

Social Sustainability of Smallholder Coffee Partnerships and SDG Linkages in North Sumatra Province

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Abstract. This study evaluates the social sustainability of a smallholder coffee partnership in Gung Pinto Village, where farmers still face production and quality constraints, limited market information, and price fluctuations. While previous research predominantly focuses on the economic outcomes of coffee supply chains, the social life cycle impact of informal smallholder partnerships remains under-investigated. The novelty of this study lies in its application of SLCIA Type I to evaluate localized social sustainability and its precise integration with regional SDG indicators in North Sumatra. The case study was conducted in November 2025; the location was selected purposively, and 30 farmer households were selected using simple random sampling. The assessment applied the UNEP-SETAC Social Life Cycle Assessment (SLCA) framework and the Social Life Cycle Impact Assessment (SLCIA) type I, with performance reference points for five indicators: fair trade relations, wealth distribution, supplier relations, fulfillment of basic needs, and access to services and inputs. The results indicate that the partnership's social performance is generally positive, with an average score of 3.5, indicating compliance and, in some aspects, exceeding minimum standards. Access to services and inputs performed best (score 5), followed by wealth distribution (4.1), supplier relationships (3.7), and basic needs fulfillment (3.7), reflecting support for inputs and services, increased income, improved access to basic services, and strengthened technical capacity through extension activities. Conversely, fair trade relationships scored low (1.0) due to the lack of written contracts, which can weaken the clarity of long-term rights and obligations. Overall, the partnership advances SDGs 1, 2, 6, 8, and 12 through improved income, access to basic services, and more sustainable production, while adaptive written agreements are needed to strengthen fairness and social resilience.

Keywords: Social Sustainability; Partnership; Smallholder Coffee; SDGs/TPB; SLCA

INTRODUCTION

Coffee is produced primarily by smallholder farmers, yet it is connected to global value chains that demand quality, sustainability, and traceability. Business partnerships are often used to expand market access and increase farmer value, though their impact varies across regions and types of market relationships (Machieu et al., 2025; Wright & Aklimawati, 2018). Indonesia is one of the world's largest coffee-producing and exporting countries (Zikra et al., 2022). In 2021, coffee exports ranked fifth after palm oil, rubber, cocoa, and coconut, while smallholder plantations accounted for 95.77% of the total area under cultivation from 1984 to 2022 (Fariz et al., 2023; Widaningsih, 2022). Despite this dominance, Indonesian smallholders face increasing pressure to comply with stringent international sustainability and traceability standards. These pressures significantly affect their access to global markets and exacerbate their vulnerability. Consequently, a critical research gap exists in understanding how localized

business partnerships can effectively buffer these global pressures and ensure social sustainability for smallholder farmers.

To address this globally relevant issue, North Sumatra serves as a highly representative case study. North Sumatra has significant potential for coffee cultivation and plays a crucial role in Indonesia's specialty coffee sector (Hasibuan et al., 2025; Radiah, 2021). Within this province, Gung Pinto Village exemplifies the complex dynamics of modern coffee farming, where farmers attempt to navigate the demanding global supply chain through local partnerships. However, despite this high potential, the sustainability of smallholder coffee businesses in the area remains threatened by cultivation and land management issues, making it an urgent and ideal location to evaluate the real-world impact of such partnerships. The main challenges include decreased production due to climate anomalies (Syakir & Surmaini, 2017), unstable quality (Sahat et al., 2016), limited information and marketing access (Zakaria et al., 2017), price uncertainty (Pratama et al., 2015), and low productivity and human resource capacity, impacting pre-harvest, post-harvest, and market conditions amidst dynamic global demand (Novita et al., 2012).

Partnerships or contract farming are promoted to reduce risks and transaction costs through market certainty, quality standards, and mentoring. However, cross-country evidence shows mixed impacts: some farmers benefit, while others face dependency and barriers to compliance. These mixed impacts often emerge because many partnerships fail to adequately address social sustainability standards. Common causes of such failures include asymmetrical bargaining power, lack of transparency in profit-sharing, and the absence of formal written contracts, which leave smallholders vulnerable to unfair practices and compliance burdens that outweigh the economic benefits. In North Sumatra, partnership patterns vary, and farmers' perceptions are influenced by communication, cooperation, trust, and commitment as core elements of social sustainability (Anh et al., 2019). Furthermore, certification or Voluntary Sustainability Standards (VSS), such as the Common Code for the Coffee Community (4C) and Rainforest Alliance, have been adopted to meet market demands, with inconsistent results due to costs and compliance burdens. Studies in Indonesia emphasize the role of knowledge, social interactions, and farmer perceptions in program legitimacy (Chiputwa et al., 2015; Putra et al., 2024). At the value chain level, relationship design, the role of producer organizations, and coordination mechanisms determine value distribution and bargaining power. Partnerships can improve farm performance, but this depends on farmer participation and characteristics (Faul et al., 2007; Haloho et al., 2024; Vicol et al., 2018).

The link between smallholder coffee partnerships and the SDGs is evident in poverty alleviation, decent work, inequality reduction, and strengthening multi-stakeholder partnerships. The literature confirms that the social contribution of VSS and sustainability initiatives is largely determined by governance, accountability, and the capacity of local actors to fairly translate standards, in line with domestic studies that emphasize strengthening the capacity and collaboration of coffee communities (Asfaw & Negeri, 2025). Improving the quality of smallholder coffee is also guided by an agribusiness approach based on farmer institutions, business orientation, and the adoption of efficient technologies within the framework of sustainable development, with three pillars: economic, social, and environmental (Purwanti et al., 2021; Novita et al., 2012). Therefore, partnerships between farmers and companies are needed to absorb production and encourage mutually beneficial productivity increases (Cahyanto et al., 2021; Putra & Siahaan, 2024).

