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Sustainability Status of RSPO-Certified and Non-Certified Smallholder Palm Oil in Kotawaringin Barat Regency

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ABSTRACT

Palm oil exhibits the highest oil productivity per hectare among vegetable oils and is priced more affordably than its counterparts. Consequently, palm oil has gained immense popularity and is currently the most extensively consumed vegetable oil. This condition has prompted a negative campaign against palm oil products, which are required to be produced sustainably. Community palm oil plantations are part of the palm oil agribusiness supply chain, which is also required to implement sustainability aspects. The objective of this study is to evaluate the sustainability of community palm oil plantations that are certified by the Roundtable on Sustainable Palm Oil (RSPO) and those that are not certified. This evaluation will be conducted using the Rap-Palmoil method, which employs index assessments across multiple dimensions, including economic, social, environmental, technological, and institutional aspects. The Multidimensional Scaling (MDS) method will be utilised for this analysis. The study was carried out in West Kotawaringin, which is located in a central district known for its palm oil fields. The data utilised comprises both primary and secondary sources. Primary data was acquired through interviews conducted with farmers, while secondary data was obtained from the central statistics agency and the plantation service. The participants in this study consisted of 60 farmers who were chosen by the snowball sampling method. The analysis using the criteria of Kavanagh & Pitcher (2004) provided multidimensional results indicating that certified and uncertified community palm oil plantations fall under the "moderately sustainable" category. The sustainability index value for certified community palm oil plantations is higher, specifically 66.50, compared to 53.08 for uncertified ones. Based on each dimension, certified community palm oil plantations are classified as "moderately sustainable" in all aspects except for non-certified community palm oil plantations, which are categorised as less sustainable in two dimensions: environmental and institutional.

Keyword: sustainability, palm oil, multidimensional scaling, community's plantations, RSPO certification

INTRODUCTION

Sustainable development aims to enhance the quality of life while simultaneously considering the needs and rights of future generations (Pertiwi, 2017). It involves harmonising economic, social, and environmental objectives (Viana, 2010). The evolution of business operations has undergone a significant transformation, shifting from a sole focus on profit to include activities aligned with the concept of sustainable development, known as the 3P framework (profit,

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people, and planet). Long-term economic development can encompass areas beyond industry, including agriculture (Pahan, 2013). The agricultural industry plays a significant part in Indonesia's economy, and one of its subsectors with considerable potential is the plantation subsector. This subsector contributes 3.76 percent to the total GDP and 30.32 percent to the Agriculture, Forestry, and Fisheries sectors (BPS, 2023).

The agricultural sector in Indonesia is also a focal point for the implementation of sustainable practices. Palm oil products are frequently scrutinized by consumers for their adherence to sustainability standards. Palm oil is a vital commodity that plays a significant role in bolstering the national economy and serves as the primary source of foreign exchange profits in the non-oil and gas sectors (Azahari, 2019). Palm oil's exceptional capacity to yield the maximum oil productivity per hectare, combined with its comparatively lower cost in comparison to other vegetable oils, has propelled it to become the prevailing and extensively used vegetable oil in the present day. Furthermore, palm oil can be produced consistently throughout the year. Palm oil's significant market share has solidified its position as the primary vegetable oil globally. This ailment seemingly initiated a campaign highlighting the adverse aspects associated with palm oil products. Palm oil has emerged as a crucial commodity for the Indonesian economy. Indonesia has emerged as the leading global producer of vegetable oil, exerting significant influence on the world's use of this commodity, which is steadily rising (Onainor, 2019).

Community palm oil plantations are a component of the palm oil agribusiness supply chain, which is gradually becoming mandated to incorporate sustainability measures. Community palm oilfarmers are in a vulnerable position when dealing with the challenges posed by the international market's demands for implementing RSPO. This requires palm oil firms to source their raw materials from plantations that have been certified as sustainable (Darmawan, 2015). The government and the RSPO sustainability organisation are actively working to establish sustainability practices in community palm oil plantations due to the significant impact of this condition. Obtaining sustainability certification is mandatory for market entry. However, farmers needing more effective management skills and prioritising commercial reasons pose challenges to meeting sustainability criteria.

