Availabe online at Website:
http://journal.uinjkt.ac.id/index.php/jko
Jurnal Kommunity Online, Volume 7, No 1, 2026, 106-122

EVALUATING MULTI DIMENSIONAL SUSTAINABILITY OF COFFEE FARMER GROUPS: INTEGRATING ENVIRONMENTAL, SOCIO-ECONOMIC, AND GOVERNANCE PERSPECTIVES

Sukron Romadhona[1*], Sumarlin[2]
[1] Universitas Diponegoro, Semarang, Indonesia
[2] Universitas Muhammadiyah Kendari, Kendari, Indonesia
E-mail: sukronromadhona@gmail.com

Submit : 6 Mei 2026, **Revisi :** 15 Juni 2026**, Approve :** 28 Juni 2026

Abstract

The dominance of smallholder-based coffee production systems, accounting for more than 94% of plantation areas, highlights both their strategic role and vulnerability within global value chains, particularly under traditional and asymmetric marketing structures. This study aims to assess the sustainability performance of smallholder coffee farming and examine the role of rural small-to-medium coffee industries in strengthening socio-economic and environmental outcomes. Research employs a quantitative-descriptive approach using the Sustainability Assessment of Food and Agriculture systems (SAFA) framework. Data were collected through purposive sampling of coffee farmers in Kalibening and Karangkobar sub-districts, supported by field observations and structured interviews. Findings reveal a heterogeneous sustainability profile. In Kalibening, strong performance is observed in holistic management (85%) and social equity (85%), while weaknesses persist in materials and energy efficiency (30%) and governance aspects such as accountability and participation (50%). In Karangkobar, economic resilience is notably high (85%), supported by strong local investment, yet governance (30–45%) and environmental indicators (45%) remain limited due to conventional farming practices and weak institutional oversight. The novelty of this study lies in integrating SAFA analysis with emerging rural agro-industry dynamics, highlighting their role as catalysts for value addition and improved farmer bargaining power. In conclusion, while socio-economic dimensions show promising progress, strengthening governance systems and promoting environmentally sustainable practices are critical for achieving holistic coffee sustainability.
Keywords*: coffee; sustainability; smallholder farmers; SAFA framework; value chain.*

How to cite: Romadhona, S. & Sumarlin. 2026. Evaluating Multi Dimensional Sustainability of Coffee Farmer Groups: Integrating Environmental, Socio-Economic, and Governance Perspectives. *Jurnal Kommunity Online*, 7(1), 2026, 106-122, doi:10.15408/jko.v7i1.51133

INTRODUCTION

Global and national coffee bean production is dominated by a smallholder-based agrarian structure, in which over 94% of coffee plantation land is managed by smallholders, making them both key players in the coffee supply chain and the group most vulnerable to market fluctuations and inequalities in value addition (Yusuf et al., 2022). Institutionally, the post-harvest marketing system that has been in place tends to be traditional and multi-layered, with farmers selling their harvests through two main channels (Blanco-pacheco & De-la-rosa-cadavid, 2025; Sia et al., 2025): small-to-medium-scale coffee industry operators who process the crop through to the final consumption stage, and intermediaries acting as aggregators but who often create information asymmetry and price pressure at the producer level (Afandi et al., 2021). The development of agricultural systems in Indonesia still faces many obstacles faced by farmers. One of the keys to agricultural development lies in human resources (Khoirunisa, 2025) . In recent years, a structural transformation has taken place in rural areas through the growth of small-to-medium-scale coffee industries that function not only as processing units but also as hubs for innovation, quality improvement, and coffee-based product diversification (Syofya, 2023). This phenomenon opens up opportunities for farmers to access markets more directly and has the potential to enhance their bargaining power within the coffee value chain (Irawan & Rabemanolontsoa, 2024).

Coffee production faces significant pressure due to the increasing frequency and intensity of extreme weather events driven by climate change, which directly threaten the sustainability of smallholder farmers' livelihoods. To enhance their resilience, targeted interventions are needed, based on a comprehensive understanding of their vulnerability levels and the adaptation strategies they have already implemented (Zimmerer et al., 2018). This approach enables the identification of relationships among actors and processes that influence value distribution, thereby serving as a foundation for formulating more effective and sustainable strategies to support coffee farmers in addressing the impacts of climate change (Makaborang et al., 2009; Sappe et al., 2022).

The rising global demand for coffee has driven massive expansion in production across both the upstream (cultivation) and downstream (processing and distribution) sectors, which in turn has led to the intensification of high-input agricultural systems to meet market demand (Azkar et al., 2025). Such intensive production patterns not only increase pressure on land, water and energy use, but also contribute significantly to environmental degradation through deforestation, reduced soil fertility, increased greenhouse gas emissions, and pollution resulting from the use of synthetic fertilisers and pesticides (Winter et al., 2020). Beyond ecological impacts, unsustainable production practices also have socio-economic implications, such as unequal access to resources, the vulnerability of smallholder farmers, and income instability within the global coffee value chain (Djufry et al., 2022; Nainggolan, 2024).

The selection of Karangkobar and Kalibening as research locations was based on three scientific considerations. First, both sub-districts represent a highland community coffee farming system dominated by smallholder farmers with distinct socio-economic characteristics. Second, these areas demonstrate a gap between resource potential and sustainability performance, making them relevant for identifying factors influencing farmer productivity, competitiveness, and well-being. Third, the diversity of cultivation conditions, institutions, and market access make these two areas representative locations for evaluating the relationship between cultivation practices, value chain governance, and coffee agribusiness sustainability. The research area falls into the category of highland areas. A characteristic of highland agricultural conditions is the land's slope, reaching up to 45° (Arifianto & Widyastuti, 2021) . The research findings are expected to generate evidence-based policy recommendations that can be replicated in other community coffee centers.

