

SUSTAINABILITY ASSESSMENT OF SOCIAL FORESTRY IN THE SAGENA INDAH FOREST FARMERS GROUP

Hayatus Sa'adiah*, Markum, Andi Chairil Ichsan

Department of Natural Resource and Environmental Management, University of Mataram,
Jalan Pendidikan No. 37, Mataram, 83115, West Nusa Tenggara, Indonesia

*Email: hayatussaadiah@gmail.com

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ABSTRACT

Social Forestry (SF) under the Community Forestry (*Hutan Kemasyarakatan/HKm*) scheme promotes community-based forest management, whose sustainability largely depends on institutional capacity and forest management performance. This study aimed to evaluate the sustainability status of Social Forestry implementation in the Sagena Indah Forest Farmers Group (*Kelompok Tani Hutan/KTH* Sagena Indah), Kiantar Village, West Sumbawa Regency, Indonesia, using the Multi-Aspect Sustainability Analysis (MSA) framework. The assessment integrated Institutional Management and Area Management dimensions based on regulatory-derived sustainability attributes. Data were collected through field observations, document verification, and structured interviews with twelve purposively selected key persons representing four stakeholder groups. The MSA analysis was conducted using sustainability indexing, leverage analysis, future condition assessment, Monte Carlo simulation, and Random Iteration analysis. The results showed that KTH Sagena Indah achieved a Sustainable status, although sustainability performance differed between management components, with Area Management performing better than Institutional Management. The findings indicate that Social Forestry sustainability is shaped by the interaction between governance capacity, community participation, and forest management practices. Based on the findings, sustainability improvement should focus on strengthening priority attributes within Institutional Management and Area Management to achieve more balanced and sustainable Social Forestry implementation.

Keywords: *Institutional Management; Area Management; Multi-Aspect Sustainability Analysis.*

INTRODUCTION

Sustainable forest management has become a global priority because forests provide essential ecological functions, including biodiversity conservation, climate regulation, ecosystem services, and livelihood support (Massiri et al., 2020). However, deforestation, forest degradation, and climate-related disturbances continue to threaten forest ecosystems, particularly in tropical developing countries (Julham, 2025). Consequently, community-based forest management has emerged as an important approach by recognizing local communities as key actors in forest protection, restoration, and sustainable resource utilization (Putraditama et al., 2021; Maryudi et al., 2022; Suswadi et al., 2024; Idin et al., 2025). Its effectiveness depends not only on access rights but also on institutional capacity, collaborative governance, social capital, and adaptive management (Hombokau et al., 2023; Rahayu et al., 2024). Therefore, multidimensional sustainability assessment is increasingly needed to evaluate the interaction between institutional performance, management practices, and adaptive governance capacity in community forestry systems (Firmansyah, 2022; Pasaribu & Dewi, 2025; Oktoyoki et al., 2026).

In Indonesia, Social Forestry (PS) has become a strategic policy to expand community access to state forests while improving livelihoods and promoting sustainable forest management (Muhdar et al., 2022). Implemented through five schemes: Community Forestry (*Hutan Kemasyarakatan/HKm*), Village Forest (*Hutan Desa/HD*), Community Plantation Forest (*Hutan Tanaman Rakyat/HTR*), Customary Forest (*Hutan Adat/HA*), and Forestry Partnership (*Kemitraan Kehutanan/KK*) the program represents a transition toward participatory forest governance (Rahayu et al., 2024; Oktoyoki & Paulina, 2026). Previous studies indicate that Social Forestry contributes to improving welfare, livelihood opportunities, participation, and local economic resilience, although outcomes vary according to institutional capacity, governance quality, and socio-ecological conditions (Suswadi et al., 2024; Ramadhan et al., 2025; Idin et al., 2025). Thus, long-term sustainability requires effective institutional management, adaptive management, and stakeholder collaboration (Massiri et al., 2020; Hombokau et al., 2023; Rahayu et al., 2024).