However, most previous research has focused on the economic and productivity aspects of coffee farmer partnerships, while studies on social sustainability, especially those using a structured Social Life Cycle Assessment (S-LCA) approach, are still limited. Furthermore, the application of SLCIA type I, which assesses social performance based on compliance with standards and reference scales, remains rare in the context of smallholder coffee-farmer partnerships, particularly in regions such as North Sumatra Province. This indicates a research gap in understanding how partnership practices not only provide economic benefits but also impact broader social dimensions, such as equity, well-being, and access to basic needs.

This study aims to assess the level of social sustainability in smallholder coffee plantation business partnerships and how it relates to the achievement of the SDGs in North Sumatra Province. By using the SLCIA type I approach, this study provides a more comprehensive evaluation of social impacts at the local level, thus becoming a new contribution to the literature on sustainable agribusiness partnerships. It is hoped that this research will serve as a reference for stakeholders in identifying areas of improvement in social sustainability to enhance the practice of smallholder coffee farmer-company partnerships. Compliance with standards and reference scales remains rare in the context of smallholder coffee-farmer partnerships, particularly in regions such as.

METHODS

This research was conducted in Gung Pinto Village, Naman Teran District, Karo Regency, North Sumatra Province, as this area is one of the coffee production centers in North Sumatra and produces specialty coffees. Furthermore, Tanah Karo Arabica coffee already holds

Geographical Indication (GI) certification, and in 2020, Karo Regency contributed 10.97% of total coffee production in North Sumatra (Widaningsih, 2022).

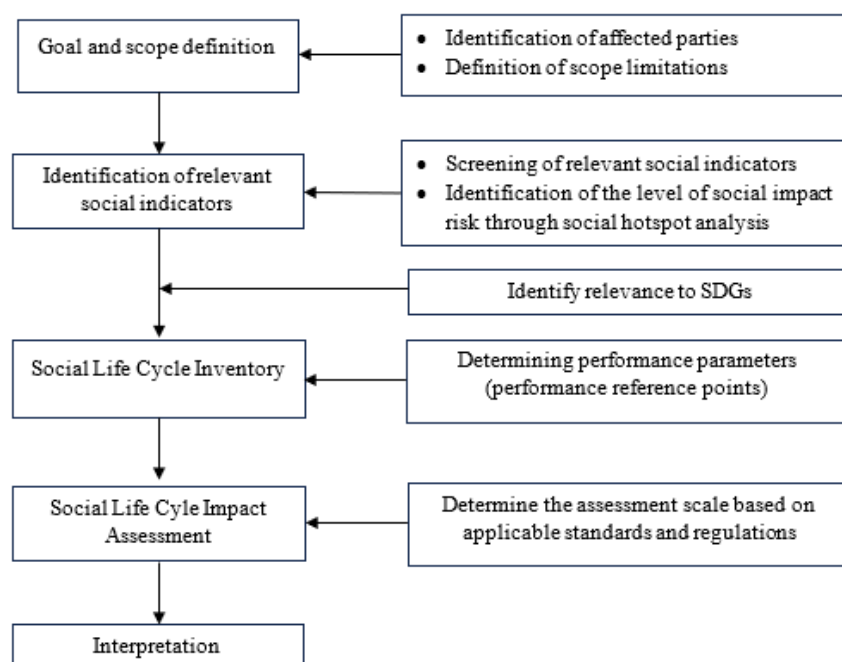


Figure 1. Research flowchart (Nasution, 2023)

This research was conducted in accordance with the SLCA framework published by UNEP-SETAC/United Nations Environment Program-Society of Environmental Toxicology and Chemistry (United Nations Environment Program, 2020). The SLCA method is based on data collected through surveys and interviews, as well as secondary data from a literature review of journal articles. It involves several steps, as shown in Figure 1.

This research was conducted in November 2025, using primary data collected through surveys and interviews, and secondary data from a literature review of journal articles and related previous studies. The sample consisted of PT Y, a coffee plantation company in Karo Regency, North Sumatra Province, and coffee farmers who are members of farmer group X and partner with PT Y. The coffee farmer sample was selected using simple random sampling, with a sample size of 30 coffee farmers. Although the sample size is relatively small, it is considered adequate for exploratory analysis and is influenced by field constraints, including accessibility and time during data collection. The social sustainability indicators used were based on research by Nasution (2023). This study employed five indicators.

Table 1. Indicators of Social Sustainability of Partnerships

No	Social Sustainability Indicators	Reference
1	Fair trade relations	UNEP/ <i>United Nations Environment Programme</i> (2021)
2	Distribution of wealth	UNEP (2021)
3	Supplier relations	GRI/ <i>Global Reporting Initiative</i> (2020); UNEP (2021); PSIA/ <i>Product Social Impact Assessment</i> (2020)
4	Fulfillment of basic needs	PSIA (2020)
5	Access to services and input	PSIA (2020)

Source: Nasution (2023)

Next, the performance parameters for each social sustainability indicator were determined based on the Global Reporting Initiative (2020) sustainability standards, the United Nations Environment Program's SLCA methodology sheet (2021), and the Product Social Impact Assessment (2020). A questionnaire was then designed for use during the survey. Questions included yes/no, single-choice, and multiple-choice. Next, the relevance of the partnership's social sustainability indicators to achieving the SDGs was identified. This step involved comparing the partnership's social sustainability indicator formulation, namely "Social Indicators - Performance Parameters," with the SDG formulation, namely "Targets - Indicators." The social impact assessment method used was SLCIA type I, a reference-scale-based method. Performance Reference Points (performance parameters) were developed to assess the company's compliance with regulations and standards. In this study, a score of 0 indicates that the condition has met the standard (compliance). In contrast, a negative score (-1 to -2) indicates performance below the standard, and a positive score (+1 to +2) indicates performance exceeding the standard. In the Product Social Impact Assessment (2020), the scale used ranged from -2 to +2.