Table 1. Area of Smallholder Plantation Crops by Plant Type

No	Kind of Plant	Plantation Area (Thousand Hectares)
1	Rubber	47.0
2	Coconut	27.7
3	Coffee	215,257.0
4	Cocoa	1,136.0
5	Tea	99,801.0
6	Tobacco	43,048.0

Source : BPS

The expansion of plantation land in Banjarnegara Regency has been massive, including the growing coffee plantations, as farmers and the government see better opportunities in the coffee industry compared to other commodities, especially as the Banjarnegara region is considered highly suitable for coffee cultivation, both Arabica and Robusta varieties. This offers particular advantages, especially for Arabica coffee, which has specific growing requirements; the Banjarnegara region is partly situated in highland areas, making it highly suitable for the development of Arabica coffee. As shown in the table of land area for 2025, coffee plantations cover 215,257 hectares; compared to other crops, coffee plantations hold the highest land area status in Banjarnegara District within the plantation sector.

Although extensive research has been conducted on the coffee value chain, marketing efficiency, and farmer welfare, most have focused on productivity, market access, or the role of intermediaries. The role of the small- and medium-scale coffee industry as a local actor strengthening the sustainability of farming through increased added value, technology transfer, access to information, and strengthening farmers' bargaining power remains understudied. Furthermore, sustainability assessments for coffee commodities generally do not utilize a holistic approach. The Sustainability Assessment of Food and Agriculture Systems (SAFA) framework, which encompasses the dimensions of Governance, Environmental Integrity, Economic Resilience, and Social Welfare, is rarely applied to coffee farming, particularly because it integrates the governance dimension as part of a comprehensive sustainability assessment.

METHODS

The Sustainability Assessment of Food and Agriculture Systems (SAFA) was used to evaluate the sustainability of coffee farming across four dimensions: good governance, environmental integrity, economic resilience, and social well-being. Data were collected through field observations, structured interviews, and farmer questionnaires covering farming practices, resource management, socio-economic conditions, and institutional aspects. Each dimension was assessed using specific indicators, and sustainability performance was measured through a percentage-based scoring system, classifying results into four categories: limited, moderate, good, and best. This approach provides a comprehensive assessment of the strengths and weaknesses of the coffee farming system.

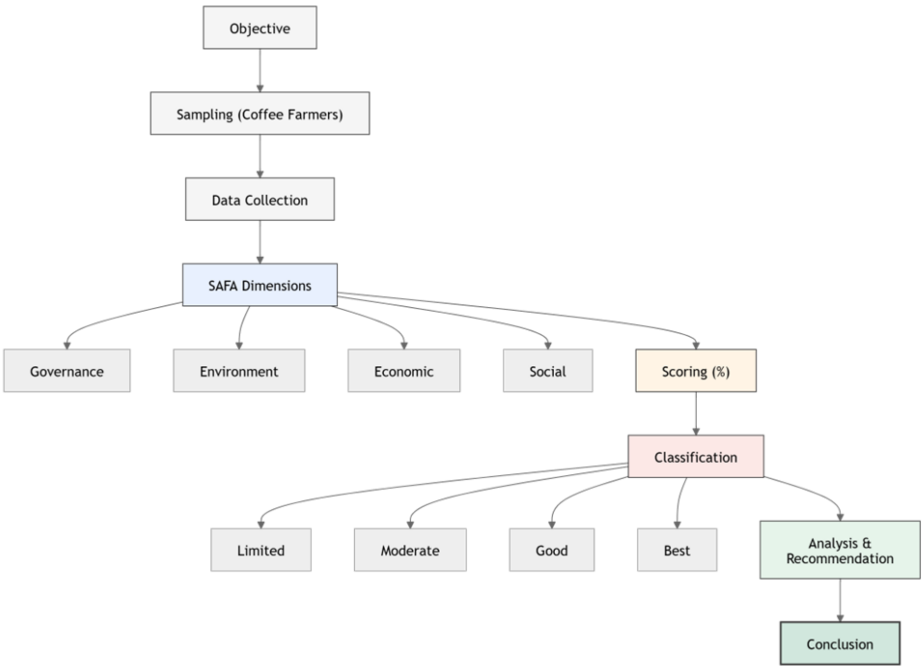


Figure 1. Simplified SAFA-Based for Assessing Coffee Farming Sustainability

Banjarnegara Regency is located at 7°12′–7°31′ South Latitude and 109°45′50″ East Longitude, covering 106,970.997 ha (3.29% of Central Java Province). It is bordered by Batang and Pekalongan Regencies to the north, Wonosobo to the east, Kebumen to the south, and Purbalingga and Banyumas to the west. The regency comprises three major topographic zones: the Dieng Plateau and Northern Serayu Mountains (north), the Serayu Depression (central), and the Southern Serayu Mountains (south). These diverse topographic conditions, particularly variations in altitude and slope, create substantial differences in land suitability for coffee cultivation.