Establishing sustainable palm oil plantations can be accomplished by addressing challenges in the realms of economics,
social, environmental, institutional, and technological dimensions. The sustainability of the partnership agribusiness model in palm oil plantation management relies on meeting a minimum of three criteria for sustainable management. From an economic perspective, the cultivation of palm oil can increase individuals' income. From a social perspective, it can enhance overall well-being by ensuring the fair distribution of palm oil products. From an environmental perspective, it can be sustained and preserved through cooperative efforts between the government, the private sector, and the community (Sabriyah & Kospa, 2016).

The research conducted by Suardi et al. (2022), Saragih et al. (2020), and Najmi et al. (2019) has examined the overall sustainability of community palm oil plantations using a Multidimensional Scaling approach. Therefore, this study aims to analyze the sustainability of community palm oil plantations specifically based on the certification status of palm oil sustainability. The aims of this study are as follows: 1) to assess

the sustainability of community palm oil plantations that have obtained RSPO certification; 2) to evaluate the sustainability of uncertified community palm oil plantations; and 3) to analyse the primary indicators that significantly impact the sustainability of both RSPO-certified and uncertified community palm oil plantations.

RESEARCH METHODS

The basic research method used is the descriptive method, which aims to create a systematic, factual, and accurate picture of the facts and characteristics of a particular population or area. The approach method used is quantitative analysis. Quantitative analysis is used to examine certain populations or samples. A study investigated the number of community palm oil plantations in West Kotawaringin Regency, Central Kalimantan Province. The determination of the research area was carried out purposefully with the consideration that Central Kalimantan is the second palm oil centre province after Riau, with a contribution of 12.10% of Indonesia's total palm oil area. Therefore, West Kotawaringin Regency is the largest district in terms of land area in Central Kalimantan Province, spanning an impressive 82.31 thousand hectares. This research utilises two different data sources, namely primary and secondary data. Primary data is the major dataset utilised, whereas secondary data is supplementary information. Primary data was obtained from direct interviews with a sample of farmers in the research area, while secondary data was obtained from the Central Kalimantan Province Central Statistics Agency (BPS), the Central Kalimantan Province Plantation Service, and other related agencies. Sampling was carried out by snowball method with 30 sample farmers who were RSPO certified and 30 sample farmers who were not RSPO certified.

The data analysis method used in this research to determine the sustainability status of community palm oil plantations uses the RAP-Palmoil ordination technique (RAPPO) which has been modified from RAPFISH (Rapid Appraisal Technique for Fisheries) through the Multidimensional Scaling (MDS) method developed by Fisheries Center University of British *Columbia* (Kavanagh & Pitcher, 2004). In this research, sustainability status will be reviewed from five dimensions, namely economic, social, environmental, technological and institutional dimensions with a total of 37 attributes. The MDS approach is employed to visually represent the position of the sustainability point, where the "bad" extreme point is assigned a value of 0%, and the "good" extreme point is assigned a value of 100%. The index categories and sustainability status of each dimension are classified into four categories which can be seen in Table 1.

Table 1.
Categories, index values, and sustainability status

Index Value	Categories and sustainability status
0.00 - 25.00	Bad; not sustainable
25.01 - 50.00	Less; less sustainable
50.01 - 75.00	Sufficient; indeed sustainable
75.01 - 100.00	Good, less sustainable

Source: Kavanagh & Pitcher (2004)

The technique used for ordination or distance determination in MDS relies on the Euclidean distance, specifically in a dimensional space, as described by the following equation:

$$d = \sqrt{|x_i - x_j|^2 + |y_i - y_j|^2 + \cdots}$$

where: d = distance between Euclidian points, x_i = x-coordinate at the i-th position, y_i = y-coordinate at the i-th position

The arrangement of the item or point in MDS is estimated by using regression to approximate the Euclidean distance (D_{ij}) from point i to point j with the origin (d_{ij}) equation by the following equation:

$d_{ij} = a + bD_{ij} + e$ (*e* is error)

The technique used to regress aforementioned equation is the ALSCAL algorithm (Fauzi and Anna, 2005). The ALSCAL method is used to optimize square distance (square distance = d_{ijklm}) to square data (origin point = O_{ijklm}). In five dimensions (i_{jklm}), written in a formula called S-stress as follows:

$$S = \sqrt{\frac{1}{m}\sum_{k=1}^{m}\left[\frac{\sum_t \sum_f (d^2_{ijklm} - 0^2_{ijklm})^2}{\sum_t \sum_f 0^4_{ijklm}}\right]}$$

