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Institutional Resilience and Collaborative Governance In The Palm Oil Sector: A Soft Systems–Structural–Analytical Model For Smallholder Empowerment

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ABSTRACT

This study formulates a model for strengthening the institutions of independent oil palm farmers in Kalimantan through a systemic and participatory approach. The weaknesses of independent oil palm farmers' institutions remain a major obstacle to increasing productivity, competitiveness, and the sustainability of farming businesses. This research method integrates Soft Systems Methodology (SSM), Interpretative Structural Modelling (ISM), and Analytical Hierarchy Process (AHP) to identify key elements, map structural relationships between variables, and determine institutional strengthening strategy priorities. The SSM results show that the root causes of institutional problems include low member participation, weak coordination between parties, and limited access to capital and information. The ISM analysis reveals that government support and farmers' willingness to change are the main driving elements, while professional human resource development and access to capital serve as connecting elements. Meanwhile, the AHP results show that developing partnerships among stakeholders (0.529) is the highest strategic priority, followed by improving organizational management (0.211) and enhancing training and mentoring (0.156). These findings emphasize the importance of synergy between the government, financial institutions, farmer associations, and palm oil companies in building strong, adaptive, and sustainable farmer institutions. Theoretically, this research contributes to the development of an integrated systems approach in strengthening agricultural institutions in Indonesia, particularly in the smallholder palm oil sub-sector.

Keywords: Farmer Institutions, Palm Oil, SSM, ISM, AHP, Sustainable Partnerships

INTRODUCTION

Indonesia stands as the world's largest palm oil producer, accounting for approximately 59% of global crude palm oil (CPO) supply (FAO, 2024). The sector plays a crucial role in the national economy, contributing 13.4% of total export value and employing over 17 million workers, both directly and indirectly. Within this sector, independent smallholders manage more than 41% of oil

palm plantations, particularly in regions such as Kalimantan, Sumatra, and Sulawesi (Ditjenbun, 2023). However, despite their strategic contribution, these independent farmers continue to face persistent institutional and structural problems that significantly hinder productivity, sustainability, and global competitiveness.

Empirical evidence indicates that independent smallholders in Kalimantan experience low productivity—averaging 2.6 tons/ha/year, which is considerably below the 4.5–5 tons/ha/year achieved by corporate plantations. Several factors contribute to this productivity gap, including limited access to certified seeds, inadequate extension services, and weak institutional coordination among farmers, cooperatives, and government agencies. Moreover, only 8–12% of smallholder-managed areas in Kalimantan are legally certified (BPDPKS, 2023), creating barriers to formal credit access, sustainability certification (ISPO/RSPO), and fair market participation. These weaknesses have direct economic consequences, leading to price dependency on middlemen, reduced bargaining power, and limited resilience against market volatility.

The urgency of institutional strengthening lies in its potential to address both economic inefficiencies and environmental challenges in the palm oil sector. Weak farmer institutions result in fragmented production chains, inefficient input distribution, and poor compliance with sustainability standards, thereby undermining Indonesia's national target for sustainable palm oil governance (ISPO 2030 Roadmap). Furthermore, the lack of institutional integration impedes smallholders' access to innovation, financial inclusion, and capacity-building programs that are vital for inclusive rural development. Therefore, improving institutional performance is not only an economic necessity but also a strategic policy imperative aligned with Sustainable Development Goals (SDGs 1, 8, 12, and 15).

From an academic standpoint, a significant research gap remains in the field of smallholder institutional strengthening. Previous studies have explored institutional empowerment in other commodities such as rice, cocoa, and sugarcane [1] , yet few have systematically addressed the complex interrelationships between institutional, economic, and social variables in the smallholder palm oil context. Most existing works rely on descriptive or regression-based analyses, which fail to capture the dynamic, systemic interactions among institutional actors. Consequently, there is a need for an integrated methodological framework capable of diagnosing problems, mapping structural dependencies, and prioritizing actionable strategies [2], [3].

This study aims to develop a System-Based Institutional Strengthening Model for independent palm oil farmers in Kalimantan through the integration of Soft Systems Methodology (SSM), Interpretative Structural Modelling (ISM), and the Analytical Hierarchy Process (AHP). The combination of these methods allows for comprehensive problem exploration (via SSM), hierarchical structuring of institutional relationships (via ISM), and quantitative prioritization of strategic alternatives (via AHP). The model not only identifies key leverage points within the institutional system but also provides a decision-support framework for policy formulation and stakeholder collaboration.

The novelty of this research lies in its tri-methodological integration—an approach that moves beyond traditional qualitative or quantitative boundaries. By merging SSM, ISM, and AHP, this study introduces a systemic and participatory decision model that addresses both diagnostic and prescriptive dimensions of institutional development. Furthermore, this research situates the Kalimantan case within a broader global discourse on sustainable smallholder governance, contributing new empirical insights for developing countries facing similar institutional challenges in agricultural

sectors. The findings are expected to enrich theoretical understanding and provide practical guidance for designing adaptive, inclusive, and sustainable institutional frameworks in Indonesia's palm oil industry.

METHOD

Research Framework

The institutional system of independent oil-palm smallholders in Kalimantan represents a complex socio-economic network in which interactions among actors, resources, and policies determine the overall performance of the farming system. This complexity arises from multiple interdependent factors—such as access to land, capital, certified seeds, technology, infrastructure, and local governance—that collectively influence institutional effectiveness [4], [5]. Therefore, strengthening farmer institutions requires a systemic and participatory approach rather than a fragmented or sectoral one.

This study is grounded on the premise that the institutional weakness of smallholders is not solely caused by technical limitations but also by a lack of systemic coordination across social, economic, and policy dimensions. To address this challenge, the research develops a System-Based Institutional Strengthening Model (SISF) by integrating three complementary methodological frameworks: Soft Systems Methodology (SSM), Interpretative Structural Modelling (ISM), and Analytical Hierarchy Process (AHP) [6], [7].