Scoring is done for each question. Each question in the questionnaire has a different number of answer choices (ranging from 2 to several, such as 3, 5, or more), depending on the question type. To maintain consistency in assessment, all responses were converted to a standard scale of 1 to 5, with 1 indicating the lowest performance and 5 the highest. The conversion process was performed proportionally to the number of answer choices for each question. The more answer options selected, the higher the score. The final score is calculated using a weighted average method. The number of questions in each indicator varies, so the score for each indicator is calculated by averaging all the scores from the questions in that indicator, allowing them to be compared. The calculated scores are averaged across each indicator. The final score obtained is converted to a score range of +2 to -2. The average value

is then classified into a scale of -2 to +2 based on the PSIA (2020) interval as presented in Table 2.

Table 2. Assessment scale in social sustainability assessment

Rating Scale	Score Interval	Information
+2	4.6 – 5.0	Ideal performance, positive output, best in class
+1	3.6 – 4.5	Performance above compliance standards, and there is monitoring
0	2.6 – 3.5	Performance according to compliance standards
-1	1.6 – 2.5	Performance is slightly below compliance standards, but improvements are underway.
-2	1.0 – 1.5	Performance below compliance standards, no data, no improvement efforts

Source: Product Social Impact Assessment (2020)

RESULT AND DISCUSSION

A partner is defined as a friend, coworker, or colleague. A partnership, on the other hand, is a relationship established by partners for collaborative work. Partnerships between farmers and companies can improve farmers' welfare and increase the availability of raw materials for companies (Mulyani et al., 2024). They also offer solutions to farmers' problems (Priska & Noor, 2024).

Partnerships aim to increase income, business sustainability, production quantity, and quality. Partnership systems address information and market risks and are used to address product price risks. Partnerships not only have the potential to increase farmer income but also the rural economy. A common problem for farmers in agricultural business partnerships is the imbalance between the implementation of the partnership model and the economic benefits realized, leading to unfulfilled expectations (Watemin & Lestari, 2025).

Partnerships depend on trust. This is stated in the Decree of the Minister of Agriculture No. 940/Kpts/OT. 210/10/1997 concerning guidelines for agricultural business partnerships, business partnership patterns consist of (Pangestuty & Dessatria, 2013):

Nucleus-Plasma Partnership

In this model, large businesses and manufacturing industries act as corporate/core partners in partnerships with agricultural producers. The partnership is conducted with farmer groups. The corporate/core partners are responsible for land preparation, production equipment, technical guidance on post-harvest cultivation practices, financing, and other assistance. Meanwhile, farmers cultivate their land according to the direction of the core or corporate partner and hand over the produce to the core company as agreed.

Contract Farming Partnership

In this model, partner farmers are given contracts to supply products to the core company according to the terms of the agreement. The core company can provide technical and managerial assistance, credit facilities, and accommodate production, processing, and marketing.

Subcontract Partnership

A subcontract partnership is a partnership between a group and a company to produce components needed by the company. This model is often found in industrial products.

General Trade Partnership

This model is a partnership between a farmer group and a company. The partners supply the needs of their corporate partners according to specified requirements. Small businesses sell products to medium- and large-sized businesses, and they can also meet their needs. In practice, these partnerships are often informal because they are not always supported by written contracts that stipulate the rights and obligations of both parties. The absence of formal contracts can create a power imbalance, leaving farmers with a weak bargaining position and forcing them to rely on companies as their primary buyers. Based on the "mixed impacts" framework, these partnerships provide market access and income opportunities, but also risk creating hidden dependencies due to the lack of formal protection.

Agent Partnership

In this model, group partners (small businesses) are granted exclusive rights to market goods and services from the company's business partners. The profit from this model is the sales profit plus a commission/fee paid by the partner company. This model is found in the distribution of production equipment or distribution.

Agribusiness Operational Partnership

In this model, the partners provide land, facilities, and labor, while the company provides capital and facilities for cultivating agricultural commodities. The company acts as a core company or advisor. It performs land clearing and cultivation, manages its own processing units, and provides training.

Based on the existing partnership model, the relationship between PT Y and smallholder coffee farmers in Gung Pinto Village is closer to a general trading partnership, as the primary focus is marketing and sales activities. In practice, farmers have no exclusive obligation to sell coffee to PT Y. Sales decisions are flexible, following market mechanisms, with farmers tending to sell to the party offering the higher price (PT Y or the middleman).

The uniqueness of this partnership is the support from PT Y in the form of inputs and training, but a binding sales contract or written contract does not accompany this support. This situation can be understood as a non-exclusive general trading partnership model, where the company encourages increased production capacity and quality through coaching but does not control marketing through sales obligations. Consequently, supply security for the company and market security for the farmers are relatively weaker than in a contract-based model. The sustainability of the relationship is determined more by price competitiveness, the benefits of services or coaching, and trust between the parties, rather than by binding formal regulations.