Recent studies have examined Social Forestry through institutional governance, stakeholder participation, socio-economic outcomes, ecological management, and adaptive governance perspectives (Maryudi et al., 2022; Afrianto, 2025; Oktoyoki et al., 2026). These studies highlight the importance of institutional capacity, collaboration, agroforestry practices, and ecological management in supporting sustainable forest governance (Massiri et al., 2020; Octavia et al., 2022; Hombokau et al., 2023). Collectively, these findings demonstrate that Social Forestry sustainability is multidimensional and requires integrated evaluation of institutional management and area management (Muhdar et al., 2022; Pasaribu & Dewi, 2025).

Despite these advances, existing studies have generally assessed institutional governance, socio-economic outcomes, ecological management, and community empowerment separately rather than as interconnected dimensions of sustainability (Massiri et al., 2020; Maryudi et al., 2022; Afrianto, 2025). Similarly, institutional readiness, adaptive governance, livelihood improvement, and agroforestry development have mostly been evaluated independently without integrating institutional management and area management into a single regulatory-based sustainability framework at the Forest Farmers Group (*Kelompok Tani Hutan/KTH*) level (Muhdar et al., 2022; Hombokau et al., 2023; Rahayu et al., 2024; Ramadhan et al., 2025). Therefore, this study addresses this gap by integrating institutional management and area management into a regulatory-based sustainability assessment framework for evaluating Social Forestry implementation at the Forest Farmers Group level (Elva et al., 2017; Suswadi et al., 2024; Oktoyoki et al., 2026).

This study applies the Multi-Aspect Sustainability Analysis (MSA) framework to assess the sustainability status of Social Forestry implementation in the Sagena Indah Forest Farmers Group (KTH Sagena Indah), Kiantar Village, West Sumbawa Regency, Indonesia (Kavanagh & Pitcher, 2004; Firmansyah, 2022). The framework enables sustainability indexing, identification of leverage attributes, future condition assessment, and analytical validation through Monte Carlo simulation and Random Iteration analysis (Kavanagh & Pitcher, 2004; Firmansyah, 2022; Octavia et al., 2022). The assessment focuses on institutional management and area management as key foundations of sustainable Social Forestry implementation, providing evidence-based recommendations for strengthening governance and improving management performance (Massiri et al., 2020; Muhdar et al., 2022; Maryudi et al., 2022; Hombokau et al., 2023).

METHOD

Study Area

This study was conducted at the KTH Sagena Indah in Kiantar Village, Poto Tano District, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia (Figure 1). The group manages approximately 48 ha of protected forest under the Community Forestry (HKm) scheme supervised by the West Sumbawa Forest Management Unit (Kesatuan Pengelolaan Hutan/KPH Sumbawa Barat). KTH Sagena Indah is officially registered as a Community Forestry management unit under Indonesia's Social Forestry Program. Field data collection was conducted from March to April 2026.

The study site was purposively selected because KTH Sagena Indah represents an active Community Forestry group with legally recognized forest utilization rights and ongoing institutional and area management activities under Indonesia's Social Forestry Program. The group is categorized as a beginner Forest Farmers Group, representing an early stage of institutional development where sustainability challenges related to governance capacity and forest management practices can be evaluated (Muhdar et al., 2022; Fikri et al., 2025). Agroforestry represents the dominant land-use practice within the management area, reflecting the main approach promoted under Community Forestry implementation (Kartila et al., 2018; Octavia et al., 2022).