1. Soft Systems Methodology (SSM) is applied to explore and structure unorganized, qualitative problems that exist within smallholder institutions. Through stages of problem exploration, stakeholder analysis, and CATWOE assessment (Customer–Actor–Transformation–Worldview–Owner–Environment), SSM produces a rich picture and root definition that capture stakeholder perspectives and the systemic nature of the problem.
2. Interpretative Structural Modelling (ISM) is then used to identify and structure the interrelationships among institutional elements. By transforming expert judgments into a Structural Self-Interaction Matrix (SSIM), ISM enables the construction of a hierarchical structure that classifies key variables according to their driving power and dependence. This process reveals the critical sub-elements that must be prioritized for institutional improvement.
3. Analytical Hierarchy Process (AHP) is subsequently employed to determine the strategic priorities for institutional strengthening. Using pairwise comparison matrices, expert respondents assess the relative importance of each alternative strategy. The consistency ratio (CR) is calculated to ensure data validity, and strategies with the highest weights are selected as the most appropriate for implementation.

The integration of these three methods provides both diagnostic and prescriptive insights: SSM diagnoses the problem systemically, ISM structures the interrelations among components, and AHP prescribes the optimal strategic solutions. This tri-method approach offers a novel decision-support framework for regional policymakers, cooperatives, and farmer organizations seeking to enhance institutional resilience and sustainability in the Kalimantan oil-palm sector.

Research Flowchart

The research process follows eight major stages as presented in Table 1 – Research Flow of Institutional Strengthening for Independent Oil-Palm Smallholders in Kalimantan. Each stage is logically connected to produce a comprehensive and validated institutional model.

Table 1. Research Flowchart

Stage	Description of Activities	Expected Output
Problem Identification	Field observations, preliminary interviews, and literature review are conducted to capture the actual conditions of smallholder institutions in Kalimantan.	List of key institutional problems (e.g., access to finance, lack of organization, weak bargaining power).
Stakeholder Data Collection	In-depth interviews and focus group discussions (FGDs) are held with farmers, cooperatives, extension officers, and government representatives to obtain multi-stakeholder perspectives.	Rich picture illustrating stakeholder relationships and system interactions.
Root Definition Formulation (CATWOE)	Identification of Customers, Actors, Transformation processes, Worldview, Ownership, and Environmental constraints to define the ideal institutional system.	Root definition of the institutional system.
Conceptual Model Development (SSM)	A conceptual model of the institutional system is developed to represent the transformation process from the existing state to the desired state.	Conceptual diagram of the institutional strengthening system.
Structural Analysis Using ISM	The relationships among institutional elements are examined through Structural Self-Interaction Matrix (SSIM) → Reachability Matrix → MICMAC analysis.	Hierarchical structure and classification of institutional sub-elements.
Strategy Prioritization Using AHP	Experts perform pairwise comparisons of strategic alternatives. Eigenvalues and consistency ratios are computed to ensure logical coherence and data reliability.	Ranked strategic priorities for institutional strengthening.
Model Validation and Triangulation	Validation is carried out through expert review and FGDs. Results are cross-checked using methodological and source triangulation to confirm the robustness of findings.	Validated and context-adapted institutional model.
Policy Recommendation and Implementation Design	Final recommendations are formulated for local governments, cooperatives, and stakeholders to enhance institutional performance and ensure long-term sustainability.	Policy framework and actionable roadmap for institutional strengthening in Kalimantan.

RESULTS

Farmer groups serve as the fundamental institutional form among smallholders, acting as platforms for knowledge exchange, cooperation, and coordination with supporting agribusiness institutions. Over time, these groups can evolve into farmer group associations (Gapoktan) that integrate multiple farmer groups within a village to expand business scale and ensure sustainability. Gapoktan plays a vital role in facilitating access to agricultural financing, production inputs, marketing coordination, and information dissemination, thereby promoting collective efficiency, productivity, and farmers' income within a sustainable agribusiness framework.

However, the performance of existing farmer institutions remains suboptimal due to low member participation, weak human resource capacity, and limited knowledge of sustainable palm-oil management. Farmers also face restricted access to credit, subsidized inputs, and formal markets,

while most still lack legal land ownership and independent marketing mechanisms. These challenges highlight the urgent need for multi-stakeholder collaboration—involving government agencies, financial institutions, and private enterprises—to strengthen institutional capacity through technical assistance, organizational empowerment, and integrated partnership models that support sustainable palm-oil development at the local level.