This research is guided by Nasution's (2023) study, which uses seven performance parameters derived from five social sustainability indicators. Figure 2 shows that these indicators can contribute to achieving the SDGs (Sustainable Development Goals), namely SDG 1, SDG 2, SDG 6, SDG 8, and SDG 12.

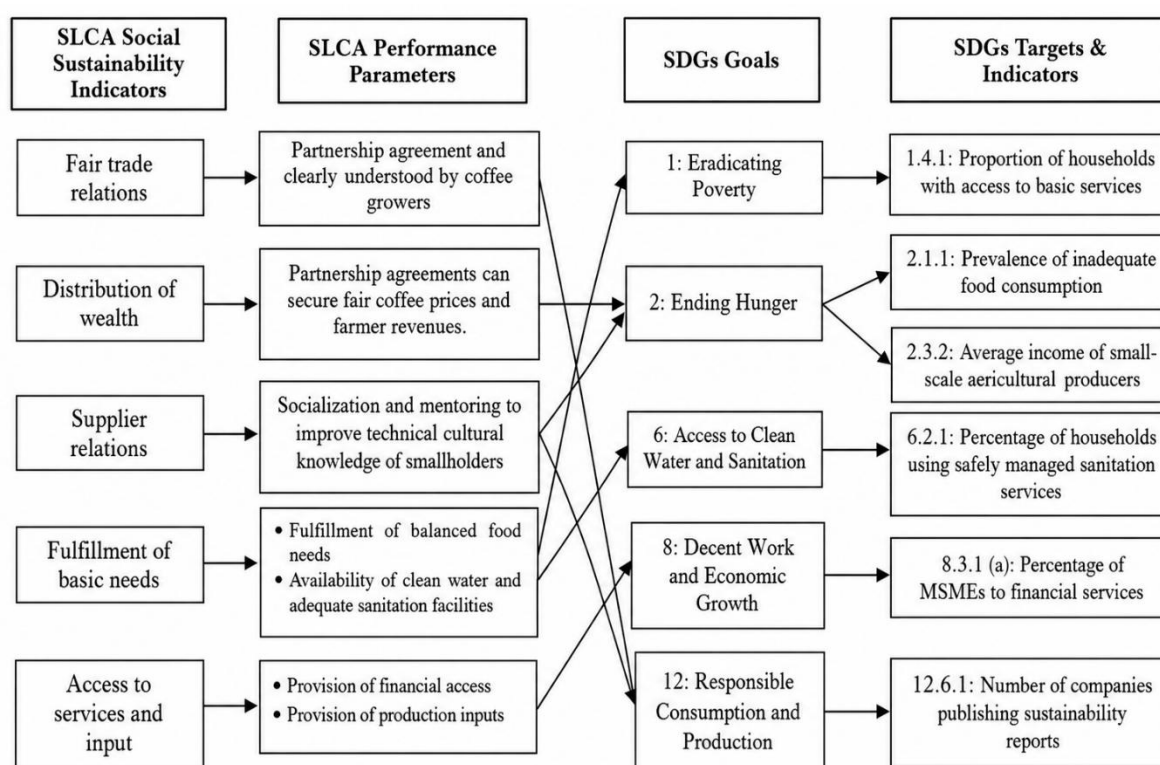


Figure 2. Identification of the Suitability of Social Sustainability Indicators of Community Coffee Plantation Partnerships to the SDGs

The social indicator related to fair trade relations supports SDG 12 (ensuring sustainable production and consumption patterns). This contribution is reflected in the performance parameter, which is the existence of an agreement between Company Y and its smallholders that all smallholders fully understand. However, the SLCA results show that these agreements remain generally informal and lack legally binding contracts. Although SDG 12 does not

specify an indicator that explicitly addresses partnerships, fair trade relations practices can still strengthen the achievement of indicator 12.6.1, particularly by encouraging companies to integrate sustainable practices into their sustainability reports. The absence of formal contracts can reduce transparency and accountability, thus becoming an obstacle to achieving SDG 12, particularly in the aspect of responsible and sustainable business practices.

The social indicator regarding wealth distribution contributes to SDG 2 (ending hunger) through partnership agreements that guarantee secure coffee prices and ensure that smallholders receive fair returns. This has the potential to increase smallholder incomes, thereby strengthening their ability to meet basic food needs. This finding aligns with indicator 2.1.1 on the prevalence of food insufficiency and indicator 2.3.2 on the average income of smallholder agricultural producers. However, the absence of a formal agreement can reduce the stability of income in the long term, potentially weakening the sustainability of these contributions. Furthermore, supplier relationships support SDG 2 and SDG 12 through outreach and mentoring activities that strengthen smallholders' technical and cultural knowledge. In this case, Company Y acts as a strategic partner promoting sustainable production practices in line with indicator 12.6.1.

The social indicator related to meeting basic needs is linked to SDG-1 (ending poverty) through the parameters of meeting the need for balanced, nutritious food and providing access to basic services. This linkage primarily refers to indicator 1.4.1, namely the proportion of households with access to basic services.

Conversely, the indicator of access to services and inputs supports SDG-8 (decent work and economic growth) by providing access to financing and production inputs. This support encourages increased production volume, improved crop quality, and enhanced farmer welfare, in line with indicator 8.3.1(a) on the percentage of Micro, Small, and Medium Enterprises (MSMEs) receiving financial services. However, reliance on company-provided inputs can create structural dependencies that limit farmers' long-term independence and resilience.

Social Life Cycle Impact Assessment

The social life cycle impact assessment is based on a rating scale that refers to applicable national laws and regulations. A score of zero indicates minimal compliance with regulatory standards; a positive score reflects performance above the standard; and a negative score indicates non-compliance without the company's remedial efforts.