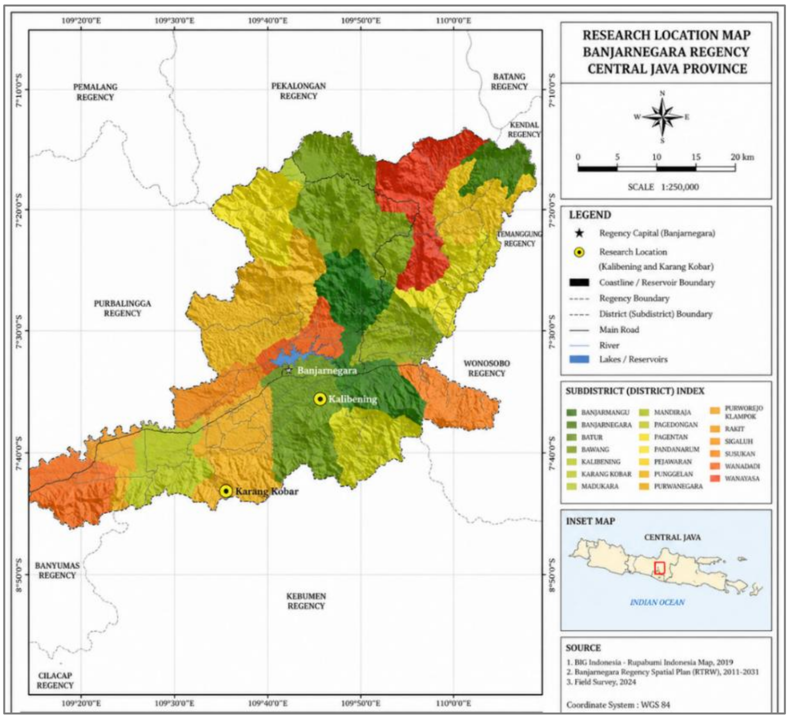


Figure 2. Map of the Study Area in Banjarnegara Regency, Central Java, Indonesia

Areas at elevations of 500–1,000 m above sea level (28.74% of the region), including Banjarmangu, Sigaluh, and part of Banjarnegara, provide favourable agroclimatic conditions for both Coffea arabica and Coffea canephora. Higher elevations of >1,000 m (24.4%), covering Karangkobar, Wanayasa, Kalibening, Pagentan, Pejawaran, and Batur, are particularly suitable for Arabica coffee due to cooler temperatures that enhance bean quality and flavour complexity. In terms of topography, gentle slopes of 0–15% (24.61%), found in Susukan, Purworejo Klampok, Mandiraja, Purwonegoro, Pagedongan, Bawang, and Rakit, support efficient cultivation by facilitating land management and reducing erosion risk. These variations in elevation and slope provide a strong basis for spatial commodity zoning and sustainable coffee production strategies.

Figure 3. Types of Coffee Cultivated in the Study Area

The coffee varieties cultivated in the study area, namely Arabica (Coffea arabica) and Robusta (Coffea canephora), are well suited to the agroecological conditions of Banjarnegara. The varied topography, elevation gradients and favourable climatic conditions, including adequate rainfall and moderate temperatures, provide a suitable environment for both species. Arabica coffee is typically grown in highland areas characterised by cooler temperatures and well-drained soil, whilst Robusta thrives in lowland to midland zones with a warmer climate and higher tolerance to environmental stress. This ecological suitability supports optimal plant growth, productivity and quality, thereby strengthening the region's potential for sustainable coffee cultivation.

Figure 4. SAFA Guidelines Structure

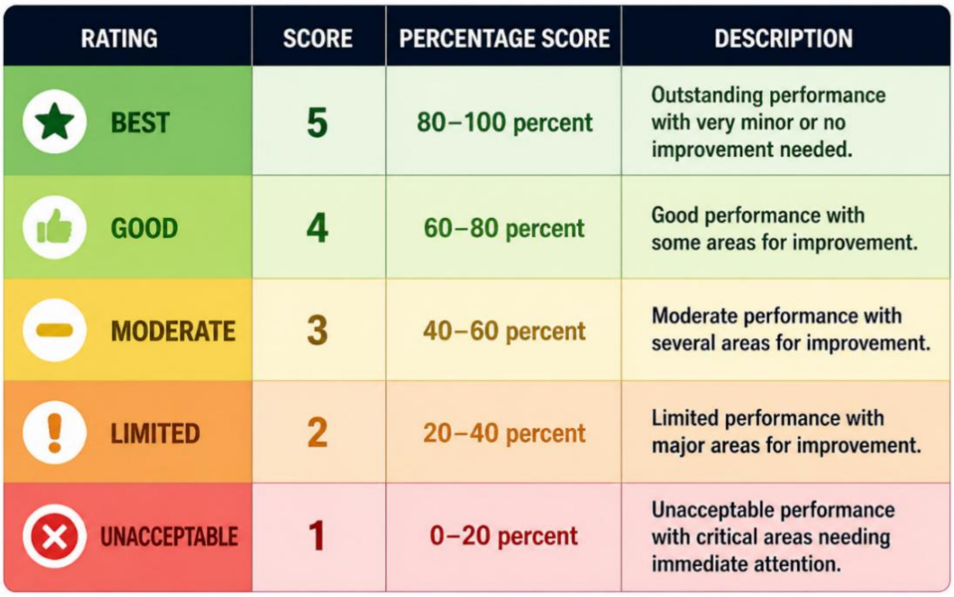
SAFA framework developed by the FAO is systematically organised into three main components: the framework, procedures, and sustainability protocol (Alaoui et al., 2022; Iakovidis et al., 2022; Scialabba & Nemes, 2019). The framework section outlines the objectives, principles, interrelationships and scope of the sustainability assessment, whilst the procedures cover the operational stages, ranging from mapping and contextualisation to indicator selection and reporting (Romadhona et al., 2024). Furthermore, the sustainability protocol forms the core of the analysis, organising indicators into four main dimensions Good Governance, Environmental Integrity, Economic Resilience, and Social Well-being which are then broken down into themes and sub-themes as the basis for a comprehensive quantitative and qualitative evaluation of the sustainability performance of the agricultural and food systems (Romadhona, Puryono, & Soedarmo, 2025).