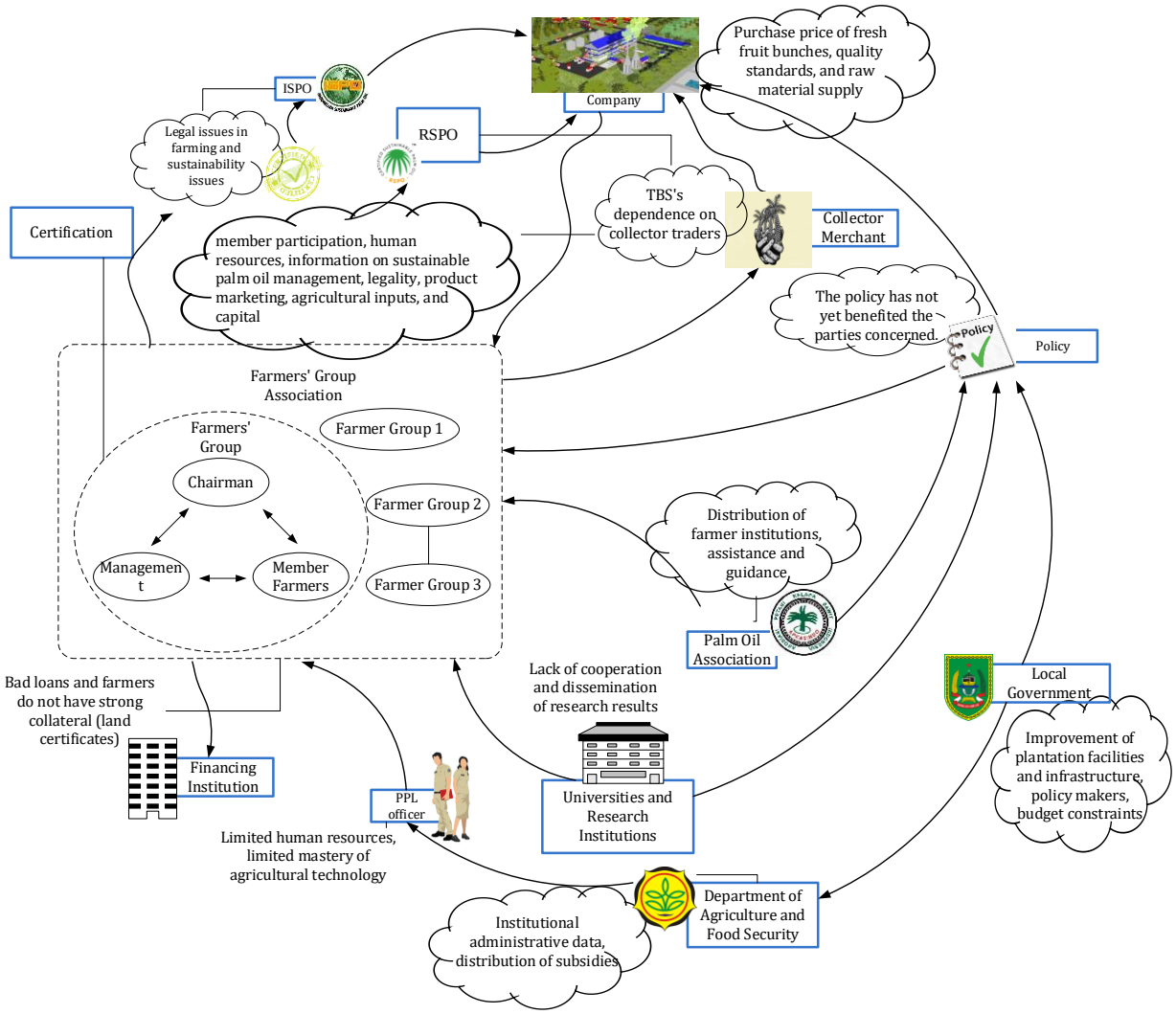


Figure 1. Mapping Institutional Problems Faced By Palm Oil Farmers In Kalimantan

Independent smallholder institutions in Kalimantan face both internal and external challenges that limit their effectiveness as collective agribusiness organizations. Internally, weaknesses include poor organizational management, low member participation, inadequate human resource capacity, and the absence of structured business units, marketing systems, and transparent financial management. Externally, constraints stem from weak coordination with key stakeholders, such as palm-oil mills, financial institutions, and government agencies, as well as limited access to credit, market information, and sustainability initiatives (ISPO/RSPO). The combination of these issues results in low competitiveness and bargaining power within the palm-oil value chain. Therefore, a systemic and collaborative institutional strengthening framework—integrating the roles of farmers,

government, private sector, and supporting organizations—is urgently needed to improve the welfare, autonomy, and sustainability of independent smallholders in Kalimantan.

Root Definition Problem

Table 2. Each Component System

Component	Definition of Each Component System
Customer	Farmers who are members and administrators of farmer groups and farmer associations.
Actors	Farmers who are members and administrators of farmer groups and farmer associations, companies, PPL officers, universities and research institutions, palm oil NGOs, local governments, and financing institutions.
Transformation	Identifying the problems and institutional needs of independent oil palm farmers and the involvement of related parties will be useful for formulating strategies for strengthening the institutions to be implemented.
World view	The formation of good policies and knowledge for all parties involved, to have a sense of responsibility in efforts to strengthen the institutions of independent oil palm farmers as part of a sustainable development plan.
Owner	Local government and related agencies.
Environmental Constraint	The capacity of management and member participation related to the understanding of farmer institutions and weak coordination between related parties.
Root Definition	
The system carries out institutional strengthening activities for independent oil palm farmers (P) by identifying current institutional problems and needs as well as the involvement of related parties in the system (Q) to be able to formulate strategies to improve the bargaining position of farmers and institutional capabilities in facing sustainable oil palm management (R).	

The institutional system for independent oil-palm farmers in Kalimantan using the CATWOE (Customer–Actor–Transformation–Worldview–Owner–Environmental Constraint) approach highlights the central role of farmers and institutional managers as both the main customers and actors in driving organizational transformation. The desired transformation focuses on developing strategies that enhance institutional capacity, strengthen farmers' bargaining power, and foster effective coordination among stakeholders. The worldview component emphasizes the need for collective awareness and shared policies toward sustainable palm-oil development, while the owner—represented by local government and related agencies—acts as the authority responsible for regulation and facilitation. However, several environmental constraints such as limited managerial skills, weak inter-agency coordination, and low member participation still hinder institutional effectiveness. Therefore, the root definition of this system underlines that institutional strengthening must be pursued through a collaborative and systemic approach involving all relevant actors to build an adaptive, inclusive, and sustainable governance model for smallholder palm-oil institutions in Kalimantan.

Conceptual Model

The following figure presents the strategic framework for strengthening independent oil-palm farmer institutions in Kalimantan, developed through the integration of systemic and participatory approaches. This framework outlines the key stages of institutional development, beginning

with internal capacity building, expanding toward external collaboration, and culminating in sustainable management practices. Each component is designed to enhance the effectiveness, resilience, and long-term sustainability of farmer organizations through continuous monitoring and evaluation mechanisms.