Table 3. Level of Sustainability of the Smallholder Coffee Plantation Partnership

Social Indicators	Score
Fair trade relations	1.0
Distribution of wealth	4.1
Supplier relations	3.7
Fulfillment of basic needs	3.7
Access to services and input	5
Average	3.5

Source: Primary data, processed (2025)

Table 3 shows that the coffee plantation partnership between PT Y and smallholder farmers achieved overall positive social performance, with a total score of 3.5. This figure indicates that the partnership's governance meets, and in some cases exceeds, applicable regulatory compliance standards.

Fair Trade Relations

According to Raynolds et al. (2007), a fair trade relationship involves interactions between stakeholders in the global supply chain to create sustainable value for farmers, workers, companies, and consumers through the principles of fairness, openness, sustainability, responsibility, and participation. Felix (2024) also stated that a fair trade relationship benefits producers, communities, and the environment.

Table 3 shows that the fair trade relationship indicator for the partnership between PT Y and coffee farmers scored 1.0, indicating below-standard performance due to the absence of a written partnership contract between PT Y and the farmers. Interviews revealed that 100% of the farmers said there was no written partnership contract, even though the partnership has been in place for 3-4 years, with PT Y continuing to offer input assistance while allowing farmers the freedom to sell their harvest. This freedom is relevant because PT Y's prices are sometimes lower than those set by middlemen. The low score results from the lack of formal written agreements that would ensure long-term transparency and fairness. This finding confirms the discussion in the introduction regarding the importance of trust and commitment in partnerships. Although relationships are based on trust, the absence of formal contracts indicates structural weaknesses that can hinder compliance and transparency.

In line with the identified research gaps, the absence of a written agreement can be seen as an obstacle to transparent, accountable partnership practices, as it creates uncertainty about each party's pricing, rights, and obligations. Therefore, it is recommended that PT Y draw up a written contract to clarify each party's rights and obligations, while maintaining sales flexibility in line with the general trading pattern.

As a managerial implication, PT Y is advised to develop a simple, easily understood contract scheme for farmers, thereby maintaining legal certainty without compromising flexibility. From a policy perspective, local stakeholders can also play a role in increasing farmer groups' capacity to understand formal agreements, thereby strengthening fair and sustainable partnerships.

Distribution of Wealth

Equitable wealth distribution among stakeholders plays a crucial role in achieving sustainable economic growth (United Nations Environment Programme, 2021). This indicator measures the fairness of profit-sharing between companies and smallholders, with transparent market pricing mechanisms enabling smallholders to receive fair income to meet their basic food needs.

Table 3 shows that the wealth distribution indicator has a score of 4.1. This score indicates social performance above compliance standards, supported by transparent pricing and the freedom for PT Y to sell to smallholders. Interviews revealed that 60% of smallholders felt their coffee income was sufficient for their families' needs, including their children's education. In comparison, 100% of smallholders (all smallholders) stated that their income had increased after partnering with Company Y. However, some smallholders continued to engage in side jobs such as farm labor, trading, or horticultural cultivation as a strategy to diversify their income to anticipate fluctuations in coffee prices.

From an S-LCA perspective, these findings suggest that although farmers' incomes have increased and may even exceed the minimum wage, this does not automatically guarantee an overall improvement in their well-being. The existence of side jobs suggests that farmers continue to face income instability, particularly amid fluctuating coffee prices and the high cost of living in plantation areas.

Furthermore, when linked to the findings on indicators of basic needs fulfillment, specifically the persistence of unbalanced food consumption patterns, this indicates that income increases have not been fully accompanied by improvements in food consumption patterns. This situation may reflect constraints in household financial management or limited access to diverse and nutritious foods, both of which are important aspects of assessing social sustainability. Thus, although partnerships have contributed to increased incomes, they have not fully addressed broader dimensions of well-being, particularly those related to food security and cost-of-living pressures.

Supplier Relations

Supplier relationships encompass all collaborative activities, agreements, exchanges, trade, and interactions between a company and suppliers of goods and services. A company's attitude toward suppliers is crucial to business continuity, with responsible companies viewing suppliers as strategic partners rather than merely commodity suppliers (United Nations Environment Program, 2021). Table 3 shows that the supplier relationship indicator scored 3.7. This score indicates social performance that exceeds compliance standards, particularly in reference to Article 57 paragraphs (1) and (2) of Law No. 39 of 2014 concerning Plantations. This provision requires the formation of mutually beneficial partnerships among plantation companies, their farmers and employees, and the surrounding community.

Interviews revealed that 100% of the farmers had participated in training or outreach related to coffee cultivation techniques from PT Y, with high participation (86.67% of farmers always attended, and 13.33% attended two to four times a year). During their partnership, PT Y has presented five main topics: harvesting techniques and determining fruit ripening time; fertilization; pest and disease control; weed control; and nursery management. However, the relevance of the topics varied: 23.33% of farmers stated that the topics met their needs, 63.33% gave a neutral assessment, and 13.33% considered the topics inappropriate. In terms of implementation, not all farmers have applied the cultivation techniques information and knowledge obtained from the company. It was found that 53.33% of farmers have implemented all five topics, 23.33% have implemented only three topics, 10% have implemented only two topics, and 13.33% have implemented only one topic. Farmers have not implemented the information or topics provided, primarily due to limited capital.

Previous research by Priska & Noor (2024) revealed that in establishing partnerships, farmers receive guidance from the company, allowing them to consult on various challenges they face. Farmers also receive marketing guarantees, eliminating the risk of unsold crops or being affected by market price fluctuations. Similar research by Nasution et al. (2023) revealed that the majority of farmers (63%) reported receiving technical cultivation guidance or assistance from partner companies.

