (Excluded survivors)**
   (High risk: 78 farmers, 1 earning a LIP)
   These farmers produce very little cocoa — all below 144 kg per hectare — and spend almost nothing on inputs or farm labour.Many are stuck in survival mode, managing aging farms with no means to invest or replant.
   - They are often older farmers, farming alone or relying on family labour, with limited access to capital or support services.
     🔍 *These farmers are not inefficient: they are effectively excluded from the tools they need to farm better.*
2. **High cost / Low Yield (Struggling farmers)**
   Very high risk: 154 farmers, 0 farmers earning a LIP
   Highest LIP, sometimes 3x higher than efficient farmers: These farmers are investing in inputs or paid labour, but not seeing results in terms of yield.
   - They may be using inputs incorrectly, or farming degraded land or old trees. This group faces a real risk of falling deeper into poverty, as they spend more than they earn from cocoa.
     🔍 *This group is trying, but failing, to break out of poverty due to poor returns on investment.*
3. **High Cost / High Yield (Emerging professionals)**
   (Medium risk: 74 farmers, 3 earning a LIP)
   These farmers achieve good yields — often above 400 kg/ha — and spend significantly more on labour, inputs, and equipment.
   - They often belong to cooperatives, are younger, and may have received training or support through certification programmes. Despite higher costs, their efficiency is better: they turn investments into income.
     🔍 *This group points to the potential of cocoa farming as a business if the right support is in place.*

4. **Low cost /High Yield (Efficient performers)**
   (<u>Low risk</u> - Majority group: 160, 17 earning a LIP)
   <u>Lowest LIP</u>, often below the sample median: These farmers are efficient and are either earning a LIP or close to it. It is also the only segment where farmers earn more than they miss to reach a Living Income.

What does this tell us? The Production Cost and Yield Relationships

When comparing cost and productivity across segments, several key trends emerge:

- Farmers in **high productivity** segments generally have LIPs **below the sample median,** regardless of cost.
    - ***LCHP*** *farmers have the best outcomes, with 17 already at or above the threshold*
- **Low-cost farmers** report **lower cost variability**. Their per-kg production costs cluster below $1/kg.
- **High-cost farmers** show **greater spread**—some report costs up to **$5.26/kg,** especially in the low-productivity quadrant.
- **Productivity** is more evenly distributed among low-cost segments but extremely poor among high-cost, low-yield farmers.
- ***No farmer in the HCLP segment*** *earns enough to meet a living income benchmark*

These patterns suggest that **poor performers are not just spending more**: they are also achieving less with that investment.

3.6 What if Farmers Were Paid a LIP?

Using the same formula described above — combining the Living Income Benchmark, diversification ratio, cost of production (including depreciation), land under cocoa, and yield per hectare — we modelled the effect of paying farmers the **median LIP** of USD 19.49/kg.

The results show:

- **High productivity farmers** (Low Cost / High Productivity and High Cost / High Productivity) would close the income gap entirely.
- **Low productivity farmers** would still fall short:
    - Low Cost / Low Productivity: gap would shrink to **7.4%** of current income.
    - High Cost / Low Productivity: gap would remain at **63.5%**.

This confirms that even if farmers were paid the **same benchmark LIP**, or an universal floor, structural difference in yield, land size, and cost-efficiency would prevent many from reaching a living income.

When applying **custom LIP values per segment** — adjusting the price floor based on each group's yields, costs, and income dependency on cocoa — all four segments would close the living income gap.

However, this approach is harder to implement at scale, as it requires granular farmer-level data and segment-specific price agreements.

These findings reinforce two points that shape the next section:

- All four segments would **close the living income gap**
- Differences in final income levels would still remain—driven by yield, land size, and household needs
- This approach is **more accurate**, but **less practical** for buyers to implement at scale

Understanding these profiles enables better targeting of interventions, price support mechanisms, and farmer support services. But the typologies listed above are not fixed: farmers can shift from one group to another based on support, access to inputs, climate impacts, and other factors. As solutions aimed at the average farmer fail to reach under performing groups, the segmentation provides a roadmap for smarter interventions:

1. **Price alone cannot close the gap for all farmers.**
2. Understanding which farmers need pricing interventions, and which need yield or cost-efficiency support, is essential for effective strategy design.

The farmer personas that follow show exactly where each group stands — and what types of interventions are most likely to work.

What this tells us

1. **Price alone is not the problem: but it is part of the solution.** Even a significant price increase would not be enough for most farmers to reach a living income unless it is combined with improvements in yield, cost-efficiency, or both.
2. **Farmer realities are invisible in current pricing.** Today's market prices are set with little regard for what it actually costs to produce cocoa in a dignified and sustainable way. This disconnect keeps farmers trapped in poverty — especially those in the lowest performing segments.