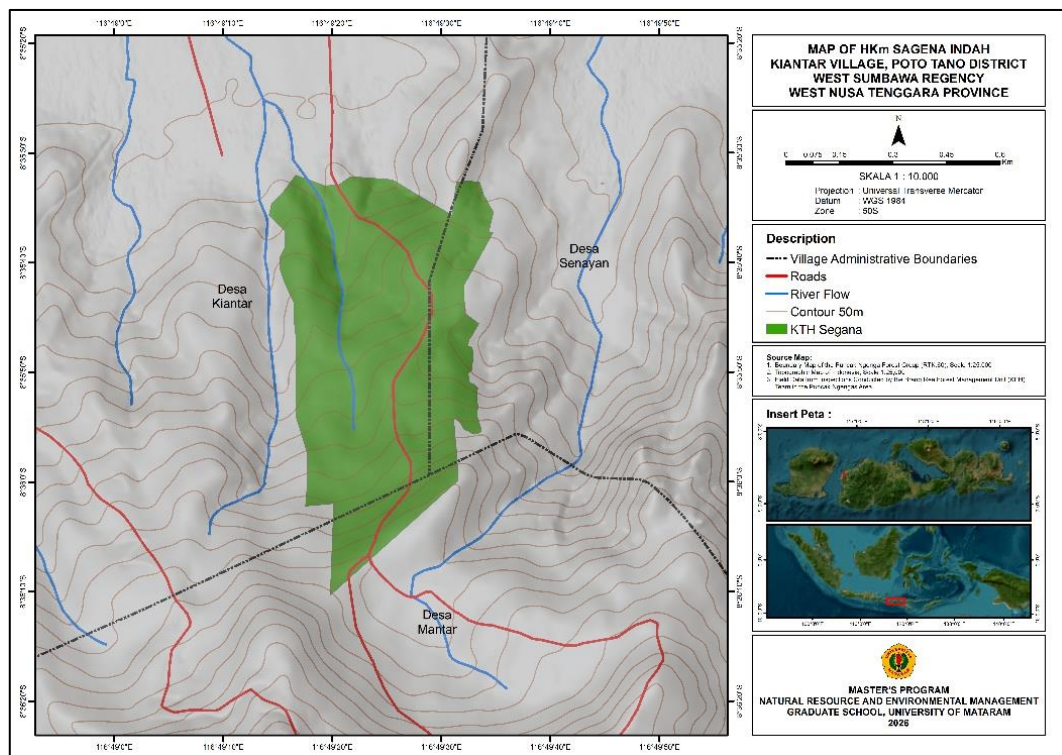


Figure 1. Location of the Study Area

Despite its legal status and active participation in the Social Forestry Program, KTH Sagena Indah continues to face challenges in institutional management and area management, including limited organizational capacity, uneven member participation, restricted market access, prolonged dry seasons, and the need to strengthen sustainable forest management practices (Supriyanto et al., 2021; Ramadhan et al., 2025). These characteristics make KTH Sagena Indah an appropriate case for evaluating the sustainability of Social Forestry implementation using the MSA framework (Firmansyah, 2022; Millah et al., 2025; Oktoyoki et al., 2026).

Research Design and Multi-Aspect Sustainability Analysis

This study employed a descriptive analytical research design to evaluate the sustainability of Social Forestry implementation in the KTH Sagena Indah using the MSA framework. The MSA framework was selected because it enables multidimensional sustainability assessment by integrating sustainability indexing, leverage analysis, and analytical validation within a single procedure, making it suitable for evaluating the complex sustainability characteristics of Social Forestry implementation (Firmansyah, 2022; Millah et al., 2025; Padama et al., 2025). This approach supports the identification of priority improvement areas and provides evidence for adaptive management.

The research consisted of four sequential stages: (1) development of sustainability assessment attributes, (2) data collection and scoring, (3) MSA analysis, and (4) interpretation of sustainability results (Figure 2). The assessment attributes were developed based on the Regulation of the Minister of Forestry No. P.57/Menhut-II/2014 concerning Guidelines for Forest Farmers Group Development and the Regulation of the Minister of Environment and Forestry No. 9 of 2021 concerning Social Forestry Management. These regulations provide institutional and operational criteria for developing measurable sustainability attributes (Muhdar et al., 2022; Firmansyah, 2022). Accordingly, the assessment framework focused on two dimensions, namely Institutional Management and Area Management, which represent the organizational and operational foundations of Social Forestry sustainability (Musdalifah et al., 2023).