The S-Stress value indicates the goodness of fit in multidimensional scaling (MDS), which is derived from the S value and R2. The stress value and coefficient of determination (R2) assess the requirement for additional qualities in properly representing the examined dimensions, ensuring proximity to the actual scenario. A low stress value signifies a favorable fit, whereas a high S value implies the contrary. The RAPFISH technique considers a model to be of high quality if the S-stress value is below 0.25 (S < 0.25) and the R2 value is near 1 (100 percent) (Kavanagh & Pitcher, 2004). Monte Carlo analysis is necessary to quantify the effect of random errors in the analysis process with a 95 percent confidence interval. It is a method of simulation used to assess the impact of random errors on all dimensions.

Leverage or sensitivity analysis is conducted to identify significant indicators or leverage qualities derived from alterations in the Root Mean Square (RMS) ordination on the x-axis. The sensitivity of this indicator in enhancing sustainable status is directly proportional to the magnitude of the change in RMS. The primary influential component is the attribute with the highest root mean square (RMS) value, which is close to or exceeds half of the value scale on the x-axis (Kavanagh & Pitcher, 2004).

RESULT AND DISCUSSION

Sustainability Status of RSPO And Non-RSPO Certified Community Palm Oil Plantations

The results of the multidimensional Rap-palm oil analysis using the multidimensional scaling method produced a sustainability index value for RSPO-certified community palm oil plantations that was greater than non-certified ones, with values of 66.50 percent for RSPO-certified and 53.08 percent for non-RSPO-certified, both of which are included in the "moderately sustainable" category. The S-stress value obtained is smaller than 0.25, and the R^2 value obtained is close to 1, so the situation meets statistical goodness of fit, which can be seen in Table 2.

The results of Rap-palmoil's analysis using multidimensional MDS by combining five sustainability dimensions produce a sustainability value of 66.50 percent and is included in the moderately sustainable category. This value encompasses all agricultural practices that adhere to sustainability qualities outlined in this study and are

conducted in certified areas with high sustainability. conducted a comprehensive analysis of the sustainability of community palm oil plantations in Jambi Province. The resulting sustainability index value was 57.79, placing it in the moderately sustainable category. The analysis of each dimension reveals the sustainability value of community palm oil plantations in certified areas, which varies across different dimensions. Specifically, the economic dimension demonstrates a sustainability value of 66.16 percent (quite sustainable), the social dimension shows a value of 81.29 percent (sustainable), the environmental dimension exhibits a value of 52.92 percent (quite sustainable), the technological dimension indicates a value of 61.21 percent (quite sustainable), and the institutional dimension reflects a value of 70.94 percent (quite sustainable).

Table 2.
The MDS statistical parameters and sustainability values of community palm oil plantations certified by RSPO

Sustainable Dimension	MDS	Monte Carlo	Difference	S-Stress	R^2
RSPO certified community palm oil plantations					
Multidimension	66.504	64.696	1.808	0.144	0.943
Economy	66.163	64.294	1.869	0.142	0.939
Sosial	81.289	78.265	3.024	0.140	0.946
Environment	52.923	52.512	0.412	0.140	0.947
Technology	61.208	59.856	1.352	0.157	0.938
Institutional	70.938	68.554	2.383	0.140	0.944
Non-RSPO certified community palm oil plantations					
Multidimension	53.076	52.551	0.525	0.147	0.944
Economy	58.018	56.926	1.092	0.144	0.944
Sosial	62.672	61.449	1.223	0.147	0.943
Environment	49.265	49.095	0.170	0.141	0.949
Technology	53.808	53.170	0.638	0.163	0.935
Institutional	41.617	42.113	-0.496	0.141	0.947

Source: Primary data analysis, 2024

The sustainability component on the flyover diagram indicates that as the sustainability point goes further from the center point, the sustainability value increases. The index value for each dimension is visible in the flyover diagram depicted in Figure 1. According to the diagram, the sustainability value is lowest in the environmental dimension, followed by the technological dimension. The economic, institutional, and social dimensions have the highest sustainability value. Saragih et al. (2020) conducted research that reveals the institutional component has the lowest sustainability value, measuring at 46.40 percent. Conversely, the social dimension has the highest value, measuring 66.83 percent. Suardi et al. (2022) also report that the institutional dimension has the lowest value at 52.21 percent, while the economic dimension has the highest sustainability value.

