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# Palm Oil Plantations in West and Central Kalimantan, Indonesia: Sustainability Analysis Using a Hierarchy Process Method

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**Abstract**

There are quite significant differences in the management of palm oil businesses in West Kalimantan and Central Kalimantan Provinces. In fact, West Kalimantan has a very large area of oil palm land, but its production output is smaller compared to Central Kalimantan province. Based on these facts, this research aims to determine the policy strategy for sustainable palm oil management, which includes economic, social, environmental and legal aspects to be implemented in the provinces of West Kalimantan and Central Kalimantan. This research applies the Analysis Hierarchy Process (AHP) method with a pairwise comparison matrix approach to calculate the weight of each index and create sustainable palm oil based on primary data collection through questionnaires. The research results show that in developing sustainable oil palm plantations, environmental aspects can be considered first, with a primary focus on oil palm land conservation. Conservation of oil palm land is an important part because it is a form of protection, restoration, improvement and maintenance of land functions in accordance with land capabilities and use. The results obtained from calculations carried out using the AHP model show that there are 3 policy alternatives, namely Agribusiness Public Partnership, Agribusiness Private Partnership, and Agribusiness Public - Private Partnership. This can provide benefits for economic growth through increasing agricultural productivity. Agribusiness Public-Private Partnerships have a very important role as a benchmark for sustainable palm oil plantation policies in Central and West Kalimantan.

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## Introduction

Oil palm plantations are an agricultural subsector that makes a significant contribution to both the national economy and people's food needs. Data from the Central Statistics Agency (BPS) shows that in 2022 CPO production will increase to 46.82 million tons. Indonesia exports palm oil to several destination countries, including India, China, and the Netherlands, the three largest countries receiving palm oil products from Indonesia. Indonesia's total exports to several countries until 2023 will reach 28,628,000 tons. This makes palm oil products a vital component of Indonesian exports. The Indonesian palm oil business can significantly contribute to the country's foreign exchange. Also, palm oil production and increasing demand for palm oil products can absorb labor and reduce unemployment. The development of private plantations has encouraged the conversion of land into smallholder oil palm plantations, changes in farmers' livelihood patterns, and labor migration to plantation areas, thereby increasing people's income and accelerating regional development (Ishak *et al.*, 2017).

Indonesia has the largest oil palm plantations in the world. More than 700 oil palm plantations have been developed throughout Indonesia. The total area of oil palm plantations is around 14.68 million hectares, of which small farmers own 40%. Apart from being owned by small farmers, oil palm plantations are also owned by large private plantations and large state plantations. Both private plantations and large state plantations have a very important role in developing oil palm plantations. Indonesian Sustainable Palm Oil (Indonesian Sustainable Palm Oil), referred to as ISPO, is a Palm Oil Plantation Business system that is economically viable, socio-culturally viable and environmentally friendly based on statutory provisions. When expanding land, environmental factors must be taken into account rather than socio-economic factors. The government and companies must pay attention to environmental indicators that can overcome the problems of land use conversion, deforestation and CO2 emissions (Papilo *et al.,* 2022). Palm oil production in Indonesia has the potential to provide great benefits for the entire community. Apart from providing economic benefits, increasing national income, alleviating poverty, and providing social benefits for the community, palm oil businesses can also absorb labor and provide social welfare for the community, especially local communities. The palm oil business also offers environmental benefits in the form of biodiesel, which can replace fossil fuel consumption. This is done if the expansion of oil palm cultivation follows sustainable planning and management practices that have been determined by clear rules (Gingold *et al.,* 2012). The government is making efforts to support sustainable palm oil, including community empowerment programs, future palm oil prospect programs, and implementing environmental management (Hariyanti *et al.,* 2024). In general, establishing an oil palm plantation usually starts with clearing forest land into plantation land, but land expansion plans can threaten the forest and the living creatures in it (Runtuboi *et al.* 2020). If palm oil entrepreneurs clear land poorly and ignore the environment, deforestation will occur and cause carbon emissions. Meanwhile, the problem of food insecurity requires policies that can be adapted to oil palm cultivation and a food system that is more focused on nutrition and environmentally friendly (Tabe-Ojong *et al.,* 2023). The government enforces regulations regarding sustainable palm oil management with the aim of eliminating deforestation, carbon emissions, land-related conflicts and labor problems. There is a need for more nuanced measurements of the social impacts of palm oil as well as more explicit accounting of the study context and social impacts (Rowland *et al.,* 2022). The government implemented policies that specifically targeted small farmers rather than prioritizing productivity (Ogahara *et al.,* 2022). The government integrates development plans into three dimensions, namely social, economic and environmental in sustainable development and poverty alleviation (Rassanjani, 2018).