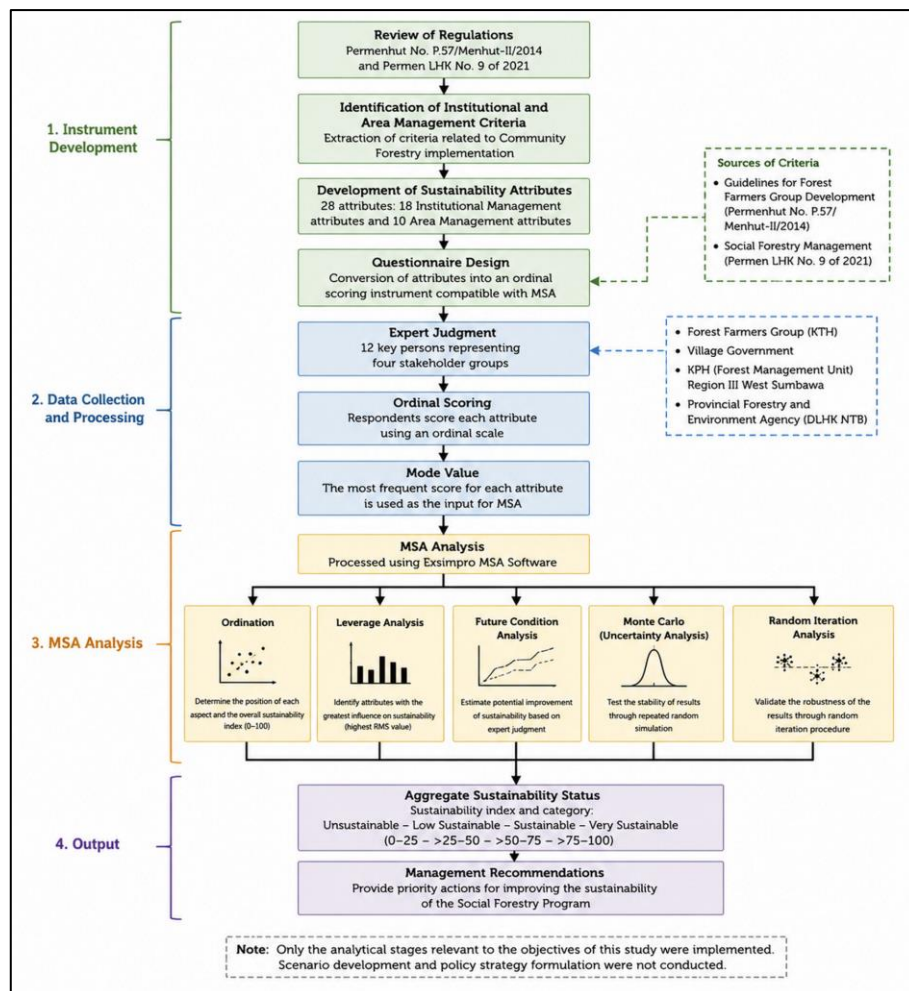


Figure 2. Analytical Workflow of the MSA Framework

Data collection and scoring involved expert judgment from twelve purposively selected key persons representing four stakeholder groups (Table 3). Each respondent evaluated the same sustainability attributes using ordinal scoring criteria, and the modal value of each attribute was used as the input for MSA analysis (Firmansyah, 2022; Ardiansyah et al., 2023; Suriani et al., 2023).

The MSA analysis was conducted using Exsimpro MSA software (Machali, 2021). Ordinal scores were transformed into sustainability indices ranging from 0–100, and sustainability status was interpreted according to the classification proposed by Kavanagh and Pitcher (2004). The corresponding sustainability index categories are presented in Table 1. The analysis included multidimensional ordination to estimate sustainability indices, leverage analysis to identify priority attributes based on Root Mean Square (RMS) values, future condition assessment, Monte Carlo simulation to evaluate index stability, and Random Iteration analysis to verify analytical robustness (Firmansyah, 2022; Millah et al., 2025; Padama et al., 2025).

Table 1. Sustainability Index Categories Used in MSA Analysis

Index Value (%)	Category
0 - 25	Unsustainable
> 25 – 50	Less Sustainable
> 50 – 75	Sustainable
> 75 – 100	Very Sustainable (Good / Very Sustainable)

Source: Kavanagh & Pitcher, 2004

Leverage attributes were interpreted as priority areas for improvement rather than direct causal determinants of sustainability performance (Firmansyah, 2022). Future condition analysis was interpreted as an ordination-based reference indicating potential improvement directions rather than a temporal prediction of future sustainability performance (Firmansyah, 2022). Monte Carlo simulation was used to assess uncertainty effects on sustainability indices, while Random Iteration analysis was applied to verify the consistency and stability of analytical outputs. Scenario development and policy formulation, which are included in the broader MSA framework, were not applied because this study focused on evaluating current sustainability conditions, identifying leverage attributes, and assessing analytical reliability (Firmansyah, 2022; Millah et al., 2025).