Table 2. Highest Quality Data Criteria in Environmental and Social Dimensions

Dimension	Data Criteria / Type	Description
Environmental	Direct sampling/testing	Empirical data collection through direct measurement (e.g., soil testing, wastewater analysis).
	Resource use records	Documentation of current resource consumption such as electricity, water, and fuel for transportation.
	Field observation	Visual inspection of land, infrastructure, and facilities based on standardized inspection criteria.
Economic	Financial records review	Examination of official financial documents and bookkeeping records to assess economic performance.
	Business planning documents	Analysis of current business plans and financial planning reports.
	Management/finance interviews	Interviews with bookkeepers or management for data validation or supplementary information, not replacing formal records.

Source: Scuderi et al., 2025

In sustainability assessment, particularly within the social dimension, the quality of interview-based data depends on rigorous methodological and ethical standards. High-quality data require representative sampling, preferably through random sampling, that captures workforce diversity (e.g., age, gender, ethnicity, seniority, and vulnerable groups), ensuring comprehensive representation of social conditions. (Romadhona & Ardhian, 2025). Furthermore, the credibility of the data is also influenced by the independence of the interviewer, who should not be from management or a direct supervisor to minimise bias and social pressure, and ideally should be an external party who understands the local language and is sensitive to labour issues. Research ethics is another crucial element, encompassing the application of principles of confidentiality, anonymity, data protection, respect for respondents' privacy, and the guarantee of respondents' right to withdraw from the interview process at any time without consequences (Ungureanu, 2026).



RATING	SCORE	PERCENTAGE SCORE	DESCRIPTION
BEST	5	80–100 percent	Outstanding performance with very minor or no improvement needed.
GOOD	4	60–80 percent	Good performance with some areas for improvement.
MODERATE	3	40–60 percent	Moderate performance with several areas for improvement.
LIMITED	2	20–40 percent	Limited performance with major areas for improvement.
UNACCEPTABLE	1	0–20 percent	Unacceptable performance with critical areas needing immediate attention.

Figure 1. Performance Rating Scale Based on Scores and Evaluation Categories

The assessment table presents a five-level ordinal performance classification that combines numerical scores, percentage ranges, and qualitative descriptions to evaluate indicator achievement. Best (5; 80–100%) indicates optimal performance, Good (4; 60–80%) reflects good performance with minor improvements needed, Moderate (3; 40–60%) denotes average performance requiring further improvement, Limited (2; 20–40%) indicates low performance with substantial shortcomings, and Unacceptable (1; 0–20%) represents critical conditions requiring immediate intervention. This framework systematically integrates quantitative scores with qualitative interpretations, providing a standardized basis for sustainability and performance evaluation.

Table 3. Data Quality Classification and Accuracy Scoring Criteria

Data Quality Level	Criteria	Accuracy Score
High Quality Data	Data is recent (1–2 years); primary data collected directly; or from verified third-party audits/tools	3
Moderate Quality Data	Primary data older than 2 years but still reliable; or secondary data	2
Low Quality Data	Primary data older than 5 years; or based on estimates/proxies	1

Source : (FAO, 2014)

Data quality was assessed using a Data Quality Level (DQL) based on data source, recency, and collection method. High-quality data (3) were recent (≤ 2 years), primary, or independently verified; moderate-quality data (2) included older primary data (>2 years) or relevant secondary data; and low-quality data (1) comprised primary data older than five years or estimates and proxies. This classification improves the transparency, consistency, and scientific robustness of the analysis. (Romadhona, Puryono, & Mussadun, 2025).

Table 4 Agroecological Characteristics of Coffee Land Suitability

Parameter	S1 (Highly Suitable)	S2 (Moderately Suitable)	S3 (Marginally Suitable)	N (Not Suitable)
Climate				
Annual rainfall (mm)	1,500–2,000	1,250–<1,500; 2,000–2,500	1,250–<1,500; 2,500–3,000	<1,000; >3,000
Dry months (<60 mm/month)	2–3	3–4	4–5	>5
Altitude (m asl)	1,000–1,500	850–<1,000; 1,500–1,750	650–<850; 1,750–2,000	<650; >2,000
Slope (%)	0–8	8–25	25–45	>45
Soil Physical Properties				
Effective soil depth (cm)	>150	100–150	60–100	<60
Soil texture	Sandy loam; Clay loam; Silty loam; Silty clay loam	Sandy clay loam; Clay loam; Sandy clay; Silty clay	Clay	Sand; Heavy clay
Surface rock (%)	0	0–3	3–15	>15
Drainage class	Well-drained	Moderately well-drained	Poor to somewhat excessive	Excessive; Very poor
Soil Chemical Properties (0–30 cm)				
pH	5.5–6.0	6.1–7.0; 5.0–5.4	7.1–8.0; 4.0–4.9	>8.0; <4.0
Organic C (%)	2–5	1–2; 5–10	0.5–1	<0.5
Total N (%)	>0.21	0.10–0.20	<0.10	-

Source: Sappe et al., 2022

Based on land suitability characteristics, Banjarnegara Regency exhibits distinct agroecological zones for coffee cultivation. Highland areas (1,000–1,500 m a.s.l.) with favourable climate and soil conditions (S1) are highly suitable for Arabica coffee, whereas mid- to lowland areas (650–1,000 m a.s.l.) with moderate suitability (S2–S3) are more appropriate for Robusta coffee due to its greater tolerance to higher temperatures and suboptimal soil conditions. This spatial variation highlights the comparative suitability of Arabica in highlands and Robusta in lower elevations.