In Indonesia, there are 5 provinces that have the largest area of oil palm land in Indonesia. The 5 provinces include Riau, West Kalimantan, Central Kalimantan, East Kalimantan and North Sumatra. Riau Province has the largest land area, namely 31% of the total national oil palm land area with a total of 2,858,173 hectares. Meanwhile, the second largest land area is in West Kalimantan Province with a land area of 2,015,914 hectares or 22% of Indonesia's oil palm land area. The highest land areas are the provinces of Central Kalimantan, East Kalimantan and North Sumatra which have an area of 1,822,893 hectares, 1,312,095 hectares and 1248,086 hectares. The next areas of oil palm plantation land are the provinces of Central Kalimantan, East Kalimantan and North Sumatra. Oil palm land expansion activities continue to be carried out in line with the increasing demand for palm oil products worldwide. Therefore, entrepreneurs in

expanding oil palm land must be able to pay attention to small farmers in their area so that they can provide effective small-farmer development programs to avoid conflicts in the surrounding community (Shahputra and Zen, 2018). The palm oil industry can reduce land use in oil palm plantations by employing efficient and effective farming (Leijten *et al.,* 2023). According to Indonesian palm oil statistics, the province with the highest palm oil production is Riau province, with a total output of 8,961,940 tons or 29% of Indonesia's total production. The second most significant amount of production is occupied by Central Kalimantan Province, with production reaching 7,280,743 tons. West Kalimantan is a little different; it has a large land area, but its production still needs to catch up to that of Central Kalimantan, whose total production reaches 5,332,338 tons. This must concern all elements of society, especially the government. The government's role is vital for the sustainability of oil palm plantations in Indonesia.

Some factors affect oil palm productivity in West Kalimantan and Central Kalimantan, including soil and topography conditions, plantation management, and policy strategies implemented. Different natural factors between the two provinces can also produce different palm oil yields. In addition, oil palm management can also affect the production of oil palm in an area. Rowland *et al.* (2022) used a mixed-method approach to investigate the role of smallholder palm plasma schemes in influencing the use of labor in oil palm plantations.

These two provinces, which have different aspects in managing the palm oil business, could be the government's task in choosing appropriate policies for the conditions of the West Kalimantan and Central Kalimantan regions. The difference in production results between these two provinces can be overcome by selecting the right policy strategy and implementing it evenly in West Kalimantan and Central Kalimantan. This research aims to find policy strategies that suit West Kalimantan's and Central Kalimantan's conditions in managing the palm oil business. Choosing the right policy can positively impact Indonesia's sustainable palm oil business.

## Materials and Methods

This research uses a qualitative method approach, the Analytical Hierarchy Process (AHP). Qualitative research is research that is different from quantitative research. Qualitative research aims to understand the phenomenon within its context and is not concerned with generalizing the results. It focuses on collecting non-numeric data through several methods such as in-depth interviews, direct participation, texts, interactive observation, and opinions. Data analysis in determining the criteria and weights for determining policies for implementing digital economy taxation in this research uses the Analytical Hierarchy Process (AHP) approach. AHP is a flexible methodology that makes it possible to decompose a decision problem into its constituent parts, build a hierarchy of criteria and capture subjective and objective evaluation measures. This analysis involves defining the decision model in steps ranging from specific to general, where only those objectives that are considered relevant are taken into account in the analysis, assuming independence between objectives (Forman and Selly, 2001).

Data was obtained from parties related to policy implementation. These related parties understand the policies and strategies implemented in sustainable palm oil plantations in the provinces of East Kalimantan and West Kalimantan. The number of respondents who will be asked about sustainable palm oil plantations are the government from the agricultural department and the provincial environmental department, palm oil farmers, palm oil entrepreneurs, namely from GAPKI (Indonesian Palm Oil Entrepreneurs

Association), communities around palm oil plantations, and academics from universities concern for palm oil research, workers in the palm oil sector and other related parties. Collecting data in the field through questionnaires was given to representatives of respondents who fall into the government category, namely from the environmental service and agricultural service, several oil palm farmers, workers in the oil palm plantation sector, several academics who research oil palm, and communities around oil palm plantations plantation. After respondents fill out a questionnaire with several questions related to sustainable palm oil, it is then processed using Expert Choice software. Stages of the AHP method with expert choice software are: Arrange the hierarchy in the AHP chart, create a pairwise comparison matrix, determine priority weight, determine the weight of each criterion, Synthesize to Get Results, Sensitivity Analysis, and Decision.