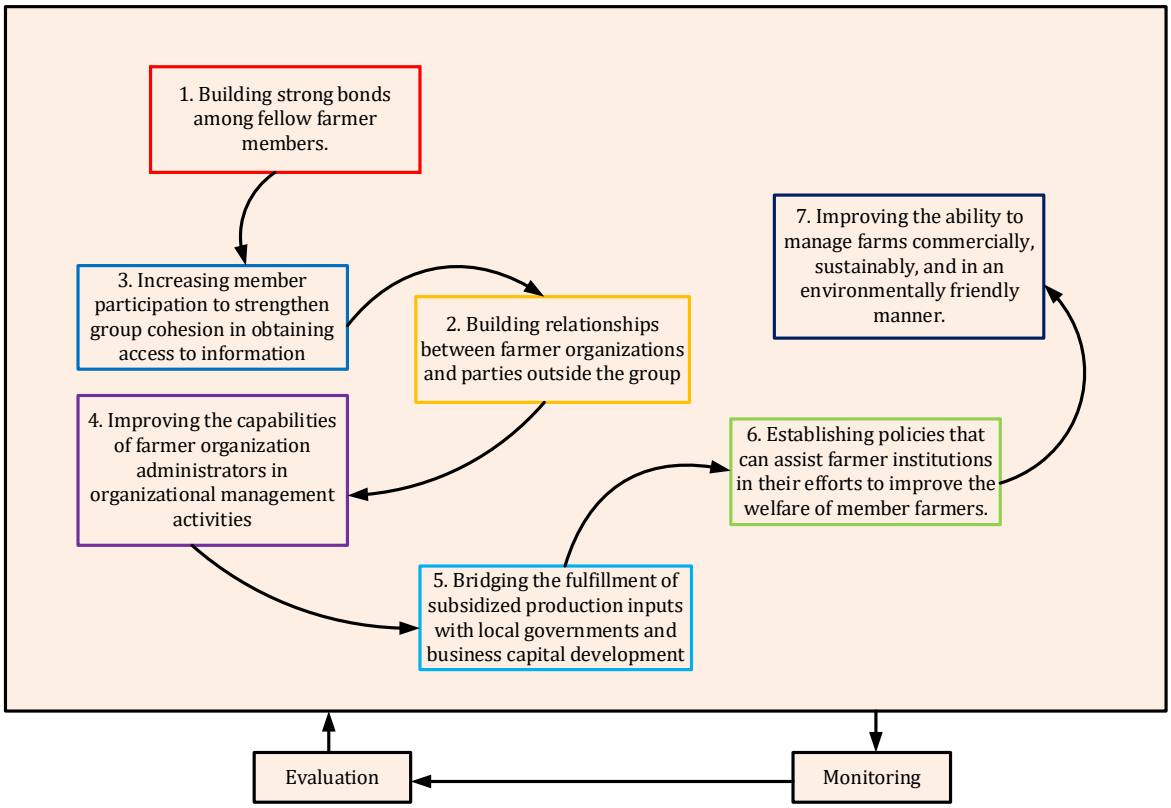


Figure 2. Strategic Framework For Strengthening Independent Farmer

The diagram illustrates the strategic framework for strengthening independent farmer institutions, emphasizing an integrated and cyclical process involving internal empowerment, external collaboration, and continuous monitoring and evaluation. The first phase focuses on building strong interpersonal bonds among farmers to foster trust and solidarity within groups, followed by enhancing participation to improve information sharing and collective access to resources. Strengthening relationships between farmer organizations and external stakeholders—such as local governments, private companies, and financial institutions—is crucial to create broader institutional linkages. Subsequently, the focus shifts to capacity building for farmer organization administrators, ensuring they possess managerial and technical skills to oversee organizational activities effectively.

The next phase involves bridging access to subsidized inputs and capital support through collaboration with local authorities and development agencies, which directly contributes to institutional sustainability. Policy development then becomes essential, where supportive regulations are established to enhance farmers' welfare and institutional resilience. Finally, the model culminates in improving farmers' capacity to manage agribusiness activities in a commercial, sustainable, and environmentally responsible manner, ensuring long-term viability.

Table 3. Components In Strengthening Independent Farmer Institutions

Element	Sub Elemen
Program Requirements	A1. Government Support A2. Willingness to Be Better A3. Guidance for Farmer Planters A4. Availability of Professional Human Resources A5. Capital and Loan Facilities A6. Agreement on Group Goal Direction A7. Ease of Access to Information A8. Good Inter-Institutional Cooperation Relationships Are Established
Main Obstacles	A1. Lack of active participation of member farmers A2. Difficult Access to Capital A3. Lack of Information Regarding Subsidized Agricultural *Inputs* A4. Farmers Don't Have Land Certificates Yet A5. Weak Coordination Between Related Parties A6. Poor Organizational Management A7. Marketing of Fresh Fruit Bunches (FFB) Through Middlemen
Parties Involved	A1. Department of Agriculture and Food Security A2. Palm Oil Company A3. Financing Institutions A4. Farmer Members A5. Universities and Research Institutions A6. Local Government A7. Farmers Association A8. Field Agricultural Extension Officer

The table identifies three core components in strengthening independent farmer institutions: program needs, main constraints, and involved stakeholders. The program needs emphasize the importance of government support, professional human resources, and strong inter-institutional collaboration to enhance farmers' capacity and access to financial and informational resources. The main constraints are dominated by weak member participation, limited access to capital, poor coordination among stakeholders, and the absence of land certification, all of which reduce institutional performance. Therefore, synergy among key actors—such as government agencies, palm-oil companies, financial institutions, and farmer associations—is essential to overcome structural barriers and achieve sustainable institutional empowerment for smallholders.

Elements of the Farmer Institutional Strengthening Program

The following figures illustrate the results of the Interpretative Structural Modeling (ISM) analysis, which identify the hierarchical structure of key elements influencing the strengthening of independent farmer institutions. The analysis visualizes both the driving power and dependence of each sub-element and the level hierarchy that determines their strategic position in the system.