Development of Sustainability Assessment Attributes

The sustainability assessment instrument was developed by the authors based on Indonesia's regulatory framework for Community Forestry implementation. Assessment attributes were derived from two principal regulations: the Regulation of the Minister of Forestry No. P.57/Menhut-II/2014 concerning Guidelines for Forest Farmers Group Development and the Regulation of the Minister of Environment and Forestry No. 9 of 2021 concerning Social Forestry Management. These regulations provide the institutional and operational standards used to evaluate the performance and sustainability of Forest Farmers Groups (Firmansyah, 2022; Musdalifah et al., 2023; Padama et al., 2025).

The regulatory criteria were translated into measurable sustainability attributes using the ordinal scoring system required by the MSA framework (Kavanagh & Pitcher, 2004; Firmansyah, 2022). The assessment focused on two dimensions, Institutional Management and Area Management, because they represent the primary development priorities of KTH Sagena Indah as a beginner Forest Farmers Group (Musdalifah et al., 2023; Fikri et al., 2025). The Business Management dimension was excluded because the group had not yet established formal forest-based enterprises or measurable business performance, thereby avoiding the evaluation of attributes that were not yet observable in the field (Kavanagh & Pitcher, 2004; Hermawan et al., 2020; Supriyanto et al., 2021; Firmansyah, 2022; Fikri et al., 2025).

The final instrument comprised 28 sustainability attributes, including 18 Institutional Management attributes and 10 Area Management attributes. Institutional Management covers organizational legality, governance, administration, participation, leadership, and institutional strengthening, whereas Area Management includes boundary management, land utilization, rehabilitation, conservation, environmental stewardship, and sustainable forest management practices. The complete list of sustainability attributes is presented in Table 2 (Firmansyah, 2022).

Table 2. Sustainability Attributes Used for the Multi-Aspect Sustainability Analysis (MSA)

Aspect	Sustainability Attribute
Institutional Management	Legal establishment of the Forest Farmers Group
	Organizational structure
	Women's participation in organizational management and group membership
	Group Activity Plan (Rencana Kerja Kelompok – RKK)
	Participation of management and members in group activities
	Monitoring and evaluation of group activities
	Availability and functionality of the group secretariat
	Internal group regulations
	Completeness of administrative records
	Frequency of group meetings
	Participation and attendance of group members
	Participation in capacity-building activities
	Types of training attended by management and members
	Involvement of the Forest Farmers Group in development programs
	Integration of local wisdom into group activities
	Formation of new Forest Farmers Groups
	Formation of Social Forestry Extension Workers (PKSM)
	Development of future KTH leaders
Area Management	Understanding of forest management boundaries
	Delineation and mapping of the management area
	Identification of the management area's potential and carrying capacity
	Identification and mapping of management area constraints
	Land utilization according to site potential
	Rehabilitation activities
	Forest resource conservation activities
	Improvement of community awareness and environmental stewardship
	Environmental impacts of management activities
	Acquisition of Sustainable Forest Management certification (PHBML/SVLK or equivalent)

Source: Adapted from Regulation No. P.57/Menhut-II/2014 and Regulation No. 9/2021 on Social Forestry Management.

Data Collection

Primary and secondary data were collected from March to April 2026 through structured interviews, field observations, document verification, and literature review. Primary data were obtained from key persons representing the main stakeholder groups of Social Forestry implementation, while field observations were conducted to verify institutional conditions, forest management practices, and supporting facilities within the KTH Sagena Indah management area (Firmansyah, 2022). Secondary data were obtained from institutional

documents of KTH Sagena Indah, Community Forestry permits, reports from the West Sumbawa Forest Management Unit (KPH), government regulations, and relevant scientific publications (Muhdar et al., 2022; Musdalifah et al., 2023). Data triangulation was applied by integrating interview results, field observations, and documentary evidence to improve the reliability and consistency of the sustainability assessment (Firmansyah, 2022; Kurniawan et al., 2025).

