



STAKEHOLDER NETWORKING AND INSTITUTIONAL SYSTEM APPROACHES IN THE CONTEXT OF SUSTAINABILITY FOR SMALLHOLDER PEATLAND PLANTATIONS

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ABSTRACT

This research investigates the challenges faced by smallholder oil palm plantations on peatlands in Mukomuko Regency. It focuses on stakeholder networking and institutional approaches to ensure the sector's sustainability. Qualitative data was collected through interviews, focus group discussions (FGDs), and field observations, capturing stakeholder perspectives and experiences. Quantitative data was gathered via surveys targeting smallholder farmers and stakeholders, analyzing power, interest, and sentiment. Key data sources include farmers, the Village government, Agricultural Extension Officers (PPL), and the Replanting Chairperson. The data analysis employs a descriptive approach, incorporating the Total Weighting of Degree Among Actors method to evaluate the strength of stakeholder networks. This method highlights the collaboration, influence, and connectivity among stakeholders. The findings reveal that the Village government, particularly the Village Head and Secretary, plays a crucial role in promoting sustainability through collaboration. Strengthening stakeholder networks, including better coordination between the Village Head, Secretary, farmers,

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and extension officers, is recommended to enhance the sustainable management of oil palm plantations on peatlands.

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INTRODUCTION

Indonesia is one of the world's largest palm oil producers, contributing approximately 50% of global production. The palm oil industry has become a strategic export commodity, supporting export revenues, reducing poverty in rural areas, and creating job opportunities (Hasan et al., 2021). However, the growth of this industry often accompanies environmental, social, and economic challenges, which have become key concerns in efforts toward sustainability (Hidayat & Kholil, 2020). Smallholder palm oil plantations play a vital role in Indonesia's economy, particularly in rural Sumatra, involving thousands of small farmers who rely on palm oil production as their primary income source, with a 41% share of land ownership from 2013 to 2022 (Barus & Ernah, 2024). Despite their significant contribution to the economy, the sector faces various challenges, particularly access to capital and technology, which often hinder small farmers from improving plantation productivity and efficiency (Budidarsono et al., 2013). Social and economic disparities continue, as farmers have superior access to resources and markets than their counterparts.

Environmental and climate change issues have gained significant attention, as palm oil plantations often entail the conversion of peatlands, which are essential for carbon storage (Ahirwal et al., 2022). The drainage procedures required for oil palm production on peatlands accelerate peat desiccation, leading to soil deterioration, increased carbon emissions, and ecological damage (Carson et al., 1994; Miettinen et al., 2016).

Eco-friendly and sustainable agricultural techniques are essential for alleviating adverse impacts on ecosystems and climate change. The Indonesian government has launched various programs and policies to address these challenges, including training programs, technical assistance, and supportive agricultural policies. However, further efforts are needed to ensure the long-term sustainability of smallholder palm oil plantations in Indonesia, especially on peatlands, through technological interventions and shifts in the orientation or attitudes of key agents, such as farmers, who influence agricultural activities on peatland fields (Hidayat & Kholil, 2020).

Bengkulu Province is a region with many smallholder palm oil farmers in Indonesia. With a plantation area of 319,696 hectares, Bengkulu ranks fourth in the number of smallholder palm oil farmers in the country (BPS, 2024), with Muko-Muko Regency serving as a production hub covering 108,767 hectares. Communities in rural areas, particularly in Muko-Muko Regency, derive their income from palm oil plantations. However, most smallholder farmers in Muko-Muko manage their plantations on peatlands, which hold potential for oil palm cultivation but pose risks to the ecosystem (Noor et al., 2014). Palm oil plantations on peatlands in Muko-Muko face complex environmental sustainability challenges. Initially serving as substantial carbon storage, peatlands are now under pressure from land conversion for plantations (Z, Z et al., 2022). One major issue is the vulnerability of peatlands to fires, especially during dry seasons, resulting in greenhouse gas emissions and air pollution that impact public health and the global climate (Miettinen et al., 2016). The drainage method necessary for oil palm production intensifies peat desiccation, hastens soil deterioration, and elevates carbon emissions, risking the sector's viability.