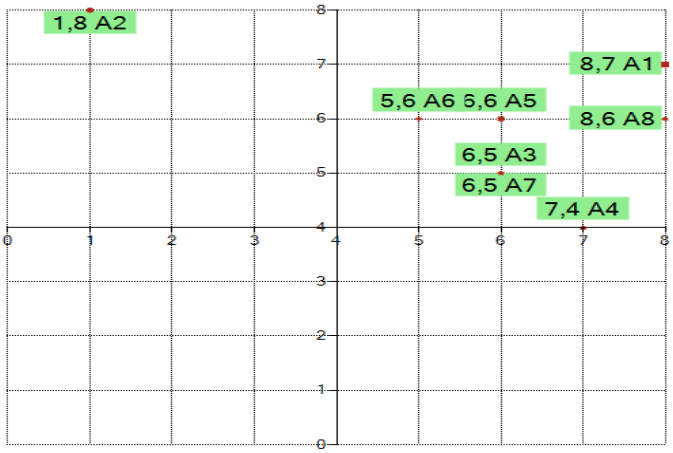


Figure 3. ISM for Elements of the Farmer Institutional Strengthening Program

Based on the ISM results, government support (A1) and farmers' willingness to improve (A2) emerge as the foundational or driving elements at Level 1, serving as the main catalysts for institutional empowerment. The mid-level elements such as professional human resources (A4), loan facilities (A5), and information access (A8) act as intermediaries that link basic motivation with higher-level strategic objectives. The upper-level element agreement on group direction (A7) reflects the consolidation phase, while training and farmer development programs (A3) strengthen collective capabilities. Ultimately, government facilitation and cross-institutional collaboration (A4) occupy the top level, indicating that institutional sustainability depends on coordinated policy frameworks and multi-stakeholder synergy. These findings confirm that the strengthening of farmer institutions requires a bottom-up process initiated by internal motivation and capacity building, followed by systematic external support from government and partner institutions.

Key Constraint Elements

The following figures present the results of the main constraints analysis in strengthening independent oil palm farmer institutions in Kalimantan using the Interpretative Structural Modeling (ISM) approach. This analysis aims to identify the key inhibiting factors that possess significant driving power and dependence levels, influencing institutional performance in a systemic manner.

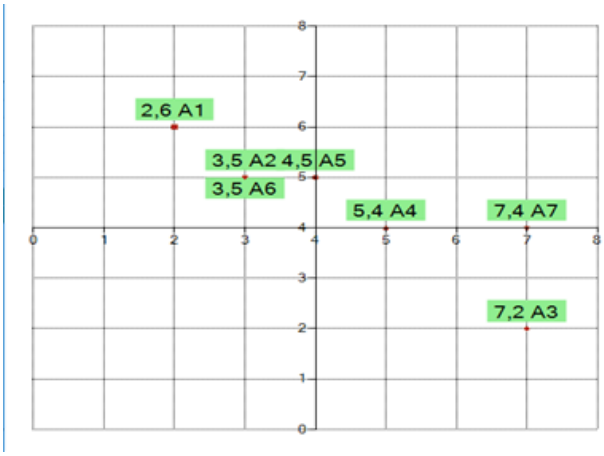


Figure 4. ISM for Elements Key Constraint Elements

The ISM results reveal that low member participation (A1) serves as the foundational element and represents the root cause of most institutional challenges. Limited access to capital (A2) and weak coordination among stakeholders (A5) occupy the middle level, functioning as linkage elements that directly affect organizational effectiveness. Meanwhile, lack of information regarding subsidized agricultural inputs (A3) emerges as the highest-level constraint, indicating that inadequate information flow and communication remain major barriers to improving productivity and access to government assistance. In addition, poor organizational management (A6) and dependence on middlemen for FFB marketing (A7) are identified as consequential problems stemming from weak institutional governance. Therefore, strategic interventions should focus on enhancing farmer participation, improving access to finance, and developing more efficient coordination and communication systems among stakeholders to establish resilient and sustainable smallholder institutions.

Elements of the Parties Involved

The analysis aims to determine the driving power and dependence levels of each stakeholder to understand their relative influence within the institutional system.

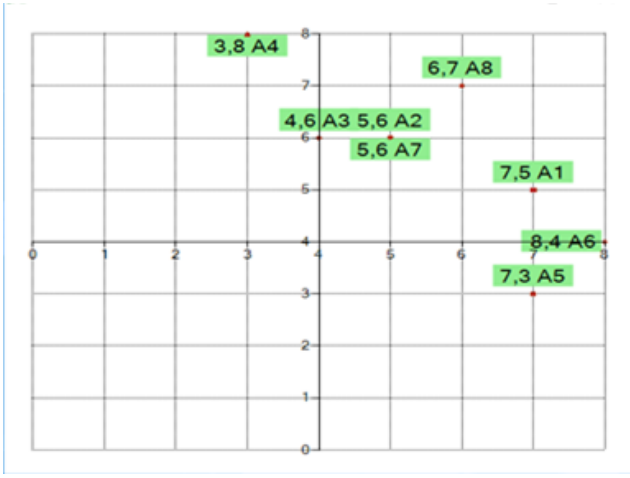


Figure 5. Elements of the Parties Involved

The ISM results reveal that agricultural extension officers (A8) and higher education and research institutions (A4) act as the key elements at the foundational level, providing knowledge, innovation, and field-level facilitation essential for institutional improvement. At the intermediate level, farmer associations (A7), palm oil companies (A2), and agricultural departments (A3) play integrative roles by linking smallholders with external actors and supporting technical implementation. Government institutions (A6) and financial organizations (A5) occupy the top hierarchy, functioning as major drivers that shape policy direction, funding allocation, and coordination mechanisms. Meanwhile, individual farmers (A1) are positioned strategically in the middle as both beneficiaries and active participants in the system. These findings demonstrate that successful institutional strengthening requires a multi-level collaboration model, where universities and extension agents act as knowledge enablers, local governments and financial bodies serve as policy and funding providers, and farmers' organizations bridge all actors toward a sustainable, inclusive palm oil governance framework.