Each criterion level is compared in pairs, considering specific criteria at higher levels directly. The subsequent stage involves the computation of the Consistency Ratio (CR). The Analytic Hierarchy Process (AHP) recognizes the potential for inconsistency but provides a method for gauging the degree of inconsistency in each evaluation set. The Consistency Ratio (CR) functions as a metric for determining the consistency of the assessment matrix (Saaty, 2008).

$$CR = \frac{CI}{RI} \quad (1)$$

The Consistency Index (CI) is a measure used to evaluate the consistency of a matrix, while the Random Index (RI) serves as a reference point. The average consistency of randomly generated matrices is provided. CI for a matrix of order n is defined as:

$$CI = \frac{\lambda \max - n}{n - 1} \quad (2)$$

A consistency ratio equal to or less than 0.1 is considered acceptable. If the score exceeds this threshold, the assessment may be less reliable, and it is recommended to repeat the process.

## Results and Discussion

1. **SWOT Analysis Sustainable Palm Oil Plantation**

Figure 1 shows SWOT Analysis Sustainable Palm Oil Plantation.

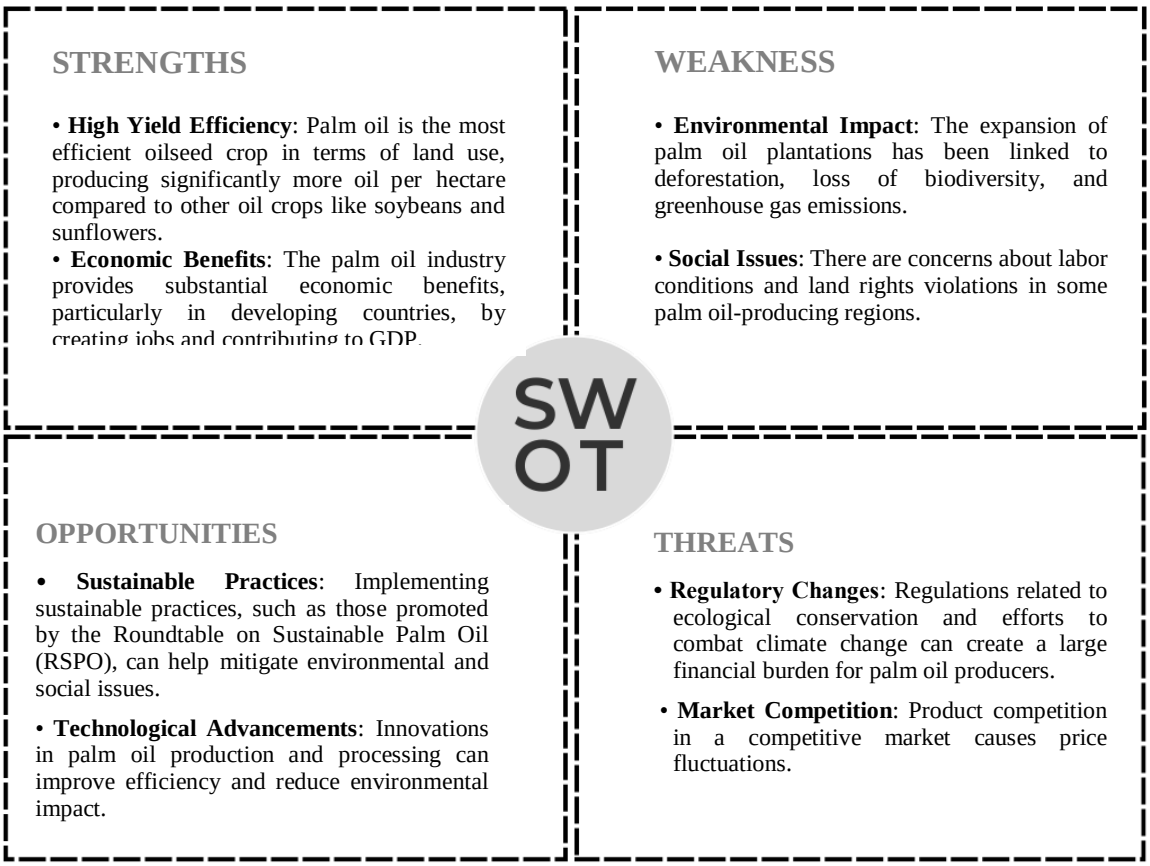



**Figure 1. SWOT Analysis Sustainable Palm Oil Plantation**

## Strengths

### a. High Yield Efficiency

Palm oil is recognized as the most productive oilseed crop in terms of land utilization, which is a critical factor in agricultural efficiency. When compared to alternative oil crops such as soybeans and sunflowers, palm oil demonstrates a remarkable ability to produce a higher volume of oil per hectare. This efficiency is attributed to the biological characteristics of the oil palm tree, which can yield up to 10 times more oil than soybeans and significantly more than sunflowers. The high yield per unit area not only maximizes the output for farmers but also minimizes the environmental footprint associated with land use. As global demand for vegetable oils continues to rise, the ability of palm oil to deliver substantial quantities of oil from a relatively small land area makes it an attractive option for meeting this demand sustainably.

### b. Economic Benefits

The palm oil sector plays a vital role in the economies of palm oil-producing countries. One of the most prominent benefits is job creation, which increases gross domestic product (GDP). Labor's absorption helps alleviate poverty and contributes to developing rural communities. This sector stimulates related industries, such as transportation, manufacturing, and retail, creating a ripple effect that increases overall economic growth. The palm oil industry also encourages investment in agricultural technology and practices, resulting in increased productivity and sustainability. The main goal of public-private partnerships in the agricultural sector is to achieve food security and economic growth (Fizzanty and Masyhuri, 2013).