Smallholder palm oil producers are essential to the local economy, significantly increasing earnings and improving community welfare. The engagement of the government and many stakeholders in assisting smallholder farmers is crucial for maintaining the sustainability of the plantation sector while tackling environmental and social sustainability issues (Anugrah, 2023). Palm oil cultivation on peatlands in Muko-Muko faces various complex challenges related to environmental sustainability. Peatlands, which initially acted as major carbon storage areas, are now under stress due to land conversion for plantations (Carson et al., 1994). One pressing issue is the susceptibility of peatlands to fires, particularly during the dry season, leading to land fires (Miettinen et al., 2016).

These obstacles underscore the significance of researching the sustainability of palm oil plantations on peatlands, including implementing practices that reduce environmental damage, preserve land productivity, and mitigate ecological impacts to facilitate more environmentally friendly and sustainable operations. Analyzing stakeholder networking and institutional system approaches is essential for addressing sustainability issues in smallholder palm oil plantations (Putri et al., 2022). This approach is essential for identifying the roles and relationships among stakeholders involved in managing palm oil plantations, including farmers, government entities, private companies, NGOs, and local communities (Baka et al., 2024). Through this approach, it is possible to analyze how the policies and actions of one stakeholder affect others and how existing formal and informal institutions can support the implementation of more sustainable policies.

The development of more effective policies and programs to mitigate the negative impacts of palm oil plantations and ensure the long-term social, economic, and environmental sustainability of peatland plantations requires a deeper understanding of stakeholder interactions. Such comprehension is crucial in designing strategies that balance ecological preservation with the livelihood needs of communities. This research aims to address these challenges by investigating the specific obstacles faced by smallholder palm oil plantations operating on peatlands within the Muko-Muko Regency. The study will focus on identifying the key factors that hinder smallholder farmers' ability to adopt sustainable practices. It will also emphasize the importance of stakeholder networking, exploring how collaborations among government agencies, local communities, non-governmental organizations, and private sector actors can contribute to more cohesive and effective management systems. By integrating insights from stakeholder engagement and institutional frameworks, this study seeks to provide actionable recommendations for policymakers, fostering a more equitable and sustainable development trajectory for peatland plantations in the region.

RESEARCH METHOD

This study investigates the challenges faced by smallholder oil palm plantations on peatlands in Ujung Pandang Village, Muko-Muko Regency, Bengkulu Province, focusing on analyzing stakeholder networks and institutional frameworks that support sustainability. The research explores interactions among key stakeholders, including farmers, local authorities, NGOs, plantation companies, and other related organizations, while examining institutional strategies for sustainable resource management. This research employs a combination of qualitative and quantitative methods. This research acquires qualitative data using comprehensive interviews, focus group discussions (FGDs), and field observations to gather stakeholder thoughts and experiences. This study gathers quantitative data via surveys directed at smallholder farmers and stakeholders, highlighting power, interest, and sentiment. Primary data sources include farmers, the Village government, the Agricultural Extension Officer (PPL), and the Replanting Chairperson, supplemented by secondary sources such as policy documents, statistical records, and previous research. This study involves 10 respondents, as mentioned earlier. The number of respondents was determined based on their proportion in the field.

The method for calculating the "Total Weighting of Degree Among Actors" in analyzing actors' influence on a program can be done through the following steps. This approach quantifies the extent of an actor's connections within a network, helping to determine their level of influence in decision-making and resource distribution. A higher degree weighting suggests that an

actor holds a more central or influential position, making them key players in the program's success. First, determine the score for each actor based on relevant measurements, such as their level of involvement, influence, or participation in the program. The score range is from 1 (minimum value) to 3 (maximum value). Next, calculate the score range using the formula:

$$\begin{aligned}\text{Score Range} &= \frac{(\text{Maximum Value} - \text{Minimum Value})}{\text{Number of Categories}} \\ &= \frac{(3 - 1)}{3} = 0.67\end{aligned}$$

Based on this score range, the level of influence of actors is classified into three categories:

- Low: 1.00 – 1.67
- Medium: 1.68 – 2.35
- High: 2.36 – 3.02

Afterward, each actor's total score is compared against these categories to determine their level of influence. For example, if an actor has an average score of 2.8, they fall into the high category, whereas an actor with a score of 1.5 falls into the low category.

Network analysis categorizes relationships as positive (+) or negative (-) based on the nature of interactions and their impact on network dynamics. Positive relationships (+) reflect good coordination, support, and cooperation between actors, contributing to increased agricultural management effectiveness, strengthened stakeholder coordination, and enhanced trust within the social network. Conversely, negative relationships (-) indicate conflicts, dominance, or distrust that may hinder program effectiveness. This network analysis includes Power/Strength, Interest, Sentiment/Emotional, Power-Interest, and Interest-Sentiment to understand actor relationships within the agricultural system and the replanting program in Ujung Padang Village.