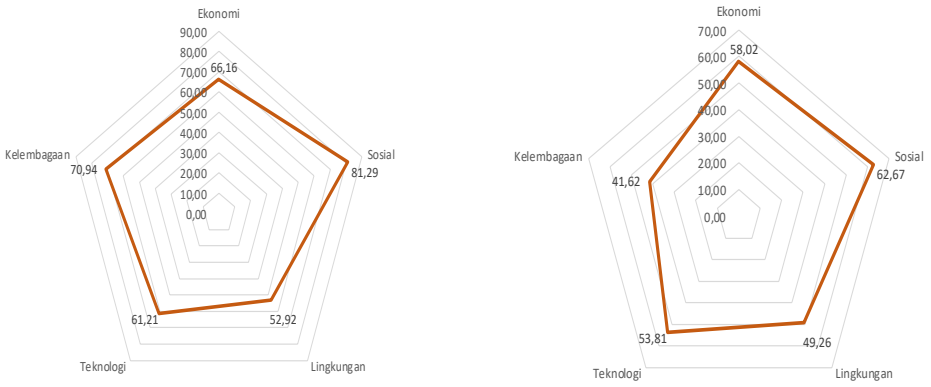


Figure 1
Flyover diagram of the sustainability index of RSPO certified and non-certified community palm oil plantations in West Kotawaringin Regency
Source: Primary data analysis, 2024

The sustainability of community palm oil plantations without certification was assessed using Rap-palm oil analysis, employing multidimensional MDS. The results indicate a sustainability rating of 53.08 percent, falling within the "fairly sustainable" category. However, the values for each dimension varied from 41 to 62 percent. This data demonstrates that agricultural practices, as indicated by the sustainability characteristics in this study, are still being conducted in a manner that is not sustainable in areas that need to be certified. The S-Stress value is less than 0.25, R2 is nearly 1, and the Monte Carlo difference with MDS is less than 5 percent. These statistical characteristics, as shown in Table 3, meet all the conditions. From a multidimensional perspective, community palm oil plantations that are not certified fall into the moderately sustainable category, scoring 53.08 percent. However, closer examination of each component shows that certain dimensions could be more sustainable.

The social component has the greatest index value, specifically 62.67 percent, indicating a high level of sustainability. On the other hand, the institutional dimension has the lowest value of 41.62 percent, indicating a lower level of sustainability. The economic dimension has a value of 58.02 percent, indicating a fairly sustainable level. The environmental dimension has a value of 49.26 percent, indicating it is not sustainable. The technological dimension has a value of 53.81 percent, indicating a pretty sustainable level. Therefore, the sustainability assessment for each dimension reveals that the economic, social, and technological dimensions are somewhat sustainable. However, the environmental and institutional dimensions are considered unsustainable.

Leverage analysis to determine Key Sustainability Indicators for RSPO Certified and Non-RSPO Certified Community Palm Oil Plantations

Leverage analysis refers to the examination of leverage attributes, which are characteristics that have a significant impact on changes in the sustainability index. The leverage value in the Rap-palmoil MDS ordination model is determined by calculating the difference between the expected and actual values. This helps identify the qualities most susceptible to being influenced by changes in distance. The determination of influential qualities relies on the Root Mean Square (RMS) value, whereby

attributes with higher RMS values significantly influence sustainability. To ascertain a lever's characteristics or crucial indications, Yusuf, Wijaya, Surya, & Taufik (2021) conducted a study. This research employs the method of extreme value analysis, which identifies a single critical indicator from each dimension that has the greatest impact on sustainability.

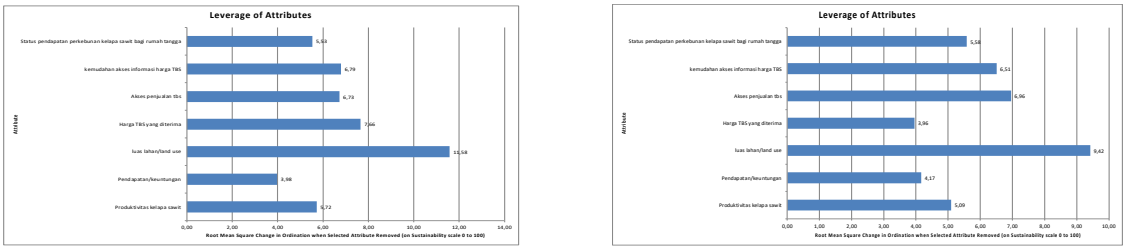
Table 3.
Results of leverage analysis on certified and non-certified RSPO community plantations

