Research Summary – Master's thesis Lea Fabritius, 16.04.2025
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Social Life Cycle Assessment of Five Coffee Production Case Studies in the South of Minas Gerais, Brazil

1 Introduction and Context

Brazil's coffee sector is globally significant and sustains millions of livelihoods. Yet, despite comparatively progressive labour legislation, Brazil is listed by the U.S. Department of Labor as likely to involve forced and child labour. In Minas Gerais, the country's leading coffee-producing state, precarious working conditions and labour rights violations are documented. These challenges underline the need for sustained efforts towards more socially sustainable development in coffee value chains. In response, this master's thesis contributes to the evolving field of Social Life Cycle Assessment (S-LCA), a methodology for assessing positive and negative socio-economic impacts across product life cycles and stakeholder groups. Unlike Environmental LCA, S-LCA is still at a pioneering stage, with gaps in its methodological operationalization and implementation. It remains less standardized and often lacks primary data. Tools such as the Social Hotspot Database (SHDB) provide only national or sector-level risk data, limiting their relevance for site-specific assessments. This thesis addresses that gap by presenting the first primary-data-based S-LCA in Brazil's coffee sector, analysing five case studies in South Minas Gerais.

2 Research Objectives and Questions

This thesis aimed to refine the S-LCA methodology for context-specific application, improve indicator relevance, and compare the results with SHDB-derived risk levels. Validation interviews with representatives from the case studies were conducted in Brazil in February 2025 to strengthen the methodological robustness and local relevance of the results.

The thesis addresses three research questions:

1. How can S-LCA be refined for effective application in the Brazilian coffee sector?
2. What are the positive and negative social impacts across the five case studies?
3. How do SHDB risk levels compare to primary data-based S-LCA results?

3 Approach and Methods

The examined case studies include diverse value chains: direct trade and certified cooperatives, a social movement cooperative, and two specialty coffee plantations. Following the UNEP's revised S-LCA guidelines, the thesis applied the four phases: goal and scope definition, life cycle inventory, impact assessment, and interpretation.

The assessment covered the life cycle stages from planting to the cooperative or plantation gate (cradle-to-gate). From the UNEP guidelines the stakeholder categories *workers*, *local communities*, and *value chain actors* were selected. Additionally, a fourth stakeholder category *farmers* was introduced. Using UNEP's guidelines as a foundation, for defining impact subcategories (specific social themes) and indicators, these were subsequently adapted to better align with the local context, leveraging insights gained from the available on-site primary data. The adapted framework contains 27 impact subcategories and 53 indicators of which 22 were newly developed. The primary data were previously gathered through 81 interviews with workers, farmers, cooperative management, and plantation owners between October and December 2023. For each indicator, a tailored four-level reference scale was created based on national standards (see Table 1). The primary data were systematically compared against the reference scale levels and final social impact scores for each indicator and case study were calculated using R and visualized with heatmaps. Negative assessments were presented separately to ensure that non-compliant situations remained visible. The reference scales were reviewed with a Swiss roaster and two S-LCA experts, and six semi-structured validation interviews were conducted in Brazil to contextualize the results.

Table 1: Reference scale example of the indicator "fair salary"

Impact Subcategory	**Indicator**	**2**	**1**	**0**	**-1**
		Evidence of outstanding efforts/ ideal performance	Proactive efforts/ progress beyond compliance	Compliance with local laws/basic societal expectations	Non-compliant situation
Fair salary	Lowest paid worker, compared to the minimum and living wage	Lowest paid workers earn wages that meet or exceed the minimum living wage (R$2,621).	Lowest paid workers earn wages that are above the legal minimum wage but still below a living wage.	Lowest paid workers earn the legal minimum wage (R$1,320, 2023).	Lowest paid workers earn wages that are below the legal minimum wage and/or fall below the poverty line.

4 Key Results

The results of the methodological adaptation highlight the importance of context specific refinement in S-LCA. Using individual reference scales per indicator, rather than aggregated scales per impact subcategory ensured the visibility of positive and negative social impacts. Including two performance levels beyond basic compliance enabled a more nuanced assessment of good practices. The results revealed that locally prioritized impact subcategories often diverged from those highlighted by the SHDB assessment. Discrepancies between the results of the S-LCA and SHDB assessment underscore the limitations of relying solely on secondary data or aggregated data. This underlines a key tension in S-LCA: while standardization enhances comparability across studies, a rigid, one-size-fits-all approach risks overlooking key social issues specific to local realities. A path forward may lie in combining a core set of standardized indicators with a complementary set of context-specific indicators.

The application of the revised S-LCA methodology revealed overall positive social performance across all case studies, with notable examples of good practices. However, several areas for improvement were identified. Women and people of colour remain overrepresented in lower-paying positions, gendered divisions of labour persist, and low wages and informal work remain a concern. Many workers viewed the minimum wage as insufficient, and union representation was weak. Farmers struggled with succession, yield variability, low incomes, and limited access to tools and information for managing price volatility.

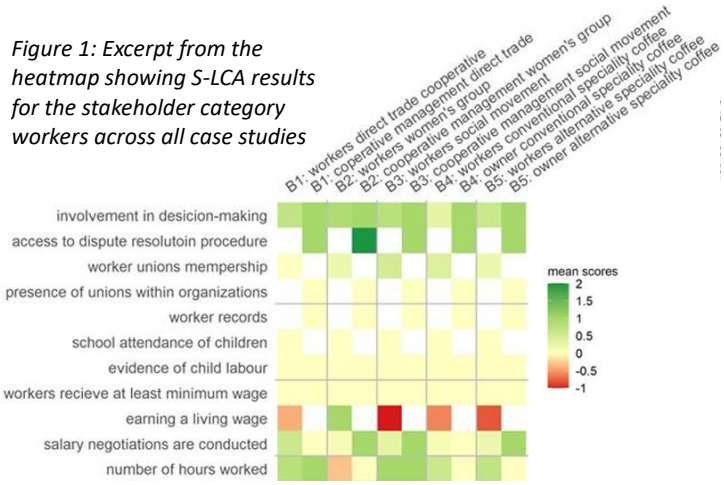

Figure 1: Excerpt from the heatmap showing S-LCA results for the stakeholder category workers across all case studies

5 Development Impact and SDGs

This thesis presents a novel and implementation-oriented contribution to sustainable agricultural development, as the first primary-data-based application of S-LCA in Brazil's coffee sector. It offers a practical, adaptable tool for assessing and improving social performance in agricultural value chains, grounded in primary data and stakeholder validation. The thesis supports the achievement of multiple SDGs:

By assessing income sufficiency, wage adequacy, and barriers to financial resilience.

By examining working conditions, employment contracts, and union presence, identifying good practices and structural gaps.

By enhancing transparency in production systems by providing a replicable framework to assess the social impacts of products.

By revealing patterns of gender-based job segregation and underrepresentation of women in decision-making and involving a women's coffee group.

By capturing the experiences of marginalized groups, such as informal workers, smallholder farmers, and people of colour.

Ultimately, this research illustrates both the potential and the limitations of current approaches to assessing social sustainability in agriculture. By making social impacts visible, comparable, and actionable, it helps move global coffee production toward greater fairness, inclusivity, and accountability. The ideal scenario is one where all actors in agricultural production, not just a few, can take pride in their work and receive fair compensation. As one coffee farm worker in Minas Gerais expressed:

"Quando você faz o que você gosta você não trabalha, e até eu sou remunerado."

("When you do what you love, it doesn't feel like work, and I even get paid for it." – coffee farm worker, age 45, Minas Gerais, 2023).

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