3. **Segment-specific interventions matter.** A universal "fair price" won't work for all. Some farmers need price support, others need access to training, inputs, or replanting schemes to improve their efficiency.

🔍 *By anchoring the conversation in real numbers, the LIP helps shift the pricing discussion from ideology to evidence.*

Chapter 4 models how yield gains, cost efficiency, and diversification strategies perform across these segments, revealing where impact is achievable, and where it's not.

4. INTERVENTION MODELLING

Segmenting farmers before designing investments is not just an academic exercise — it is a way to ensure resources reach the right people, in the right way, at the right time. The profiles from Chapter 3 show that Sierra Leone's cocoa farmers face vastly different realities, which means a single "best practice" will inevitably fail some groups.

By segmenting farmers before designing investments, companies can:

- **Back strategies** with a higher chance of success.
- **Monitor progress** against tangible, segment-specific benchmarks.
- **Protect and enhance** past investments in resilience and supply continuity.
- **Meet compliance requirements** (EUDR, CSDDD) with stronger, evidence-based claims.

In contexts where production costs are significantly lower than the Living Income Benchmark, diversification and yield increases will almost always reduce the LIP more than cost-saving measures. This is particularly relevant in Sierra Leone, where most farmers operate in low-input systems.

The disparities revealed by the Cost-Yield Efficiency (CYE) analysis make one thing clear: **cocoa farmers here are not a homogenous group**. Strategies that work for efficient, high-performing farmers may fail entirely for those who are resource-constrained or structurally disadvantaged. To illustrate this, three interventions were modelled — each applied uniformly across the dataset — to assess how they would affect the Living Income Price (LIP) required for each segment.

The interventions are:

1. **A 10% increase in income diversification**
2. **A 10% increase in productivity (kg/ha)**

3. **A 10% reduction in production cost (USD/kg)**

Each was chosen for its potential relevance to Sierra Leone's context, where limited capital, low-input farming systems, and climatic variability limit the effectiveness of traditional agronomic recommendations.

> *(add heat map here? I find it confusing, maybe generate an alternative format with illustrations?)*

4.1 Income diversification

Mechanism of impact: Income diversification reduces the proportion of total household income that must come from cocoa, lowering the **diversification ratio** used in the LIP formula. When cocoa is no longer the sole income stream, the pressure on its price diminishes.

In the model, a 10% increase in non-cocoa income consistently **reduces the LIP across all segments**, with the **greatest relative effect in the most vulnerable groups**.

Segment impact

- **HCLP (High Cost, Low Productivity)** farmers benefit most, with an **11.8% reduction** in LIP, demonstrating that income smoothing may be a lifeline when productivity is low and costs are high.
- For **LCLP** farmers, the reduction is nearly as high at **8.9%**, suggesting that even low-investment households can meaningfully benefit from diversification.
- **LCHP** and **HCHP** also experience notable reductions (9.6% and 2.8% respectively), though to a lesser degree, reflecting that these segments are already approaching economic viability.

Considerations for implementation

While the concept is promising, effective income diversification strategies must be **region-specific and risk-aware**. Government concerns about food insecurity add a layer of complexity, as farmers moving into alternative crops may risk undermining food production.

Existing diversification pathways in Sierra Leone include:

- **Intercropping with rice, plantain, or cassava** (especially on newer farms)
- **Small livestock**, particularly poultry and goats
- **Engagement in petty trade or mining activities**

However, interventions must ensure that diversification:

- **Does not reduce cocoa productivity**
- **Builds resilience** (e.g. drought-tolerant crops, fast-growing food crops)
- **Aligns with market access and local food security plans**

Moreover, **local knowledge is essential**. Farmer sensemaking sessions and community consultation, particularly with youth and women, are key to understanding what diversification looks like in practice, and how it can be scaled without creating new dependencies or risks.

4.2 Productivity gains

Mechanism of impact: A 10% increase in productivity (kg/ha) directly reduces the LIP by increasing the output over which fixed costs are distributed. The **mathematical effect is consistent across all groups**: a 10% yield increase reduces the LIP by **9.1%**, due to the way the formula is structured.

Yet the **real-world implications** of that 9.1% differ by segment.

Segment impact

- For **HCLP** farmers, the absolute LIP reduction is substantial—nearly **$3.10/kg**—suggesting a strong return on yield-enhancing interventions.
- Even for **LCHP** and **HCHP** segments, which are already efficient, a productivity bump yields financial flexibility and reduces reliance on price premiums.
- For **LCLP** farmers, where input use is minimal and output is low, even a modest increase in productivity could mark the difference between chronic underperformance and viable cocoa production.