RESULT AND DISCUSSION

Network of Relationships Between Actors

The network of actor relationships in Ujung Padang Village, as shown in Table 1, highlights positive power dynamics (+) between the Village Head and various actors, including the Village Secretary, Agricultural Extension Worker (PPL), Replanting Committee Chair, and Farmers. These positive relationships reflect effective communication and cooperation in executing tasks within the village. The significance of positive relationships among actors in managing sustainable resources, such as oil palm on peatlands, aligns with field

conditions (Bodin, 2009). The Village Head is central to this network, the primary connector that unites various actors (Freeman, 1978). The village head's predominant involvement in decision-making establishes them as pivotal in executing local policy. This relationship pattern signifies a centralized network structure when influence and control are concentrated in one major player. Gea (2018) stated that the Village Head plays a crucial role in village management, including a communication network dominated by discussions on village fund management, often based on friendship ties.

Table 1. Network of Actor Relationships in Ujung Padang Village: Power/Strength

No	Type of Relationship and Status (+/-)	Actors (A and B) or More Than Two Actors
1	Power (+)	Village Head with Village Secretary
2	Power (+)	Village Head with Agricultural Extension Officer (PPL)
3	Power (+)	Village Head with the Replanting Chairperson
4	Power (+)	Village Head with Farmers

A centralized system provides benefits like efficiency and stability (Provan & Kenis, 2007), it also presents the danger of over-dependence on the Village Head. It is essential to encourage the active involvement of various stakeholders, including farmers, the Replanting Committee Chair, and PPL, to ensure equitable decision-making that meets the developmental needs of oil palms in the village. A participatory approach can strengthen village development through oil palm initiatives by providing a more balanced distribution of roles and responsibilities while reducing potential conflict or power imbalances. Collaboration and role distribution within the village governance network are critical to avoiding dominance and ensuring the success of collective efforts (Emerson et al., 2012).

Table 2. Network of Actor Relationships in Ujung Padang Village: Interest

No	Type of Relationship and Status (+/-)	Actors (A and B) or More Than Two Actors
1	Interest (+)	Village Head with Village Secretary
2	Interest (+)	Village Head with Agricultural Extension Officer (PPL)
3	Interest (+)	Village Head with the Replanting Chairperson
4	Interest (+)	Village Head with Farmers

Table 2. presents the relationships among actors in Ujung Padang Village based on their respective interests. These "interest" relationships between actors are categorized as positive (+), indicating mutual support and collaboration among the involved actors. The table shows that although each actor has different interests based on their roles, their relationships exhibit positive interaction. This indicates that each participant collaborates and assists in attaining shared objectives about the village's sustainability of oil palm cultivation. This harmonious partnership demonstrates effective coordination and mutual understanding among the participants in pursuit of shared prosperity while respecting the particular interests of each side. The Village Head plays a central role in this network as the key link that ensures each actor's interests are met within the framework of shared objectives. Coordination among these actors is crucial in the joint management of the oil palm sector in peatland, as each actor plays a specific role that complements the others in achieving sustainable development goals. This coordination demonstrates the need to combine personal interests to support collective action. The stakeholders, including the Village Head, Agricultural Extension Officer (PPL), Village Secretary, Replanting Chairperson, and Farmers, are committed to sustainable oil palm management. These entities must collaborate to advance sustainable agricultural practices, enhance production, enhance welfare, and guarantee environmental sustainability (Jensen et al., 2016). During the arid season, this region is susceptible to fires caused by oil palm plantations, which substantially affect environmental contamination. The parties involved share a common interest in addressing this situation effectively.

In line with the stakeholder theory, the actors in this network represent groups with their respective interests, yet they work together to achieve shared benefits (Freeman, 1978). Collaboration among stakeholders is vital for promoting sustainable agricultural practices (Lesmana & Sulandjari, 2023) and effective resource management, particularly in oil palm plantations on peatlands, which require special attention to environmental and economic factors (Bodin & Crona, 2009). Additionally, the relationships among these actors demonstrate a governance model where each party's interests are not in conflict but are managed through effective communication and cooperation.