Table 5. Distribution of Respondents by Key Characteristics

Variable	Category / Unit	Kalibening (n=40)	Karangkobar (n=40)	Total (n=80)	Percentage (%)
Respondent Distribution	Main coffee villages (number of farmers)	25	27	52	65.0
	Non-central villages (farmers)	15	13	28	35.0
Land Ownership Status	Owner-operated (farmers)	28	30	58	72.5
	Rented/sharecropping (farmers)	12	10	22	27.5
Coffee Type	Robusta (farmers)	30	22	52	65.0
	Arabica (farmers)	10	18	28	35.0
Land Size	< 0.5 ha (hectares per farmer)	12	10	22	27.5
	0.5 – 1.0 ha	18	16	34	42.5
	> 1.0 ha	10	14	24	30.0
Average Production	< 500 kg/year (green bean)	14	10	24	30.0
	500 – 1,000 kg/year	16	18	34	42.5
	> 1,000 kg/year	10	12	22	27.5

Source: Primary Data

The study employed a quantitative descriptive approach using purposive sampling of 80 coffee farmers, equally distributed between Kalibening and Karangkobar (40 respondents each), to capture variations in production and socio-economic conditions. Most respondents were owner-operated farmers (72.5%), while 27.5% were tenants or leaseholders, indicating the predominance of independent farming systems. Robusta was the dominant coffee variety (65.0%), followed by Arabica (35.0%). Most farmers cultivated medium-sized landholdings (0.5–1.0 ha; 42.5%), followed by large (>1.0 ha; 30.0%) and small (<0.5 ha; 27.5%) farms. Annual production was also dominated by the medium category (500–1,000 kg; 42.5%), with the remainder distributed between low (<500 kg; 30.0%) and high (>1,000 kg; 27.5%) production levels. These characteristics indicate that the sample adequately represents the diversity of small- and medium-scale coffee farming systems in the study area.

Table 6. SAFA Performance Indicators for Sustainability Assessment

INDICATOR TYPE AND DESCRIPTION	POTENTIAL RESPONSES	RATING SCALES
Performance indicators are considered those that take a direct measurement, utilize primary data from the operation itself, or otherwise calculate the actual impacts of the operation on the sustainability issue.	Yes/no/partial Percentage	80 percent or more/Yes - SAFA defined
		60 percent - 80 percent - User Defined
		40 percent - 60 percent Partial - User Defined
		20 percent - 40 percent - User Defined
		20 percent or Less/ No - SAFA defined

Source: (FAO, 2013)

Sustainability performance was assessed using the SAFA Performance Indicators, which directly measure sustainability outcomes through primary operational data or calculated impacts on specific sustainability issues. Each indicator was evaluated using binary (Yes/No), partial, or percentage-based responses. The resulting scores were classified into five performance levels: ≥80% (Yes), 60–79%, 40–59% (Partial), 20–39%, and ≤20% (No). The highest and lowest thresholds followed the original SAFA guidelines, while the intermediate categories were operationally defined to improve discrimination among performance levels. This rating system enabled a standardized and transparent assessment of sustainability performance across all evaluated indicators.

RESULTS AND DISCUSSION

The findings of this study will be divided into an analysis of two different locations to examine the dynamics of the values present in each location; the aim is, of course, to assess sustainable performance specific to each location, given that the two regions share similar characteristics, thereby enabling us to understand how the SAFA framework can evaluate the four dimensions within the SAFA framework in those locations.

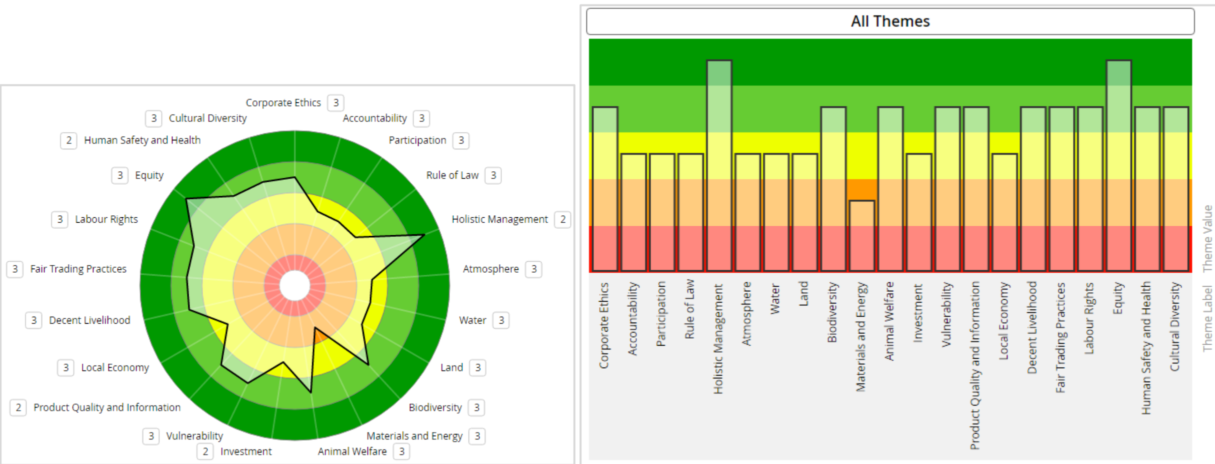


Figure 1. SAFA Radar Map Results and Performance Chart of Agricultural System in Kalibening Area