Fulfillment of Basic Needs

To achieve human well-being, it is essential to fulfill basic needs. Access to food, water, clothing, housing, healthcare, and other necessities is a basic requirement (Dreyer et al., 2006). A balanced diet (Ministry of Health Regulation No. 41 of 2014), clean water facilities (Law No. 17 of 2019), and sanitation and bathing, washing, toilet, or MCK facilities (SNI 03-2399-2002) are performance parameters for this indicator. Adequate MCK buildings must meet

twelve criteria: they must not pollute drinking water sources; they must be located far from drinking water sources; they must be odorless and clean; they must be of adequate size and not pollute the surrounding soil; they must be easy to clean and safe to use; they must be equipped with protective walls and roofs; they must have waterproof walls; they must have adequate lighting; they must have waterproof floors; they must have good ventilation; they must have water and cleaning equipment; and they must have a septic tank.

The social indicator for fulfillment of basic needs has a score of 3.7. This indicates the partnership's social performance exceeds regulatory compliance standards. This indicator indicates that no farmer has a balanced diet. The majority of farmers (93.33%) have a partial diet, and 6.67% consume only two types of food. Access to clean water for bathing and washing is sufficient. The empirical data reveal that, among the surveyed smallholders, 80% have secure access to a clean water supply and 80% utilize proper sanitation facilities; however, a stark contrast is observed in food consumption patterns. It implies that farmers have not successfully leveraged the economic benefits generated from the partnership to improve their dietary diversity and household food security. These results align with research by Nasution et al. (2023), which also reported a score of 3.7.

This discrepancy between low nutritional status and high scores can be explained by the significant contribution of the clean water and sanitation component to the final score. From an S-LCA perspective, these findings indicate a trade-off, where improvements in basic infrastructure (clean water and sanitation) have been achieved, but food security and nutritional quality remain relatively weak.

Furthermore, this condition is also influenced by socio-cultural factors in rural communities, where consumption of staple foods such as rice and side dishes is considered sufficient, with little attention to nutritional balance. This suggests that the increased income from the partnership has not been fully reflected in changes in consumption patterns or in greater nutritional awareness. Thus, although the partnership has succeeded in increasing access to basic services, challenges remain in improving food security and nutritional quality, which are essential components of community well-being.

Access to Services and Inputs

Access to services and production inputs is one of the benefits of partnerships between companies and smallholders (Nasution et al., 2023). The company's contribution to financial access and production inputs is a performance parameter used to assess this indicator. PT Y's social performance on this indicator is within the ideal or best-in-class range, with a score of 5. This is supported by statements from 100% of smallholders who stated that PT Y contributes

positively to their businesses by providing superior seeds and providing guidance on purchasing quality fertilizer. Smallholders also expressed satisfaction with the current partnership, as their income has increased.

CONCLUSION

Based on the SLCA assessment, the partnership between PT Y and smallholder coffee farmers demonstrates strong social sustainability performance, actively enhancing farmer welfare and agricultural capacity. For the future of coffee partnerships in North Sumatra, these findings indicate that collaborative models focused on input provision and knowledge transfer can serve as effective engines for rural economic resilience and SDG achievement, even in informal settings. Indicators for wealth distribution, supplier relationships, fulfillment of basic needs, and access to services and inputs were in the above-standard performance category, reflecting the partnership's contribution to increasing farmer incomes, access to production inputs, basic services, and technical capacity through extension and mentoring.

The access to services and inputs indicator was the highest-performing aspect, confirming the company's strategic role in strengthening the production base and the welfare of smallholders. However, the fair trade relations indicator still performed relatively poorly due to the lack of a written partnership contract, potentially weakening the certainty of the parties' rights and obligations in the long term. These findings confirm that the social sustainability of partnerships is determined not only by technical and economic support, but also by institutional governance and the formalization of fair and transparent relationships.

Overall, smallholder coffee plantation business partnerships significantly contribute to achieving the SDGs, particularly SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), and SDG 12 (Sustainable Consumption and Production). The research findings emphasize that strengthening institutional aspects, particularly through clear, adaptable partnership agreements, is key to enhancing the social sustainability of smallholder coffee partnerships inclusively and sustainably.

Acknowledgments

Thank you to Satya Terra Bhinneka University and LPPM Satya Terra Bhinneka University for funding this research through an Internal Grant scheme. Thank you also to the farmers who are members of Farmer Group X and Company Y for their cooperation, data transparency, and active participation throughout the research process, as well as to all parties involved in implementing this research.

Author Contribution

Indah Kartika Sandra, Hendris Syah Putra, and M. Fariz Afif Hasibuan collaboratively conceptualized and designed the study, including the application of the UNEP-SETAC SLCA framework. All three authors jointly conducted data collection through surveys with 30 farmer households in Gung Pinto Village, performed data curation and analysis, and interpreted results with a focus on SDG linkages. Indah Kartika Sandra led drafting the initial manuscript and supervised project administration, while Hendris Syah Putra and M. Fariz Afif Hasibuan contributed to drafting the discussion/implications sections. All authors provided critical revisions to the manuscript for intellectual content and approved the final version, sharing full accountability for all aspects of the work.