The relationships between actors in Ujung Padang Village are dominated by positive emotional interactions, as evidenced by four actor groups who share relationships based on sentiment or strong emotional bonds. This indicates that most actors have harmonious relationships, which can be important in building practical cooperation (Andini et al., 2024). With good cooperation among the actors, the likelihood of achieving sustainable development in Ujung Padang Village increases, as mutual support and trust

can strengthen the implementation of various development initiatives, particularly oil palm cultivation on peatlands fields (Bodin & Crona, 2009).

Table 3. Network of Actor Relationships in Ujung Padang Village: Sentiment/Emotional

No	Type of Relationship and Status (+/-)	Actors (A and B) or More Than Two Actors
1	Sentiment (+)	Village Head with Village Secretary
2	Sentiment (+)	Village Head with Agricultural Extension Officer (PPL)
3	Sentiment (+)	Village Head with the Replanting Chairperson
4	Sentiment (+)	Village Head with Farmers

On the other hand, the presence of this good experience indicates a significant degree of emotional commitment on the part of the participants, which has the potential to increase the efficiency of projects and work together more efficiently (Table 3). As a result of the fact that emotional links serve as a stimulant for motivation, the participants' willingness to contribute to the community's developmental goals, particularly in the form of the replanting project, is increased. The emotional bond between the Village Head and other actors, such as the Village Secretary, Agricultural Extension Officer (PPL), Replanting Leader, and Farmers, demonstrates that these actors are bound by professional roles and share a common sense of solidarity. This solidarity becomes a key factor in collectively overcoming challenges that benefit all parties involved.

Further, these emotional relationships can facilitate more effective communication, decreasing the likelihood of misunderstandings and conflicts (Elvie et al., 2016). Farmers' groups and village office meetings indicate the trust established through positive relationships among actors, which has facilitated the alignment of their actions towards shared objectives and the resolution of problems. This is particularly important in managing oil palm plantations on peatlands in Ujung Padang Village, which faces numerous challenges. Achieving environmental and economic sustainability requires coordinated efforts from all parties involved (Freeman, 1978; Jensen et al., 2016).

The relationships among actors in Ujung Pandang Village reflect a combination of power and interest that support the creation of practical cooperation (Table 4). The positive relationships between the Village Head, Village Secretary, Agricultural Extension Worker (PPL), Replanting Coordinator, and Farmers reflect mutual support in achieving common goals related to sustainable agricultural management. As the bearer of central

authority, the Village Head plays a strategic role in coordinating among the many actors. In this context, the policies and choices prioritize the agricultural sector's management while considering each individual actor's interests. In this regard, the Village Head's power to facilitate strategic decisions related to replanting and other agricultural programs directly impacts the success of collaboration among the actors (Bryson et al., 2014).

Table 4. Network of Actor Relationships in Ujung Padang Village: Power-Interest

No	Type of Relationship and Status (+/-)	Actors (A and B) or More Than Two Actors
1	Power, Interest (+)	Village Head with Village Secretary
2	Power, Interest (+)	Village Head with Agricultural Extension Officer (PPL)
3	Power, Interest (+)	Village Head with the Replanting Chairperson
4	Power, Interest (+)	Village Head with Farmers

The relationships among actors and their respective interests indicate that, although they have specific objectives, their synergy is a crucial factor in effective management. The actors' interests are associated with improved outcomes in the oil palm sector. The role of the Village Head and PPL as agricultural extension workers is crucial in facilitating communication and providing accurate information to farmers, which in turn can raise awareness about sustainable farming practices. For instance, the appropriate use of fertilizer for peatland, which has a high moisture content that affects plant growth, is crucial. These linkages also emphasize fire control (Nasution et al., 2021; Nurliza et al., 2022), which is important given the high susceptibility of peatland to flames. This partnership has the potential to speed up the decision-making process, making it more accurate and sensitive to the requirements of farmers, who are the group most impacted by decisions of this nature. Research Rhofita (2022) indicates that the success of natural resource and agricultural management heavily depends on supporting actors with apparent power and interests and good coordination. The sustainability of the agricultural sector in Ujung Pandang Village dramatically depends on how these power and interest relationships are maximized to achieve each actor's objectives.