Table 6. Sustainability Performance Across SAFA Themes Kalibening

SAFA Theme	Estimated Score (%)	Category	Score	Interpretation
Corporate Ethics	65%	Good	4	Ethical practices are generally well applied, though not fully formalized
Accountability	50%	Moderate	3	Accountability systems exist but remain limited and informal

SAFA Theme	Estimated Score (%)	Category	Score	Interpretation
Participation	50%	Moderate	3	Stakeholder participation is present but not yet inclusive or structured
Rule of Law	50%	Moderate	3	Compliance with regulations is adequate but not fully optimized
Holistic Management	85%	Best	5	Farm management is highly integrated and consistently applied
Atmosphere	50%	Moderate	3	Emission control practices are still limited
Water	50%	Moderate	3	Water management is adequate but requires improvement
Land	50%	Moderate	3	Land management practices are standard but not optimized
Biodiversity	65%	Good	4	Initial conservation efforts are evident
Materials and Energy	30%	Limited	2	Resource and energy efficiency remain low
Animal Welfare	65%	Good	4	Adequate practices (context-dependent relevance)
Investment	50%	Moderate	3	Investment capacity is still limited
Vulnerability	65%	Good	4	Moderate resilience, but exposure to risks remains
Product Quality and Information	65%	Good	4	Product quality is acceptable with basic information provided
Local Economy	50%	Moderate	3	Moderate contribution to local economic development
Decent Livelihood	65%	Good	4	Livelihood conditions are fairly adequate
Fair Trading Practices	65%	Good	4	Trading relationships are relatively fair
Labour Rights	65%	Good	4	Basic labor rights are generally respected
Equity	85%	Best	5	Strong performance in equity and fairness
Human Safety and Health	65%	Good	4	Health and safety conditions are acceptable but improvable
Cultural Diversity	65%	Good	4	Cultural values and diversity are maintained

Source: Primary Data Processing

The SAFA assessment indicates that coffee farming sustainability in Kalibening demonstrates generally balanced performance, although several aspects require further improvement. In the Good Governance dimension, Holistic Management achieved the highest score (85%; Best), reflecting integrated and adaptive farm management. Corporate Ethics also performed well (65%; Good), whereas Accountability, Participation, and Rule of Law each scored 50% (Moderate), indicating the need to strengthen transparency, stakeholder engagement, and regulatory compliance. Within the Environmental Integrity dimension, Atmosphere, Water, and Land each scored 50% (Moderate), suggesting that resource management practices remain conventional rather than fully conservation-oriented. Biodiversity reached the Good category (65%), while Materials and Energy recorded the lowest score (30%; Limited), highlighting inefficient resource use and continued dependence on external inputs.

In the economic dimension, Investment and Local Economy (50%, Moderate) indicate limited economic strengthening, while Product Quality and Information, Fair Trading Practices, and Vulnerability (65%, Good) reflect adequate product quality, trading practices, and business resilience. The social dimension shows strong performance, particularly in Equity (85%, Best), supported by Decent Livelihood, Labour Rights, Human Safety and Health, and Cultural Diversity (65%, Good), indicating relatively inclusive social conditions. Overall, the Karangkobar coffee farming system demonstrates upper-middle sustainability performance, with strengths in holistic management and social equity, but requires improvement in energy efficiency.

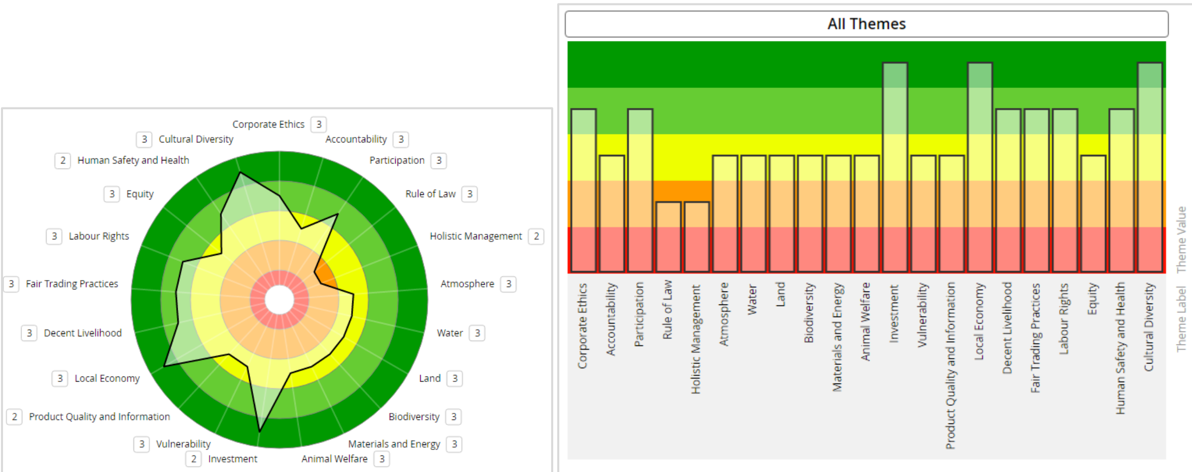


Figure 4. SAFA Radar Map Results and Performance Chart of Agricultural System in Karangkobar Area

Table 7. Sustainability Performance Across SAFA Themes Krangkobara

No	SAFA Theme	Estimated Score (%)	Category	Score	Interpretation
1	Corporate Ethics	65%	Good	4	Ethical practices are relatively well implemented but still partially informal
2	Accountability	45%	Moderate	3	Accountability mechanisms exist but lack formal documentation
3	Participation	60%	Good	4	Stakeholder participation is fairly active but not fully inclusive
4	Rule of Law	30%	Limited	2	Compliance is weak and inconsistently applied