Actions to Change the Situation

The hierarchical structure in determining the strategy for strengthening independent palm oil farmer institutions is built through three levels of analysis, namely level zero (main objective), level one (decision criteria), and level two (strategy alternatives). The main objective is to create strong, adaptive, and sustainable farmer institutions. At the criteria level, there are five main aspects that form the basis for decision-making, namely legality, quality of human resources, policy regulations, sustainable farm management, and farmer welfare. Meanwhile, the alternative strategies that can be implemented include improving organizational management, increasing the intensity of training and mentoring, developing productive partnerships, and providing incentives for farmers. This hierarchy shows that institutional strengthening strategies need to be developed systematically, taking into account legal factors, internal capacity, policy support, and the sustainability of farming businesses in order to improve the bargaining position and welfare of independent oil palm farmers as a whole.

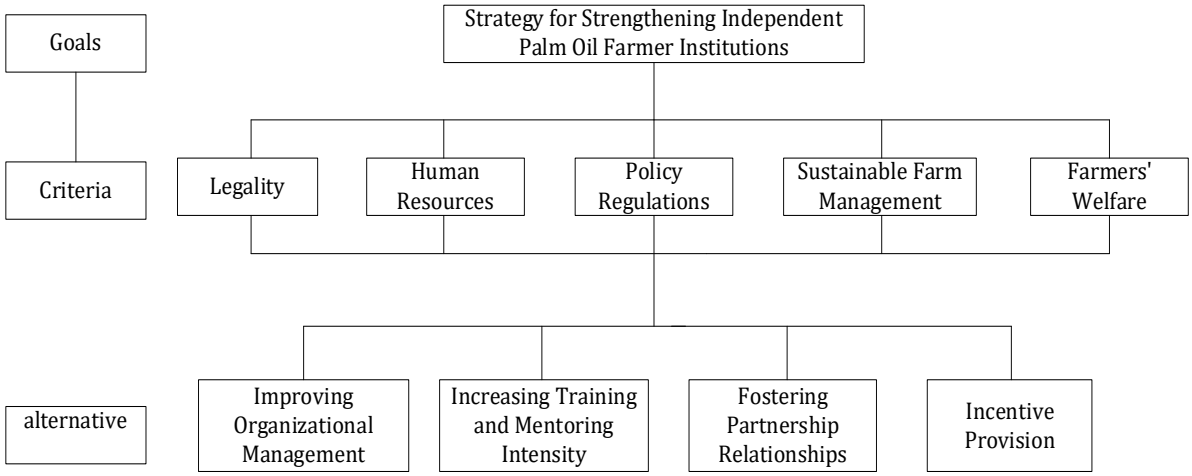
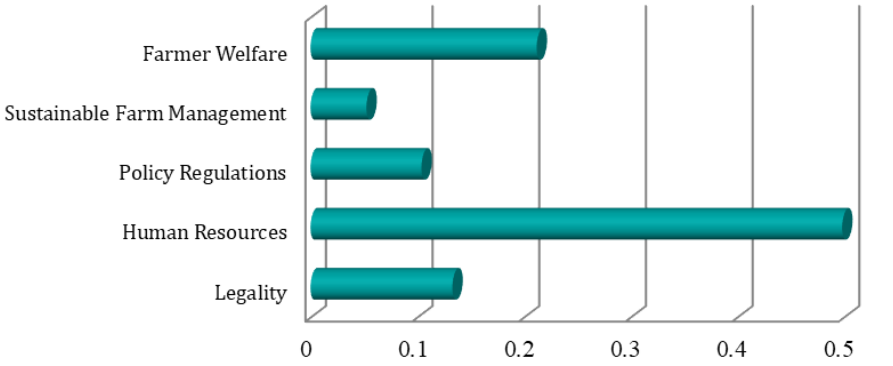


Figure 6. The Criteria Weighting Analysis For Selecting Strategies To Strengthen Independent

The following figure presents the results of the criteria weighting analysis for selecting strategies to strengthen independent oil palm farmer institutions using the Analytical Hierarchy Process (AHP) approach. This analysis aims to determine the relative importance of each criterion that influences the effectiveness and sustainability of institutional strengthening strategies.

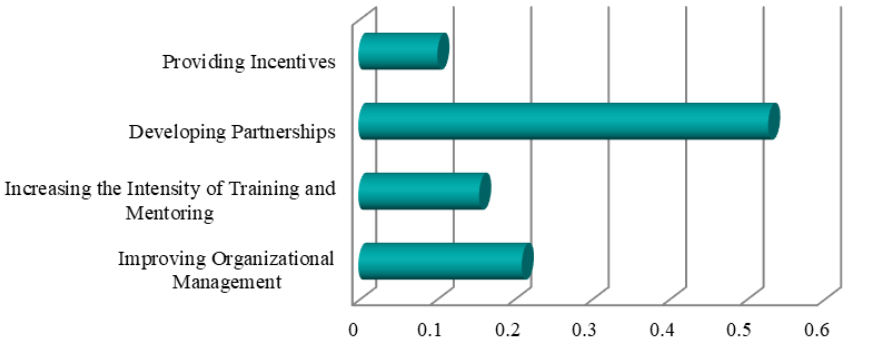


	Legality	Human Resources	Policy Regulations	Sustainable Farm Management	Farmer Welfare
Criteria Weight	0.133	0.498	0.104	0.052	0.212

Figure 7. The Weight of Criteria

Based on the results, human resources (0.498) obtained the highest weight, indicating that improving farmer capacity and competence is the most critical factor in institutional empowerment. Farmer welfare (0.212) ranked second, reflecting the importance of ensuring tangible benefits for members as a foundation for institutional sustainability. Legality (0.133) and policy regulations (0.104) occupy middle positions, suggesting that legal frameworks and policy support play complementary roles to strengthen internal institutional capacity. Meanwhile, sustainable farm management (0.052) has the lowest weight, implying that sustainability efforts can only be effectively achieved when supported by competent human resources and a robust institutional structure. These findings highlight that the success of strengthening independent oil palm farmer institutions fundamentally depends on enhancing human capital as the key driver of sustainable agricultural development.

This analysis aims to identify the most effective strategic priorities to enhance institutional performance and sustainability.