Dimension	Key Indicators	RMS Value
RSPO certified community palm oil plantations		
Economy	Land Area	11.58
Sosial	Healthcare Access	9.81
Environment	The presence of LCC/ground cover plants	5.39
Technology	Planting based on SOP/plant distance	6.35
Institutional	Financial institutions' accessibility to farmer organisations	6.98
Non-RSPO certified community palm oil plantations		
Economy	Land Area	9.42
Sosial	Healthcare Access	5.25
Environment	The presence of LCC/ground cover plants	5.12
Technology	Planting based on SOP/plant distance	3.97
Institutional	Financial institutions' accessibility to farmer organisations	6.08

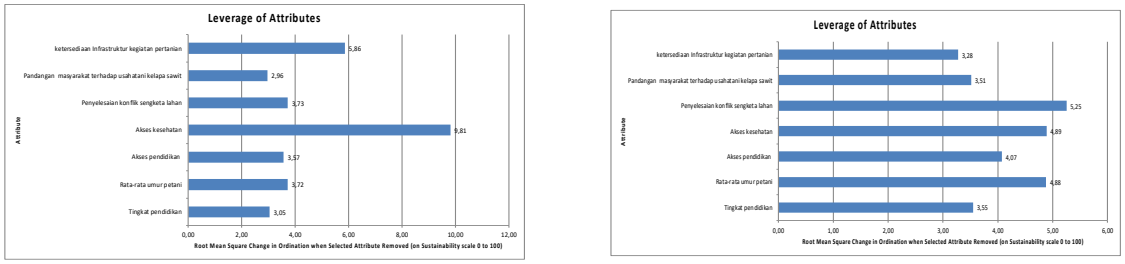
Source: Primary data analysis, 2024

The findings of the leverage analysis on the sustainability of certified and uncertified community palm oil plantations in West Kotawaringin Regency for each attribute are presented in Table 4. The essential metrics for assessing the sustainability of certified and uncertified community palm oil plantations are nearly identical across all aspects except the social and technological dimensions.

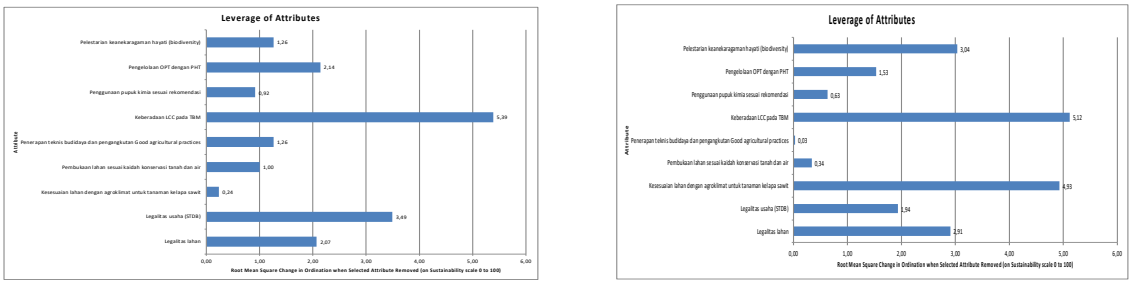
The key indicator in the economic dimension is the area of land cultivated for palm oil plantations. The area of palm oil land managed will affect the amount of of fresh fruit bunch (FFB) production produced, subsequently influencing the well-being of farmers. Hidayatullah (2023) explains that augmenting palm oil production and prices will directly enhance farmers' well-being. The key indicator in the social dimension for certified community palm oil plantations is access to healthcare, while for uncertified community plantations is the resolution of land disputes. In the environmental dimension, a key indicator of the sustainability of community palm oil plantations, both certified and uncertified, is the presence of LCC/ground cover crops. In the technological dimension, there are also differences in key indicators that influence the sustainability of certified and uncertified community palm oil plantations. The key indicator of the technological dimension in certified community plantations is planting according to the SOP/planting distance, whereas in non-certified community plantations is the use of certified seeds.