Selection of Key Persons

The sustainability assessment involved twelve purposively selected key persons representing the main stakeholders of the Social Forestry Program (Table 2). Respondents were selected based on their institutional roles, technical expertise, decision-making authority, and practical experience in Community Forestry management, as the MSA framework emphasizes respondent competence and knowledge rather than sample size (Massiri et al., 2020; Firmansyah, 2022; Suriani et al., 2023). Each respondent assessed the same sustainability attributes using the same ordinal scoring criteria to ensure consistency and comparability among stakeholder evaluations.

The selected key persons represented four stakeholder groups: KTH Sagena Indah, Kiantar Village Government, West Sumbawa Forest Management Unit (KPH Region III), and Provincial Forestry and Environment Agency of West Nusa Tenggara (Dinas Lingkungan Hidup dan Kehutanan Nusa Tenggara Barat/DLHK NTB). Each stakeholder group contributed three respondents to capture complementary perspectives from community institutions, local government, forest management authorities, and provincial agencies (Maryudi et al., 2022; Muhdar et al., 2022; Rahayu et al., 2024).

Table 3. Distribution of Key Persons Participating in the Sustainability Assessment

Stakeholder Group	Number of Key Persons	Position
Sagena Indah Forest Farmers Group	3	Chairperson, Secretary, Member
Kiantar Village Government	3	Village Officials
West Sumbawa Forest Management Unit (KPH Region III)	3	Forestry Officers
Provincial Forestry and Environment Agency (DLHK NTB)	3	Forestry Officers

Source: Develop by Author's (2026)

RESULTS AND DISCUSSION

Institutional Management Aspect

The Institutional Management aspect of KTH Sagena Indah obtained a sustainability index of 50.94, categorized as Sustainable according to the MSA classification. However, the value was close to the lower sustainability threshold, indicating that institutional capacity remains in a consolidation stage. This condition is consistent with the characteristics of beginner Forest Farmers Groups, where basic organizational structures and legal recognition are generally established, while administrative capacity, leadership development, stakeholder coordination, and adaptive governance continue to develop (Massiri et al., 2020; Maryudi et al., 2022; Agus et al., 2024; Pasaribu & Dewi, 2025). Institutional sustainability therefore depends not only on formal establishment but also on the capacity of organizations to support collective action and adaptive management (Elva et al., 2017; Firmansyah, 2022; Hombokau et al., 2023). The leverage analysis identified Group Activity Planning, integration of local wisdom, formation of new Forest Farmers Groups, and establishment of Social Forestry Extension Workers

(*Penyuluh Kehutanan Swadaya Masyarakat/PKSM*) as attributes with relatively higher sensitivity values within the Institutional Management dimension (Figure 3).

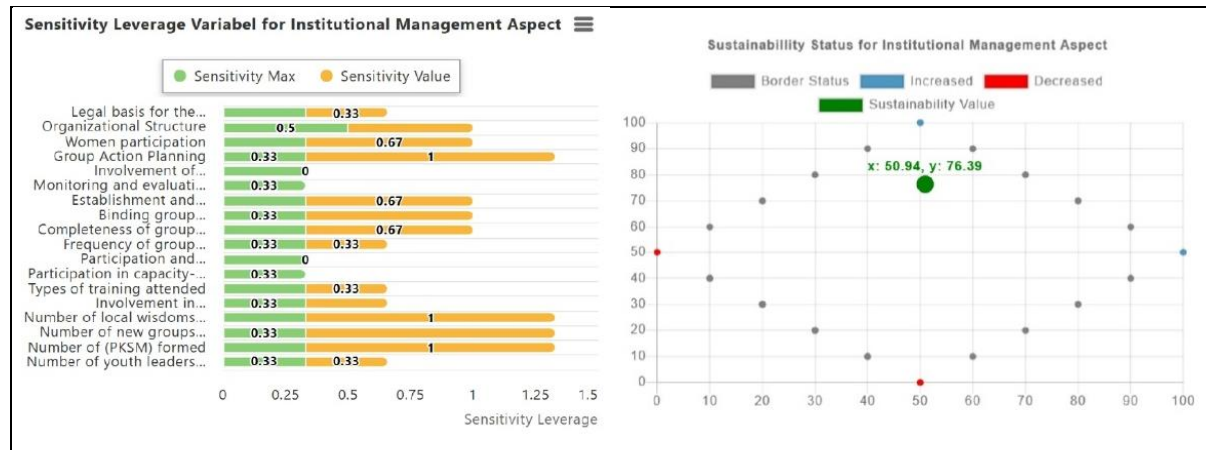


Figure 3. Sustainability Status and Sensitivity Leverage Attributes of the Institutional Management Aspect