	Improving Organizational Management	Increasing the Intensity of Training and Mentoring	Developing Partnerships	Providing Incentives
Alternative Weight	0.211	0.156	0.529	0.102

Figure 8. The Weight of Alternative

The results show that developing partnerships (0.529) ranks as the top strategic priority, indicating that collaboration between farmers, palm oil companies, government agencies, and financial institutions is the most influential factor in strengthening institutional capacity. Improving organizational management (0.211) follows as the second priority, emphasizing the need for stronger governance structures, transparent administration, and effective coordination within farmer organizations. Meanwhile, increasing the intensity of training and mentoring (0.156) contributes to enhancing human resource competence and technical capability, serving as a critical support factor for long-term sustainability. Lastly, providing incentives (0.102), although the least prioritized, remains important as a motivational element to encourage farmer participation and organizational engagement. Overall, the results suggest that partnership development combined with institutional and managerial improvements forms the foundation for a sustainable empowerment strategy for independent oil palm farmers in Kalimantan.

Forms of Institutional Partnerships for Farmers

This framework integrates the roles of government, financial institutions, research bodies, associations, and private companies to support farmers across various dimensions—policy, financing, training, and market access. The model emphasizes a synergistic approach in which institutional capacity building, technological innovation, and partnership-based governance collectively enhance the sustainability and competitiveness of independent smallholders.

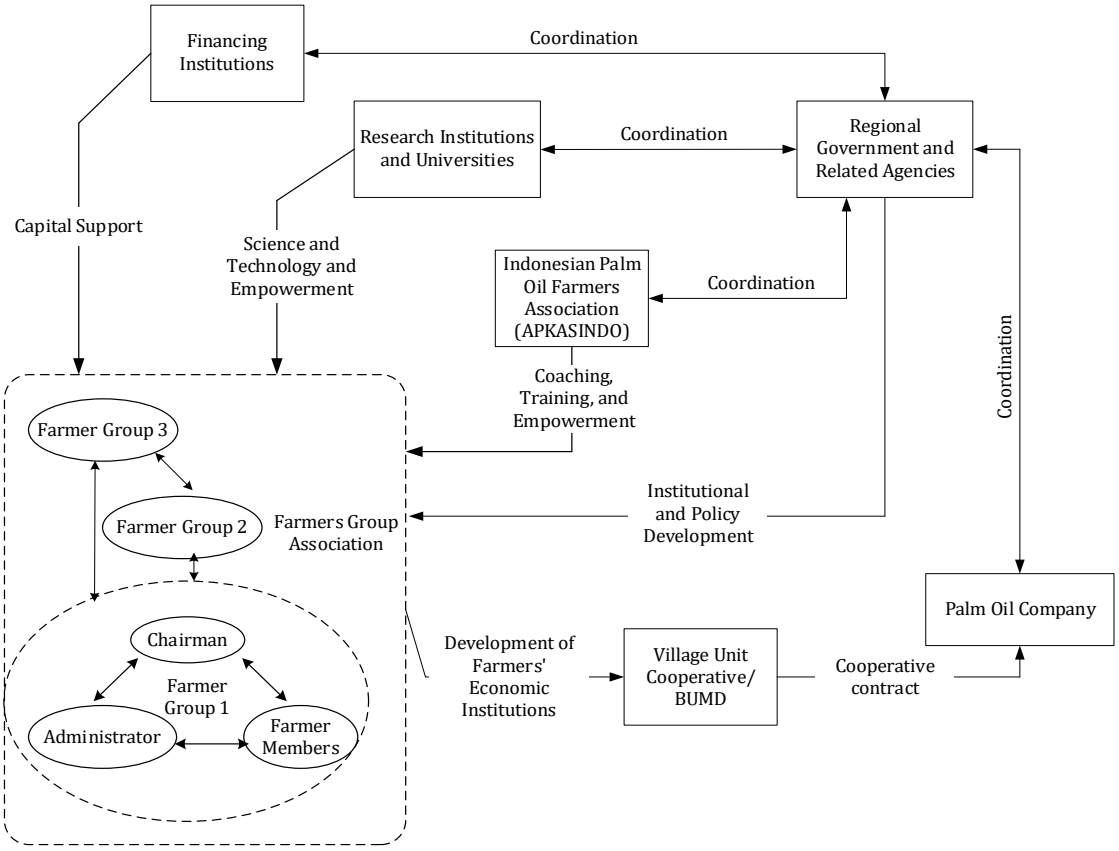


Figure 9. Framework Integrates The Roles Of Government, Financial Institutions, Research Bodies, Associations, and Private Companies

The following figure illustrates the **collaborative network model for strengthening independent palm oil farmer institutions** through a multi-stakeholder approach. This model integrates various actors—government agencies, financial institutions, research bodies, private enterprises, and farmer organizations—each contributing complementary functions toward institutional sustainability. The synergy among these actors is essential for addressing the systemic challenges faced by independent smallholders, particularly in areas such as capital access, knowledge transfer, policy support, and market integration.

At the core of this model are the **farmer institutions**, consisting of farmer groups (poktan) and farmer group associations (gapoktan), which act as the primary organizational units for managing plantation activities. These institutions are responsible for implementing collaborative farming programs, increasing member participation, and ensuring the availability of agricultural inputs, business capital, and information access. Moreover, they facilitate the smooth flow of production—from cultivation to harvest and marketing—while promoting the transformation of farmer groups into economically viable institutions capable of sustaining long-term growth.

Financial institutions play a vital role by providing accessible capital and investment support through low-interest credit schemes tailored to smallholders. Their function extends beyond funding; they serve as strategic partners in risk mitigation and financial literacy programs that enable farmers to manage loans responsibly. Meanwhile, research institutions and universities contribute through innovation, technology transfer, and community empowerment initiatives. By conducting applied research and delivering agricultural extension services, they strengthen farmers' technical and managerial capacities while fulfilling their tri dharma responsibilities in education, research, and community service.