No	SAFA Theme	Estimated Score (%)	Category	Score	Interpretation
5	Holistic Management	30%	Limited	2	Integrated management systems are largely absent
6	Atmosphere	45%	Moderate	3	Emission control remains insufficient
7	Water	45%	Moderate	3	Water management practices are basic
8	Land	45%	Moderate	3	Land management is present but not optimized
9	Biodiversity	45%	Moderate	3	Limited implementation of biodiversity conservation
10	Materials and Energy	45%	Moderate	3	Resource efficiency practices are still underdeveloped
11	Animal Welfare	45%	Moderate	3	Basic practices exist (context-dependent relevance)
12	Investment	85%	Best	5	Strong investment capacity and financial engagement
13	Vulnerability	45%	Moderate	3	Moderate resilience but still exposed to risks
14	Product Quality and Information	~45%	Moderate	3	Product quality is acceptable but lacks standardization
15	Local Economy	85%	Best	5	Strong contribution to local economic development
16	Decent Livelihood	65%	Good	4	Livelihood conditions are relatively stable
17	Fair Trading Practices	65%	Good	4	Market relations are fairly equitable
18	Labour Rights	65%	Good	4	Basic labor rights are generally respected
19	Equity	45%	Moderate	3	Equity issues still require attention
20	Human Safety and Health	65%	Good	4	Health and safety practices are acceptable
21	Cultural Diversity	85%	Best	5	Strong preservation of cultural and social values

Source : Primary Data Processing

Based on the SAFA Framework, coffee farming sustainability in Karangkobar Sub-district shows strong economic and social performance but remains limited in governance and environmental aspects. Governance indicators show good Corporate Ethics (65%) and Participation (60%), but moderate Accountability (45%) and limited Rule of Law and Holistic Management (30%) indicate weak transparency, oversight, and integrated farm management. Environmental indicators (Atmosphere, Water, Land, Biodiversity, Materials and Energy, and Animal Welfare) are all moderate (45%), reflecting conventional practices with ongoing pressure on natural resources and limited adoption of conservation-oriented management.

The economic dimension shows strong performance, with Investment and Local Economy scoring 85% (Best), supported by Decent Livelihood and Fair Trading Practices (65%; Good), indicating adequate economic resilience and fair trading conditions. The social dimension is also relatively strong, with Labour Rights and Human Safety and Health (65%; Good) and Cultural Diversity (85%; Best) reflecting decent working conditions and preservation of local values. However, Equity and Product Quality and Information (45%; Moderate) highlight gaps in benefit distribution, quality standards, and market information. Overall, coffee farming in Karangkobar demonstrates moderate sustainability, with key strengths in economic and social aspects, but requires improvements in governance and environmentally sustainable practices.

CONCLUSION

SAFA assessment shows that coffee sustainability in Kalibening and Karangkobar develops unevenly due to differences in management capacity, biophysical conditions, and institutional support. Kalibening performs well in Holistic Management and Equity (85%) due to stronger planning, farmer institutions, and social cooperation, while socio-economic and biodiversity aspects (65%) reflect the benefits of agroforestry and diversification. However, low Materials and Energy performance (30%) and moderate environmental indicators (50%) indicate limited adoption of efficient inputs and conservation practices. In Karangkobar, strong Investment and Local Economy performance (85%) demonstrates the economic contribution of coffee farming, but low Rule of Law and Holistic Management scores (30%) reveal weaknesses in governance, sustainability standards, and long-term planning. Moderate environmental performance (45%) and Equity and Product Quality scores indicate the need to improve conservation practices, training access, innovation, and product quality enhancement.

REFERENCES

Afandi, M. F., Komariyah, S., Aprillianto, B., & Vidia, D. (2021). *Social Relations Between Markets and Farmers : A Sustainable Development Model for Coffee Commodities*. *194*(Icombest), 180–185.

Alaoui, A., Barão, L., Ferreira, C. S. S., & Hessel, R. (2022). An Overview of Sustainability Assessment Frameworks in Agriculture. *Land*, *11*(4), 1–26. https://doi.org/10.3390/land11040537

Arifianto, A., & Widyastuti, N. (2021). *PERAN KOMUNIKASI KELOMPOK TANI TERHADAP TINGKAT ADOPSI PETANI PENGGUNAAN (Effective Microorganisme) EM4 PADA TANAMAN CABAI (Capcisum Annum)*. *2*(1), 43–62. https://doi.org/10.15408/jko.v2i1.21890

Azkar, R., Darma, R., & Amir, A. A. (2025). *Sustainability of the Toraja Arabica coffee value chain in Indonesia : economic , cultural , environmental , and certification dimensions*. *December*. https://doi.org/10.3389/frsus.2025.1691977

Blanco-pacheco, T. E., & De-la-rosa-cadavid, M. L. (2025). *Corporate Sustainability in the*

Coffee Industry : Organic Certification for Small Producers in the Sierra Nevada de Santa. 1–23.

Boudreau, L., & Cajal-grossi, J. (2023). *Global Value Chains in Developing Countries: A Relational Perspective from Coffee and Garments*. *37*(3), 59–86.

Djufry, F., Wulandari, S., & Villano, R. (2022). *Climate Smart Agriculture Implementation on Coffee Smallholders in Indonesia and Strategy to Accelerate*.