Barriers and priorities

Increasing productivity in Sierra Leone's cocoa sector is **neither straightforward nor purely technical**. The most cited causes of low yields are:

- **Inadequate farm maintenance** (infrequent pruning, limited pest management)
- **Poor shade management**
- **Use of old, low-yielding varieties**
- **Soil degradation**
- **Ageing cocoa trees and insufficient rehabilitation**

Additionally, **climate change-related diseases** are on the rise, but knowledge on diagnosis and treatment is limited. Extension services are thin, and most farmers lack access to improved planting materials or fertilisers.

However, data validated by local Solidaridaridad's expertise reveal that **certification schemes** and **NGO programmes** in Kailahun and Kenema have succeeded in raising yields—suggesting that with long-term support and investment, productivity gains are feasible.

Key areas for intervention include:

- **Access to resistant seedling varieties**
- **Farmer training in shade management, pruning, and composting**
- **Soil fertility improvements and mulching practices**
- **Youth engagement in farm renovation and maintenance**

Solidaridad's ongoing agroforestry promotion could also be leveraged to **increase cocoa yields through integrated systems**, while offering secondary income streams.

4.3 Cost reduction

Mechanism of impact: Reducing production costs by 10% has the smallest effect across all segments, especially among low-cost producers. This is expected: if you're already spending very little, there is simply less room to cut.

Segment impact

- **HCHP** farmers benefit the most (5.2% LIP reduction), given their larger baseline costs.
- **HCLP** sees a **2.9% drop**, though not enough to make a meaningful dent in the gap.
- **LCHP** and **LCLP** see **minimal impact** (0.8% and 0.2%, respectively).

In fact, further cost-cutting may introduce **new risks**, such as sacrificing productivity due to underinvestment, deducing labour use in a context where unpaid family labour already dominates or avoiding necessary farm maintenance or input application.

The data shows that **labour, tools, and seedling costs** are the dominant cost drivers, not fertiliser or chemicals. Labour is particularly costly in HCHP and HCLP segments, with high turnover, reliance on paid labourers and shortages during peak periods as frequent risks. Tools (especially non-mechanised equipment like machetes and axes) are also a major expense due to i**nferior quality on the market** and **requent replacement needs**

Opportunities

Rather than cutting costs outright, a better strategy may be to **improve cost-efficiency**:

- Subsidise or facilitate access to **high-quality, durable tools**
- Support **local youth service brigades** to lower labour costs while creating employment
- Invest in **farmer literacy and recordkeeping**, so that farmers can make more informed financial decisions

In the long run, **cost savings alone will not close the gap**, but smarter spending and better decision-making can increase cost-effectiveness.

Cross-cutting Insight: Gender and age dynamics

The study also uncovered social patterns that influence intervention success:

- **Youth** tended to have slightly higher productivity and lower costs, often because they farmed smaller plots and had more physical capacity to manage their land.
- **Older farmers**, by contrast, had larger farms but much lower yields, and often lacked the labour or resources to maintain them.
- **Women** were underrepresented in paid labour data, despite contributing significantly to farm work, highlighting persistent gender biases in how value is attributed within the household.
  🔍 *Understanding these dynamics is essential for designing/tailoiring inclusive procurement programmes for different segments credit schemes and policies that do not leave the most vulnerable behind.*

4.4 Takeaways from the intervention modelling

- **Income diversification** stands out as the **most impactful and equitable intervention**, especially for vulnerable segments.
- **Productivity gains** offer consistent benefits, but require long-term investments in knowledge, seedlings, and soil health.
- **Cost reductions** yield marginal benefits and are only meaningful where initial costs are high. Cost-efficiency—rather than absolute cost reduction—should be the priority.

The modelling confirms that **a one-size-fits-all approach will fail**. Instead, **segment-based intervention packages**, tailored to real farmer conditions, offer the clearest path to impact.

5. CONCLUSION: KEY INSIGHTS AND RECOMMENDATIONS

This Living Income Price (LIP) case study provides the most comprehensive farmer-level analysis of the cocoa sector in Sierra Leone to date, revealing a sector marked by **low-cost, low-yield production**, wide regional and demographic disparities, and multiple intersecting barriers to achieving a living income. While some farmers—particularly those with certification and higher productivity—are approaching economic viability, the vast majority remain **trapped in a cycle of underperformance and under-compensation**.

The central message is clear: closing the living income gap will require segment-specific interventions that combine fairer prices with targeted productivity, diversification, and capacity-building measures — designed and co-owned by farmers, cooperatives, government, and the private sector.

Below, we synthesise key discussion points and translate them into practical, segment-specific recommendations.

5.1 Regional differentiation is essential

The analysis confirms that **regional differences in productivity, cost structures, and LIP values are significant** and must shape programme design. Certain district-level differences can only be understood thanks to local stakeholders consultation.

For example:

- **Kailahun and Kenema** exhibit higher productivity and lower LIPs, a result likely linked to sustained NGO support and the earlier introduction of certification schemes.
- **Pujehun**, by contrast, shows the **highest LIP**, primarily due to small average land sizes and limited yield.