Within the MSA framework, leverage attributes indicate priority areas for improvement rather than direct causal determinants (Firmansyah, 2022). The sensitivity value of Group Activity Planning indicates that structured institutional planning is a priority area for improvement, while local wisdom integration reflects the role of community-based governance in strengthening participation and institutional legitimacy (Lawasi, 2024; Refani et al., 2024). Similar studies emphasize that effective planning, institutional learning, and stakeholder collaboration support adaptive capacity in Social Forestry systems (Maryudi et al., 2022; Hombokau et al., 2023; Oktoyoki et al., 2026).

The sensitivity value of PKSM establishment identifies this attribute as a priority area for institutional improvement, particularly related to facilitation, knowledge exchange, and institutional networking. Extension support has been reported to contribute to improving technical capacity and interaction between communities and government institutions (Rahayu et al., 2024). Overall, KTH Sagena Indah has achieved a Sustainable status in Institutional Management, although strengthening planning systems, participatory governance, extension support, and institutional networking remains necessary to improve long-term Social Forestry sustainability (Pasaribu & Dewi, 2025).

Area Management Aspect

The Area Management aspect of KTH Sagena Indah achieved a sustainability index of 73.40, categorized as Sustainable and approaching the Very Sustainable category (Figure 4). The higher index compared with Institutional Management (50.94) indicates that field-based management practices have developed relatively further than institutional components. This pattern has also been reported in early-stage Social Forestry implementation, where ecological practices may develop earlier than institutional consolidation (Larson et al., 2021; Maryudi et al., 2022; Pasaribu & Dewi, 2025).

Several attributes related to forest boundary understanding, zoning, mapping, area potential identification, and land utilization showed relatively low sensitivity values (0.33). Within the MSA framework, these values indicate limited contribution to changes in the sustainability index within the current model and do not imply low ecological importance (Firmansyah, 2022). These attributes remain relevant because they provide the spatial foundation for sustainable forest management and reducing potential management conflicts (Muhdar et al., 2022; Ananda et al., 2023). The leverage analysis identified sustainable forest management

certification, environmental awareness, and community stewardship as attributes with relatively higher sensitivity values within the Area Management dimension (Figure 4).



Figure 4. Sustainability Status and Sensitivity Leverage Attributes of the Area Management Aspect

Within the MSA framework, leverage attributes represent priority areas for improvement rather than direct causal determinants (Firmansyah, 2022). The high sensitivity value of sustainable forest management certification identifies this attribute as a priority area related to management standards, documentation, monitoring, and accountability mechanisms. Environmental awareness and community stewardship were identified as priority attributes related to participation and collective responsibility in maintaining forest management practices (Suswadi et al., 2024; Rahayu et al., 2024). The future-condition coordinate ($x = 73.40$; $y = 70.00$) represents an analytical reference derived from MSA ordination rather than a temporal prediction of future sustainability performance (Firmansyah, 2022). Overall, Area Management represents the relatively stronger sustainability dimension of KTH Sagena Indah, supported by relatively established agroforestry, conservation, rehabilitation, and land utilization practices (Suswadi et al., 2024). However, maintaining this performance requires continued improvement in ecological monitoring, environmental awareness, and institutional capacity to support long-term Social Forestry sustainability (Firmansyah, 2022; Pasaribu & Dewi, 2025; Lawasi, 2024; Idin et al., 2025;).

Sustainability Value

The overall sustainability assessment of Social Forestry implementation in KTH Sagena Indah resulted in an aggregate sustainability index of 62.17, categorized as Sustainable according to the MSA classification (Table 4). The index was derived from Institutional Management (50.94) and Area Management (73.40), indicating that KTH Sagena Indah has established basic conditions supporting sustainable Community Forestry implementation. However, the difference between dimensions shows that sustainability performance has not developed uniformly across management components.