The **Indonesian Palm Oil Farmers Association (APKASINDO)** functions as a unifying national body that bridges the interests of farmers, private companies, and the government. APKASINDO's mandate includes developing professional and independent smallholders capable of competing in the global palm oil market, ensuring fair representation, and safeguarding farmers' rights against exploitative practices. In collaboration with regional governments and related agencies, the association also facilitates policy advocacy, training programs, and certification support. Through these collaborative mechanisms, the institutional network operates as an integrated ecosystem—linking capital provision, knowledge dissemination, and regulatory alignment—to achieve inclusive, competitive, and sustainable development of independent palm oil smallholders in Indonesia.

RESEARCH IMPLICATIONS

This research carries substantial theoretical and practical implications by introducing an integrated SSM–ISM–AHP framework that bridges qualitative and quantitative approaches in analyzing institutional resilience and collaborative governance within the palm oil sector. The model advances theory by empirically demonstrating that human resource competence and multi-stakeholder partnerships are the key drivers of sustainable institutional transformation. Practically, the study provides a replicable decision-support tool for policymakers, cooperatives, and development agencies to design adaptive and participatory institutional roadmaps aligned with SDGs 1, 8, 12, and 15. Its application strengthens policy coherence, enhances access to finance and knowledge, and promotes

inclusive, sustainable governance for smallholders—making it a scalable framework for broader agricultural development contexts in emerging economie

DISCUSSION

The findings of this study confirm that the institutional weakness of independent oil palm smallholders in Kalimantan is not merely a technical issue but a systemic coordination problem, consistent with the conclusions of [8], [9]. They emphasized that the fragmentation between farmer groups, local governments, and financial institutions limits the diffusion of innovation and sustainable farming practices. Similarly, [10], [11] found that poor coordination in smallholder institutions leads to inefficiencies in market access and weak compliance with sustainability standards such as ISPO and RSPO.

This study enriches previous findings by integrating Soft Systems Methodology (SSM), Interpretative Structural Modelling (ISM), and Analytical Hierarchy Process (AHP) into a single analytical framework. While earlier works—such as those by [12], [13], [14]—tended to analyze the institutional dimension separately using descriptive or regression methods, the present research offers a structured systems approach capable of mapping inter-variable relationships and prioritizing actionable strategies.

The ISM results indicate that government support and farmers' willingness to improve act as key driving forces in institutional transformation. This corroborates the findings of [15], [16], who highlighted that the success of agricultural institutions in Indonesia is largely determined by political commitment and consistent policy frameworks. However, unlike conventional top-down policies, this study underscores the necessity of bottom-up participation, where the motivation and readiness of farmers to adopt institutional reforms serve as the foundational catalysts for systemic change.

The finding that human resource competence (0.498) is the most critical factor in the AHP hierarchy aligns with the conclusions of [17], [18], [19], who showed that the sustainability of farmer organizations depends heavily on managerial and entrepreneurial capacity rather than physical capital investment alone. This reinforces the theoretical view that institutional resilience emerges from human capital empowerment, consistent with Ostrom's (1990) theory of collective action in resource governance.

The prioritization of multi-stakeholder partnerships (0.529) as the most influential strengthening strategy demonstrates the importance of cross-institutional collaboration, a finding that resonates with the studies of [20], [21]. Their research collectively argues that integrated partnerships among farmers, government agencies, and private companies can enhance market access, capital flow, and innovation transfer.

This study advances prior models by offering a quantitative validation through AHP weighting, ensuring that partnership development is not only a conceptual but also an empirically supported strategic priority. Compared with studies in Malaysia [22] and Thailand [23], which focus on cooperative-based partnerships, the Kalimantan model proposed here places greater emphasis on adaptive and inclusive governance, enabling the participation of smallholders in sustainability certification and policy dialogues.

When compared with research from other emerging palm oil regions—such as [24], [25], [26]—this study reveals a similar pattern of institutional fragmentation, yet with distinct contextual challenges. In African cases, the main constraints are market monopolies and infrastructure

deficiencies, while in Indonesia the dominant obstacles are organizational management, capital access, and policy coherence. However, both contexts converge on the finding that institutional strengthening must be grounded in multi-level partnerships and participatory policy frameworks.

This comparative insight situates the current research within the broader discourse of South–South agricultural governance, illustrating how developing countries can adopt system-based methodologies (SSM–ISM–AHP) to design context-sensitive institutional reforms.The integration of institutional strengthening with sustainability principles directly supports Indonesia's commitment to Sustainable Development Goals (SDGs 1, 8, 12, and 15). By ensuring that smallholders have equitable access to resources, markets, and information, this framework addresses not only productivity concerns but also environmental and social dimensions of palm oil governance. In line [27] this research suggests that the future competitiveness of Indonesia's palm oil sector will depend on institutional innovation that harmonizes profit, people, and planet objectives.

CONCLUSION

.The study concludes that independent oil palm smallholders in Kalimantan face multidimensional challenges—both internal and external—that hinder institutional effectiveness and long-term competitiveness. Internally, weak organizational management, low member participation, and limited human resource capacity are the primary constraints. Externally, insufficient access to finance, information, and coordinated stakeholder support exacerbate institutional fragility.

The integration of SSM–ISM–AHP successfully provides a systemic understanding of these institutional dynamics. ISM analysis demonstrates that government support and farmers' intrinsic motivation act as foundational drivers for institutional transformation, while AHP prioritization confirms that multi-stakeholder partnership development is the most effective strategy for long-term institutional strengthening. In practical terms, institutional empowerment must be pursued through participatory and synergistic collaboration involving farmers, local governments, financial institutions, research bodies, and private companies. The results emphasize that human resource improvement and managerial competence are central to achieving sustainable institutional performance.
Ultimately, this research offers an integrated model that can guide policymakers and agricultural development agencies in designing inclusive and adaptive institutional frameworks. The proposed model not only enhances farmers' bargaining power and welfare but also promotes environmentally and socially responsible palm oil production systems aligned with Indonesia's sustainable development agenda.

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