FAO. (2013). Sustainability Assessment of Food and Agricultural System: SAFA Indicators. *Food and Agriculture Organization of the United Nations - Rome 2013*, 271. http://www.fao.org/nr/sustainability/sustainability-assessments-safa

FAO. (2014). Sustainability Assessment of Food and Agricultural System: Guidelines. In *Food and Agriculture Organization of the United Nations*. http://www.fao.org/nr/sustainability/sustainability-assessments-safa

Food and Agriculture Organization. (2017). SAFA: Sustainability Assessment of Food and Agriculture systems guidelines. In *FAO Natural Resouce Management and Environmental Development* (Issue June).

Iakovidis, D., Gadanakis, Y., & Park, J. (2022). Farm-level sustainability assessment in Mediterranean environments: Enhancing decision-making to improve business sustainability. *Environmental and Sustainability Indicators*, *15*. https://doi.org/10.1016/j.indic.2022.100187

Irawan, A., & Rabemanolontsoa, H. (2024). *Comprehensive Environmental Impact Analysis of Dry Processing Methods for Specialty Coffee Beans in Bondowoso , Indonesia Using Life Cycle Assessment*. 843–864.

Khoirunisa, A. (2025). *Peran balai penyuluhan pertanian dalam memberdayakan ekonomi kelompok tani sugih tani ii melalui usaha bunga potong*. *6*(1), 94–109. https://doi.org/10.15408/jko.v6i1.44855

Makaborang, M., Goenadi, S., & Hadi, P. (2009). Optimasi Penggunaan Lahan Berdasarkan Kelas Kesesuaian Lahan Untuk Pengembangan Tanaman Perkebunan (Studi Kasus: Kabupaten Sumba Timur Provinsi Nusa Tenggara Timur). *Agrotech*, *29*(4), 188–197.

Nainggolan, M. F. (n.d.). *Sustainability agricultural supply chain in improving the welfare of North Toraja Arabica coffee farmers Sustainability agricultural supply chain in improving the welfare of North Toraja Arabica coffee farmers*. https://doi.org/10.1088/1755-1315/1107/1/012065

Romadhona, S., & Ardhian, M. (2025). *Towards Sustainable Agriculture : Assessment of Organic Salak Pondoh (Salacca edulis Reinw) Farming in Magelang Using the SAFA Framework*. *1*(2), 107–124.

Romadhona, S., Puryono, S., & Mussadun, M. (2025). *Integration of geographical information systems in the land suitability assessment for rice crops in Sleman District , Indonesia*. *14*(1), 16–29. https://doi.org/10.36706/JLSO.14.1.2025.728

Romadhona, S., Puryono, S. R. I., & Soedarmo, K. (2025). *Evaluation of land potential for organic farming development and implications for achieving Sustainable Development Goals (SDGs) in Sleman District , Yogyakarta , Indonesia*. *9*(1), 69–83. https://doi.org/10.13057/asianjagric/g090108

Romadhona, S., Puryono, S., Rachmawati, S., & Sciences, N. (2024). *Holistic Sustainability Assessment of Certified Organic, NonCertified Organic, and Non-Organic Rice Farming Practices Using SAFA Framework in Sleman Regency, Indonesia*. *10*(2), 256–278.

Sappe, N. J., Baja, S., Neswati, R., & Rukmana, D. (2022). Land suitability assessment for agricultural crops in Enrekang, Indonesia: combination of principal component analysis and fuzzy methods. *Sains Tanah*, *19*(2), 165–179. https://doi.org/10.20961/stjssa.v19i2.61973

Scialabba, N., & Nemes, N. (2019). *SAFA - A Long-awaited Step Forward to Sustainability in the Food and Agriculture Sectors*. 959. https://doi.org/10.3390/wsf2-00959

Scuderi, A., Chinnici, G., Zarbà, C., Cammarata, M., & Gravagno, R. M. (2025). Sustainability assessment of blood orange production in sicily through the application of the SAFA framework. *Cleaner Environmental Systems*, *18*(May). https://doi.org/10.1016/j.cesys.2025.100293

Sia, R., Darma, R., Salman, D., & Riwu, M. (2025). *Sustainability Assessment of the Arabica Coffee Agribusiness in North Toraja : Insight from a Multidimensional Approach*.

Syofya, H. (2023). *The Effect of Environmental Sustainabiity and Value Chain Concept in the Context of Local Economy on Value Added of Coffee Commodities in Kerinci*. *1*(03), 107–117.

Ungureanu, N. (2026). *Sustainable Valorization of Spent Coffee Grounds Within the Circular Economy : Innovative Applications in Food , Agriculture , Environmental , and Industrial Sectors*. 1–66.

Winter, E., Marton, S. M. R. R., Baumgart, L., Curran, M., & Stolze, M. (2020). *Evaluating the Sustainability Performance of Typical Conventional and Certified Coffee Production Systems in Brazil and Ethiopia Based on Expert Judgements*. *4*(May), 1–18. https://doi.org/10.3389/fsufs.2020.00049

Wright, D. R., Bekessy, S. A., Lentini, P. E., Garrard, G. E., Gordon, A., Rodewald, A. D., Bennett, R. E., & Selinske, M. J. (2024). Sustainable coffee : A review of the diverse initiatives and governance dimensions of global coffee supply chains. *Ambio*, *53*(7), 984–1001. https://doi.org/10.1007/s13280-024-02003-w

Yusuf, E. S., Ariningsih, E., Gunawan, E., Purba, H. J., Suhartini, S. H., Tarigan, H., Hestina, J., Saputra, Y. H., Wulandari, S., & Ilham, N. (2022). *Sustainability of Arabica co ff ee business in West Java , Indonesia : A multidimensional scaling approach*. 820–836.

Zimmerer, K. S., Lambin, E. F., & Vanek, S. J. (2018). *Smallholder telecoupling and potential sustainability*. *23*(1).