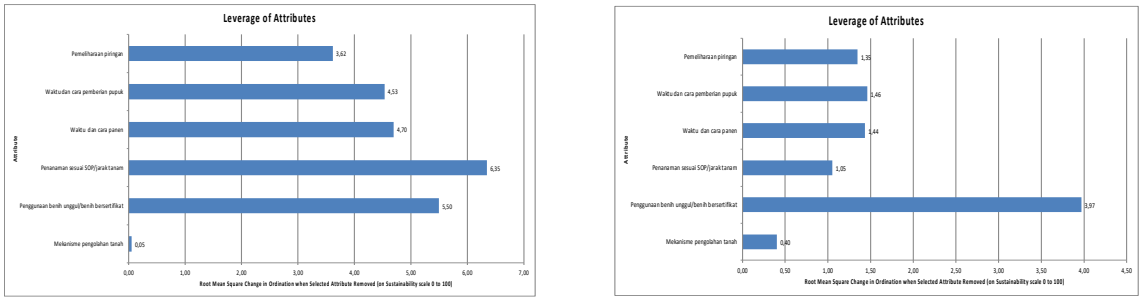
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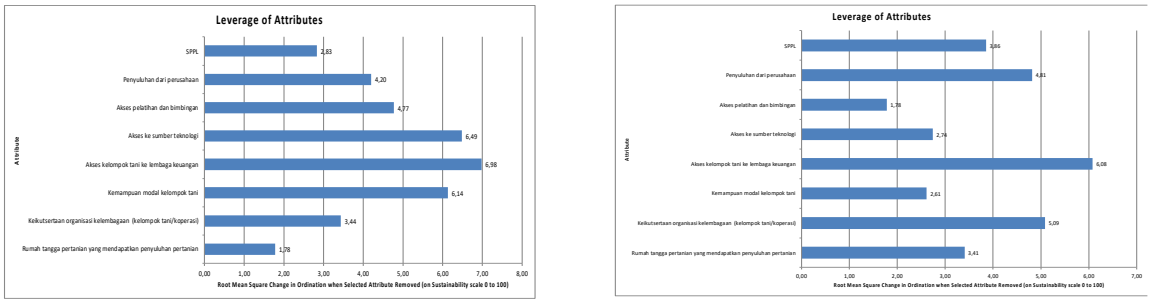
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Figure 2
The results of sustainability leverage analysis of RSPO certified and non-RSPO certified community palm oil plantations
Source: Primary data analysis, 2024

Both certified and non-certified community palm oil plantations have the same critical indicator in the institutional dimension, which is the availability of farmer groups to financial institutions. Figure 3 displays the outcomes of the leverage analysis for each dimension.

CONCLUSIONS

The multidimensional sustainability index value of RSPO-certified community palm oil plantations in West Kotawaringin Regency is 66.50 percent. The sustainability status of RSPO-certified community palm oil plantations is "moderately sustainable". The multidimensional sustainability index value of non-certified community palm oil plantations in West Kotawaringin Regency is 53.08 percent. The sustainability index value of RSPO-certified community palm oil plantations in West Kotawaringin Regency is 66.50 percent. The sustainability rating of RSPO-certified community palm oil plantations is classified as "moderately sustainable." The sustainability index value of non-certified community palm oil plantations in West Kotawaringin Regency is 53.08 percent. The sustainability status of non-certified community palm oil plantations can be described as "sufficiently sustainable." The key indicators for each dimension of sustainability in both RSPO-certified and non-certified community palm oil plantations are identical. These indicators include land area, the existence of cover crops, and the accessibility of financial institutions for farmer groups, corresponding to the economic, environmental, and institutional dimensions, respectively. Meanwhile, the crucial factors determining the sustainability of RSPO-certified community palm oil plantations in terms of social and technological aspects are the availability of healthcare services and adherence to standard operating procedures (SOP) regarding planting distances. Resolving land conflicts and utilizing certified seeds are crucial benchmarks for assessing the viability of uncertified community palm oil plantations in terms of social and technological aspects.

There is a need to enhance sustainability in certified and non-certified community palm oil plantations by addressing unsustainable practices, taking inspiration from the successful initiatives implemented by certified community palm oil plantations. Both the government and corporate sector should enhance their involvement in supporting uncertified community palm oil plantations to acquire palm oil sustainability certification, including both RSPO and ISPO certifications.

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