This suggests that **national-level averages mask critical sub-national disparities**. A regional approach is not only recommended but necessary. For example, a bundled intervention that works in Kenema may fail in Bo or Pujehun unless it's adapted to local agro-ecological conditions, farm sizes, and economic activities.

Recommendations:

- **Programme design:** Cluster districts with similar profiles and co-design interventions with local authorities and cooperatives.
- **Monitoring:** Disaggregate analysis by district to ensure interventions remain relevant and responsive.

5.2 Productivity is the main lever

Low input use keeps production costs down, but yields too low to close income gaps. Productivity gains consistently have the largest impact on reducing the LIP, especially for high-cost, low-productivity farmers.

Recommendations:

- **NGOs/Extension:** Focus on proven yield-boosting practices (pruning, soil health restoration, shade management, improved planting material).
- **Youth programmes:** Create service models (e.g. pruning teams, compost production) to support older farmers and generate rural jobs.
- **Cooperatives/Buyers:** Combine training with input provision and link productivity gains to traceable premiums.

5.3 Cost-efficiency, not cost-cutting

Most farmers already operate with minimal costs; further cuts bring little benefit and may harm productivity. The priority should be improving cost-effectiveness and decision-making.

Recommendations:

- Donors/NGOs: Support access to durable tools and shared labour services.
- Cooperatives: Train farmers in recordkeeping and cost tracking.
- Government: Regulate tool and input markets to improve quality and pricing consistency.

5.4 Diversification strengthens resilience - but must be context specific

Income diversification lowers the LIP across all segments, particularly for vulnerable high-cost, low-productivity farmers. However, strategies must complement cocoa rather than compete with it, and align with national food security goals.

Recommendations:

- **NGOs:** Promote district-suited companion crops and livestock.
- **Government:** Issue district-level guidance to balance diversification with staple crop needs.
- **Youth initiatives:** Support rural enterprises in processing, small livestock, or input production.

5.5 Certification as a proxy for bundled services

Certified farmers typically have higher yields, lower costs, and lower LIPs — largely due to bundled inputs, training, and technical assistance. These benefits can be extended to non-certified farmers through cooperative or service-centre delivery.

Recommendations:

- **NGOs/Buyers:** Offer certification-adjacent services to all farmers.
- **Certification bodies:** Integrate living income metrics and segment-specific needs into standards.

5.6 Youth as a service and innovation driver

Youth farmers often have lower costs and greater openness to innovation but face land access barriers. Their mobility and technology use make them strong candidates for scaling digital tools and service provision.

Recommendations:

- **Government/Donors:** Expand youth investment models linking land access with service provision.
- **Buyers:** Engage youth in data collection, traceability, and agroforestry monitoring.

5.7 Literacy and data reliability as prerequisites

Low financial literacy and poor recordkeeping undermine both intervention design and regulatory compliance (EUDR, CSDDD). Functional literacy is not optional — it's foundational.

Recommendations:

- **NGOs/Cooperatives:** Integrate basic literacy and numeracy into all training.
- **Compliance systems:** Use simplified, visual, or NFC-based tools to support illiterate farmers.

5.8 Agroforestry and carbon-linked opportunities

Agroforestry is common and offers potential for carbon finance and bio-input production. This could open new revenue streams if linked to enabling policies and aggregation models.

Recommendations:

- **Government:** Strengthen land rights and frameworks for smallholder participation in carbon markets.
- **Project developers:** Bundle agroforestry with carbon finance, fertiliser production, and youth employment.
- **Buyers:** Invest in joint monitoring of environmental and income impacts

5.9 Private sector co-investment and shared responsibility

Finally, Exporters are prioritising quality and productivity but still rely heavily on certification as a proxy for impact. Dynamic, farmer-level data is needed to drive pricing, investment, and risk management.

Recommendations:

- **Traders/Buyers:** Co-invest in farmer-facing interventions and share data on costs, quality, and premiums.
- **NGOs/Platforms:** Facilitate pre-competitive data-sharing frameworks.
- **Policy advocates:** Use EUDR and CSDDD leverage to promote long-term buying commitments.

Final Call to Action

Achieving living incomes for Sierra Leone's cocoa farmers will not come from price alone; nor from generic, top-down programmes. The most realistic pathway is **a coordinated, segment-based approach** that:

1. Pays fair, traceable prices aligned with LIP benchmarks.
2. Targets productivity improvements to underperforming segments.
3. Supports cost-efficiency and complementary diversification.
4. Builds the literacy, data systems, and market linkages needed for sustained impact.

This requires **shared responsibility**: farmers bringing local knowledge, cooperatives coordinating services, government enabling the right policy environment, and buyers committing to long-term, transparent relationships. With these elements in place, the income gap can be closed — not for a few, but for all.