REFERENCES

- Anh, N. H., Bokelmann, W., Thuan, N. T., & Nga, D. T. (2019). Smallholders' preferences for different contract farming models: Empirical evidence from sustainable certified coffee production in Vietnam. *Sustainability*, 11(14), 9–13. <https://doi.org/10.3390/su11143799>
- Asfaw, T. B., & Negeri, P. G. (2025). Impact of voluntary sustainability standards on decent rural employment: Evidence from smallholder coffee farms and cooperatives. *Journal of Agriculture and Food Research*, 24, 102352. <https://doi.org/10.1016/j.jafr.2025.102352>
- Cahyanto, G. D., Wibowo, A., & Permatasari, P. (2021). Kemitraan antara petani kopi dan perusahaan: Studi kasus Kintamani [Partnership between coffee farmers and companies: Kintamani case study]. *SALAM: Jurnal Sosial dan Budaya Syar-i*, 8(1), 173–190. <https://doi.org/10.15408/sjsbs.v8i1.19426>
- Chiputwa, B., Spielman, D. J., & Qaim, M. (2015). Food standards, certification, and poverty among coffee farmers in Uganda. *World Development*, 66, 400–412. <https://doi.org/10.1016/j.worlddev.2014.09.006>
- Dreyer, L. C., Hauschild, M. Z., & Schierbeck, J. (2006). A framework for social life cycle impact assessment. *International Journal of Life Cycle Assessment*, 11(2), 88–97. <https://doi.org/10.1065/lca2005.08.223>
- Fariz, M., Hasibuan, A., & Putra, H. S. (2023). Analisis persaingan ekspor biji kopi di pasar internasional [Analysis of coffee bean export competition in the international market]. *Agriprimatech*, 7(1), 25–33. <https://doi.org/10.34012/agriprimatech.v7i1.4160>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Felix, M. (2024). Potensi implementasi fair trade dan studi kasus di Indonesia [Potential for fair trade implementation and case studies in Indonesia]. *Perspektif*, 13(3), 793–810. <https://doi.org/10.31289/perspektif.v13i3.11744>
- Haloho, R. D., Amruddin, U. D. R., Boekoesoe, Y., Tapi, T., Harli, N. H., M. F. A., S., M., & Karim, A. R. (2024). *Manajemen agribisnis* [Agribusiness management]. Yayasan Kita Menulis. <https://kitamenulis.id/2024/01/22/manajemen-agribisnis-3/>
- Hasibuan, M. F. A., Putra, H. S., Siadari, U., & Uli, V. (2025). Sustainability analysis of Arabica coffee plantation agribusiness in North Sumatra Province. *Journal of*

- Sustainability Science and Management*, 20(8), 1616–1629.
<https://doi.org/10.46754/jssm.2025.08.005>
- Machieu, S. R., Amruddin, A., Z., Hasibuan, M. F. A., Arianti, D., Elza, N. I., Rahmah, K., Mastuti, R., Lestari, S. U., & Hidayati, R. (2025). *Agribisnis kreatif: Pilar agripreneurship masa depan* [Creative agribusiness: Pillars of future agripreneurship]. Yayasan Kita Menulis. <https://kitamenulis.id/2025/01/01/agribisnis-kreatif-pilar-agripreneurship-masa-depan/>
- Mulyani, S. I., Karsidi, R., Kartono, D. T., & Anantanyu, S. (2024). Sustainable partnership between farmers and companies in the PT Sido Muncul Tbk Spice Village Program. In *Proceedings of the International Conference on Multidisciplinary Studies (ICoMSi, 2023): Advances in Social Science, Education and Humanities Research* (Vol. 829, pp. 565–575). https://doi.org/10.2991/978-2-38476-228-6_47
- Nasution, Z. P. S., Mulatsih, S., & Rahma, H. (2023). Penilaian keberlanjutan sosial kemitraan usaha perkebunan kelapa sawit rakyat dan kaitannya terhadap pencapaian tujuan pembangunan berkelanjutan: Studi kasus di Provinsi Sumatera Utara [Assessment of the social sustainability of smallholder oil palm plantation business partnerships and their linkage to the achievement of sustainable development goals: A case study in North Sumatra Province]. *Jurnal Penelitian Kelapa Sawit*, 31(1), 55–72. <https://www.academia.edu/download/103630826/144.pdf>
- Novita, E., Suryaningrat, I. B., Andriyani, I., & Widyotomo, S. (2012). Analisis keberlanjutan kawasan usaha perkebunan kopi (KUPK) rakyat di Desa Sidomulyo Kabupaten Jember [Sustainability analysis of the smallholder coffee plantation business area (KUPK) in Sidomulyo Village, Jember Regency]. *Journal Agri-tech*, 32(2), 183–191. <https://doi.org/10.22146/agritech.9621>
- Pangestuty, F. W., & Dessatria, A. N. U. (2013). Patterns and trust formed on the partnership contract between the sugar factory and the cane farmers. *Proceedings Book of ICEFMO 2013: Malaysia Handbook on the Economic, Finance and Management Outlooks*.
- Pratama, Y. Y., Ismono, R. H., & Prasmatiwi, F. E. (2015). Manfaat ekonomi dan risiko tunda jual kopi di Desa Tanjung Rejo Kecamatan Pulau Panggung Kabupaten Tanggamus [Economic benefits and risks of delaying coffee sales in Tanjung Rejo Village, Pulau Panggung District, Tanggamus Regency]. *Jurnal Ilmu Ilmu Agribisnis: Journal of Agribusiness Science*, 3(3), 221–228. <https://doi.org/10.23960/jiia.v3i3.1051>
- Priska, P. R., & Noor, T. I. (2024). Analisis kemitraan dan pendapatan usahatani mitra dan nonmitra CV Bumi Agro Technology di Desa Sarimukti, Kecamatan Pasirwangi, Kabupaten Garut [Analysis of partnership and farming income of partners and non-partners of CV Bumi Agro Technology in Sarimukti Village, Pasirwangi District, Garut Regency]. *Jurnal Ilmiah Mahasiswa Agroinfo Galuh*, 11(3), 1596–1607. <http://dx.doi.org/10.25157/jimag.v11i3.14528>
- Product Social Impact Assessment. (2020). *Handbook for product social impact assessment*. <https://www.scribd.com/document/811180989/Handbook-for-Product-Social-Impact-Assessment-2020>
- Purwanti, R. E., Lasinta, M., & Jayadisastra, Y. (2024). *Komunikasi pembangunan pertanian* [Agricultural development communication]. Eureka Media Aksara.