Table 4. Sustainability values of Social Forestry management in KTH Sagena Indah

No	Aspect	Sustainability Index	Sustainability Category
1	Institutional Management	50.94	Sustainable
2	Area Management	73.40	Sustainable
Overall Sustainability Index		62.17	Sustainable

Source: Authors' analysis based on expert assessment data (2026).

Figure 5 illustrates that Area Management achieved a higher sustainability index than Institutional Management, with a difference of 22.46 points. This indicates that field-based

management practices have developed relatively further than institutional components, which generally require longer processes of organizational learning, coordination, and adaptive governance (Larson et al., 2021; Maryudi et al., 2022; Pasaribu & Dewi, 2025).

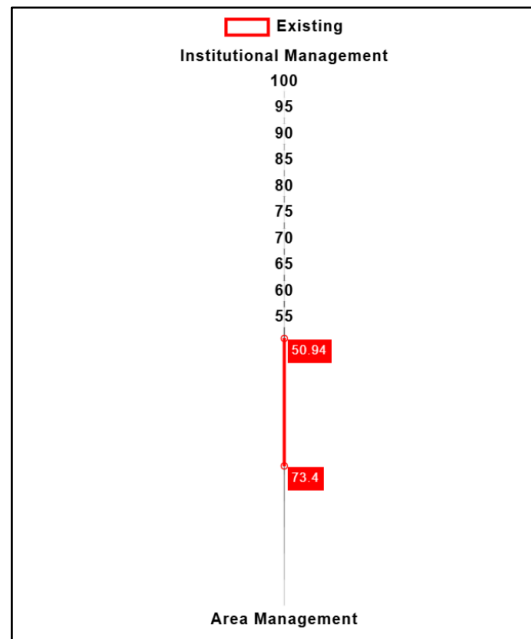


Figure 5. Comparison of Sustainability Indices Between Institutional Management and Area Management

The difference between dimensions demonstrates the need for multidimensional sustainability assessment in Social Forestry evaluation (Pasaribu & Dewi, 2025). The MSA framework provides an integrated assessment by simultaneously evaluating Institutional Management and Area Management as complementary components of sustainability performance (Kavanagh & Pitcher, 2004; Massiri et al., 2020; Firmansyah, 2022). Overall, KTH Sagena Indah was categorized as Sustainable; however, the difference between Institutional Management and Area Management indicates the need for a more balanced sustainability development trajectory (Idin et al., 2025). Strengthening organizational planning, leadership regeneration, participation, institutional learning, and stakeholder collaboration may support future improvements in Social Forestry management (Oktoyoki et al., 2026).

CONCLUSION AND RECOMENDATION

This study evaluated the sustainability status of Social Forestry implementation in KTH Sagena Indah using the MSA framework by integrating Institutional Management and Area Management dimensions. The results demonstrate that KTH Sagena Indah achieved a Sustainable status, although sustainability performance differed between management components. Area Management showed relatively stronger performance than Institutional Management, reflecting more developed field-based forest management practices compared with institutional capacity. The regulatory-based MSA framework provides an integrated approach for assessing Social Forestry sustainability at the Forest Farmers Group level by combining sustainability assessment, leverage identification, and analytical validation. The findings indicate that sustainability is shaped by the interaction between governance capacity, community participation, and forest management practices rather than by ecological or institutional aspects individually. Based on the leverage analysis, sustainability improvement in KTH Sagena Indah should focus on strengthening priority attributes within each management dimension. Institutional Management improvement should emphasize Group Activity Planning, strengthening the role of Social Forestry Extension Workers (*Penyuluh*

Kehutanan Swadaya Masyarakat/PKSM), institutional networking, and integration of local wisdom into group governance to enhance participation and institutional legitimacy. For Area Management, priority actions should include improving environmental awareness, community stewardship, participatory monitoring, and preparation toward sustainable forest management certification through strengthened documentation and accountability mechanisms. These recommendations may support a more balanced sustainability trajectory by consolidating institutional capacity while maintaining existing achievements in forest management practices.

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