Using interest and sentiment as two of the most essential social network aspects, Table 5 illustrates the ties between the actors in Ujung Padang Village. The dynamics of these relationships reflect interactions driven not only by the interests of each actor but also by emotional elements that enhance the bonds

between the persons involved. The data shows that the relationships between the Village Head and the Village Secretary, the Agricultural Extension Officer (PPL), the planting leader, and the Farmers exhibit a positive status, indicating close collaboration and mutual support. In making decisions about initiatives such as replanting oil palms or deploying ecologically friendly agricultural technologies, the Village Head is vested with much authority. To obtain better results in these circumstances, aligning all the actors' interests is necessary. Overall, the relationships built through the combination of interest and sentiment highlight the importance of the emotional dimension in strengthening cooperation among actors. To successfully construct successful collaboration and achieve sustainable development goals in managing natural resources in Ujung Padang Village, it is essential to have a profound awareness of the interests and priorities of each side, as well as a positive attitude.

Table 5. Network of Actor Relationships in Ujung Padang Village: Interest-sentiment

No	Type of Relationship and Status (+/-)	Actors (A and B) or More Than Two Actors
1	Interest, sentiment (+)	Village Head with Village Secretary
2	Interest, sentiment (+)	Village Head with Agricultural Extension Officer (PPL)
3	Interest, sentiment (+)	Village Head with the Replanting Chairperson
4	Interest, sentiment (+)	Village Head with Farmers

Analysis of the Degree of Relationships Among Actors in Oil Palm Development

According to the graph on the left (Figure 1.a), the village head holds the highest rank, while the village secretary holds the second-highest position. With this information, it is clear that these two persons play a big part in the process of decision-making and the execution of the project. On the other hand, the Replanting Chairman and the Agricultural Extension Officer hold the lowest levels of influence, suggesting that their jobs are more technical or supporting. The right graph (Figure 1.b) illustrates the program's interest level. The results show a similar pattern, with the Village Head and Village Secretary exhibiting high-interest levels while the Agricultural Extension Officer has a low level of interest.

The analysis of these graphs indicates that the formal village hierarchy influences the distribution of power and interest in village programs, with the Village Head as the most influential and motivated actor. This resembles farmer empowerment initiatives established by village finances.

Simultaneously, farmers' engagement is moderate in power and interest, underscoring their significance as direct beneficiaries. Farmers exhibit less interest owing to time limitations since they are required to labor for financial sustenance. Disadvantaged groups, such as farmers, frequently do not have the opportunity or the financial means to engage in development programs, even if these efforts are designed to benefit them. Because of this, it is necessary to have flexible and adaptable solutions to engage farmers successfully. Reed et al., (2009) highlight the need to develop developer trust and enhance communication. This is an extra point of interest that should be taken into consideration. As an additional point of interest, Reed et al., (2009) emphasize the need to foster stakeholder trust and communication to facilitate collaboration. Program managers can build programs that are more flexible and inclusive if they have a thorough awareness of the requirements and limitations of each stakeholder. This will enable all stakeholders, particularly farmers, to participate and profit from the program.

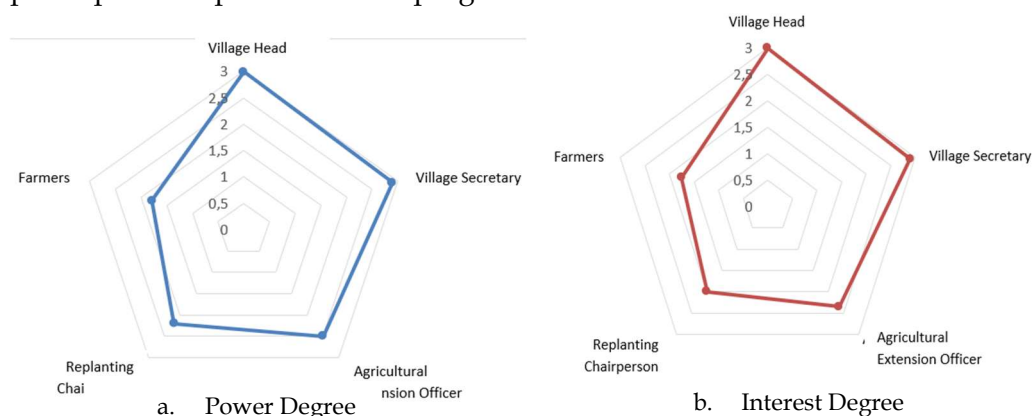


Figure 1.
Graph of Power Degree and Interest Degree
Blue line: Power degree
Red line: Interest degree

The favourable perception of the continuing program is evidenced by the Village Head's highest emotional score, succeeded by the Village Secretary (Figure 2). Their significant involvement in the planning and execution procedures, along with the immediate benefits derived from the accomplishment of the oil palm development program, accounts for their prominence. On the other hand, the Farmers and Replanting Chairman exhibit moderate sentiment levels, while the Agricultural Extension Officer shows the lowest sentiment score. Insufficient resources or communication challenges with other stakeholders may lead to a bad perception of the Agricultural Extension Officer (Irdiana et al., 2023; Wibowo, 2020), the low sentiment

towards the Agricultural Extension Officer could indicate potential operational issues, such as a lack of resources or challenges in communication with other stakeholders.