- <https://repository.penerbiteureka.com/media/publications/585408-komunikasi-pembangunan-pertanian-180dcf47.pdf>
- Putra, H. S., Octoyuda, E., & Hasibuan, M. F. A. (2024). Decoding Arabica coffee purchase intention: Exploring the role of product origin through fuzzy-set qualitative comparative analysis. In *2024, the 12th International Conference on Cyber and IT Service Management (CITSM)* (pp. 1–6). <https://doi.org/10.1109/CITSM64103.2024.10775358>
- Putra, H. S., & Siahaan, H. N. (2024). Commodity regional analysis and the role of smallholder Arabica coffee plantations in the regional development of North Sumatra Province. *Jurnal Ilmiah Membangun Desa dan Pertanian*, 9(3), 212–221. <https://doi.org/10.37149/jimdp.v9i3.1139>
- Radiah, R. (2021). Analisis faktor-faktor yang mempengaruhi permintaan komoditi kopi di Provinsi Sumatera Utara [Analysis of factors influencing demand for coffee commodities in North Sumatra Province]. *Wahana Inovasi: Jurnal Penelitian dan Pengabdian Masyarakat UISU*, 10(2), 338–353.
- Raynolds, L. T., Murray, D. L., & Wilkinson, J. (Eds.). (2007). *Fair trade: The challenges of transforming globalization*. Routledge. <https://books.google.co.id/books?id=0gQymQ7nbTIC>
- Sahat, S. F., Nuryartono, N., & Hutagaol, M. P. (2016). Analisis pengembangan ekspor kopi di Indonesia [Analysis of coffee export development in Indonesia]. *Jurnal Ekonomi dan Kebijakan Pembangunan*, 5(1), 63–89. <https://doi.org/10.29244/jekp.5.1.2016.63-89>
- Syakir, M., & Surmaini, E. (2017). Perubahan iklim dalam konteks sistem produksi dan pengembangan kopi di Indonesia [Climate change in the context of coffee production and development systems in Indonesia]. *Jurnal Penelitian dan Pengembangan Pertanian*, 36(2), 77–90. <https://doi.org/10.21082/jp3.v36n2.2017.p77-90>
- United Nations Environment Programme. (2020). *Guidelines for social life cycle assessment of products and organizations 2020*. <https://www.lifecycleinitiative.org/wp-content/uploads/2021/01/Guidelines-for-Social-Life-Cycle-Assessment-of-Products-and-Organizations-2020-22.1.21sml.pdf>
- United Nations Environment Programme. (2021). *Methodological sheets for subcategories in social life cycle assessment (S-LCA) 2021*. <https://www.lifecycleinitiative.org/library/methodological-sheets-for-subcategories-in-social-life-cycle-assessment-s-lca-2021/>
- Vicol, M., Neilson, J., Faila, D., Hartatri, S., & Cooper, P. (2018). Upgrading for whom? Relationship coffee, value chain interventions and rural development in Indonesia. *World Development*, 110, 26–37. <https://doi.org/10.1016/j.worlddev.2018.05.020>
- Watemin, & Lestari, E. (2025). Partnership pattern between Robusta coffee farmers and Mukidi Coffee Home Industry in Gandurejo Village, Temanggung, Central Java. *New Countryside*, 4(1), 70–78. <https://doi.org/10.55121/nc.v4i1.429>
- Widaningsih, R. (2022). *Outlook komoditas perkebunan kopi* [Outlook for coffee plantation commodities]. Pusat Data dan Sistem Informasi Pertanian, Sekretariat Jenderal Kementerian Pertanian.

- Wright, J., & Aklimawati, L. (2018). Geographical indications and value capture in the Indonesia coffee sector. *Journal of Rural Studies*, 59, 35–48. <https://doi.org/10.1016/j.jrurstud.2018.01.003>
- Zakaria, A. P., Aditiawati, A., & Rosmiati, M. (2017). Strategi pengembangan usahatani kopi arabika: Kasus pada petani kopi di Desa Suntenjaya, Kecamatan Lembang, Kabupaten Bandung Barat, Provinsi Jawa Barat [Arabica coffee farming development strategy: Case study of coffee farmers in Suntenjaya Village, Lembang District, West Bandung Regency, West Java Province]. *Jurnal Sositologi*, 16(3), 325–339. <https://doi.org/10.5614/sostek.itbj.2017.16.3.7>
- Zikra, A., Dhardiri, H., & Yulianti, S. (2022). Analisis potensi komoditas kopi kabupaten/kota di Indonesia tahun 2015: Metode fuzzy C-medoid clustering [Analysis of coffee commodity potential in regencies/cities in Indonesia in 2015: Fuzzy C-medoid clustering method]. *Journal of Agricultural Socio-Economics (JASE)*, 3(1), 1–7. <https://doi.org/10.33474/jase.v3i1>