Figure 2.
Graph of Sentiment Degree

This examination underscores the requirement of knowing many elements. Given the conditions of this research, the importance of understanding the numerous perspectives of stakeholders is further highlighted. Enhanced communication strategies are required to increase positive sentiment, particularly among persons with lower emotional ratings. The results of recent studies, such as the one conducted by Georgios & Barraí, (2023), suggest enhancing the participants' feelings by actively integrating them into the program and giving them greater control. This is something that can be done.

Additionally, Tewdwr-Jones's (1998) conflict management and cooperation theory emphasizes the importance of creating mutual trust and understanding among stakeholders to diminish resistance and enhance support. This is done to achieve the goals of reducing resistance and increasing support. Village initiatives must use a participatory and inclusive strategy to guarantee that all stakeholders, including those with low sentiment, are recognized and included. This may result in increased success for the program due to enhanced teamwork.

The Total Weighting of Degrees Among Actors (Figure 3) illustrates the level of influence of the five main actors on the sustainability of the oil palm plantations in Ujung Padang Village, Kota Muko District, Mukomuko Regency. In the graph, the total weighting values of the actors analyzed indicate that the Village Head holds the highest influence. Based on this information, the Village Head is the key figure in assessing the program's sustainability and policies related to oil palm farms. The Village Secretary is the second most important

position in the village, after the Village Head. The Village Secretary's score, close to the high category, reflects their significant dedication to their role as an administrative supporter and the executors of the policies established by the Village Head. Their responsibilities include making strategic decisions and managing the village's financial resources.



Figure 3.
Total Weighting of Degrees Among Actors

This analysis is consistent with the findings Supriatna et al., (2024) & Suardi et al., (2022) which stress the critical need for government intervention and support to enhance the sustainability of smallholder oil palm plantations in Indonesia. Addressing these challenges requires comprehensive policy measures and assistance to promote sustainable agricultural practices in rural areas. Therefore, it is essential to strengthen the involvement of actors with medium to low influence, such as farmers and extension officers, through training and incentives to increase their active participation in plantation management. Additionally, a collaborative and participatory approach, as recommended by Saputra & Havlíček, (2024), should be adopted to ensure the sustainability and equitable distribution of benefits from government programs. Collaborative governance can enhance rural governance by creating a more inclusive and responsive system that better meets the needs of rural communities (Amsler, 2016; Batory & Svensson, 2020; Bush et al., 2019; McIsaac et al., 2020; Zhang et al., 2022).

CONCLUSION AND SUGGESTION

Conclusion

Based on the analysis, the stakeholder networking and institutional system approach in managing the sustainability of oil palm plantations on

peatland in Ujung Pandang Village show that the most influential parties are the village government, particularly the Village Head and Village Secretary. Their roles are crucial in developing oil palm on peatland and rural empowerment. The strong network among the village government actors indicates a harmonious relationship, which strengthens the role of the Village Head in driving the success of related programs and policies. This highlights the importance of collaboration and coordination among relevant parties in achieving the sustainability of oil palm plantations at the village level.

Suggestion

Based on the findings of this study, it is recommended that the Ujung Pandang Village government continue to strengthen the network among actors in managing the sustainability of oil palm plantations on peatland by fostering closer relationships between the Village Head, Village Secretary, farmers, and agricultural extension officers. The roles of the Village Head and Village Secretary, which have been shown to play a significant role in driving the program's success, can be further optimized through training and the provision of incentives to farmers and extension officers to enhance their involvement. In addition, a collaborative approach involving all relevant stakeholders, including the local community, must be strengthened to ensure the program's stability and the equitable distribution of its benefits. It is also essential to develop policies that are more flexible and responsive to local dynamics and improve coordination among government agencies to support the sustainability of the agricultural sector, particularly oil palm cultivation on peatland.

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