## Weakness

### a. Environmental Consequences

The expansion of oil palm plantations has caused widespread deforestation, especially in tropical regions such as Southeast Asia. This deforestation not only results in the loss of large portions of the rainforest but also disrupts entire ecosystems, causing a significant reduction in biodiversity. This contributes to climate change and worsens global warming. The loss of trees, which act as carbon sinks, further exacerbates the problem, as fewer trees are available to absorb carbon emissions. In addition, draining peatlands for oil palm cultivation releases carbon stores, further increasing greenhouse gas emissions. The impact of palm oil production on the environment includes not only deforestation and emissions. The use of pesticides and fertilizers in oil palm cultivation can pollute local water sources, endanger aquatic life, and affect the health of local communities.

**b. Social Concerns**

In addition to environmental issues, the palm oil industry is fraught with social concerns, particularly regarding labor conditions and land rights. In many regions where palm oil is produced, workers often face poor working conditions, low wages, and a lack of job security. Reports of child labor, forced labor, and exploitation are prevalent in some plantations, raising serious ethical questions about the industry.

The lack of transparency and accountability in the palm oil supply chain exacerbates these social issues. Many consumers are unaware of the origins of the palm oil in the products they purchase, making it difficult to hold companies accountable for unethical practices. Efforts to promote sustainable palm oil production, such as the Roundtable on Sustainable Palm Oil (RSPO), aim to address these concerns, but challenges remain in ensuring compliance and improving conditions for workers and local communities. In summary, the growth of palm oil plantations poses significant environmental challenges, including deforestation, loss of biodiversity, and increased greenhouse gas emissions.

**Opportunities**

**a. Adoption of Sustainable Practices**

The integration of sustainable practices, as advocated by the Roundtable on Sustainable Palm Oil (RSPO), can play a significant role in addressing environmental and social challenges associated with palm oil production. Sustainable practices encompass a range of strategies aimed at reducing the negative impacts of palm oil cultivation on ecosystems and communities.

For instance, the RSPO sets criteria that promote responsible land use, ensuring that palm oil is sourced from plantations that do not contribute to deforestation or the destruction of high conservation value areas. By adhering to these guidelines, producers can help preserve biodiversity, protect endangered species, and maintain vital ecosystem services such as carbon sequestration and water filtration.

Moreover, sustainable practices also emphasize the importance of social responsibility. This includes fair treatment of workers, respect for indigenous land rights, and the promotion of community development initiatives. By fostering equitable relationships between producers and local communities, sustainable palm oil production can contribute to poverty alleviation and improve the livelihoods of those who depend on the industry.

In addition, the adoption of sustainable practices can enhance the marketability of palm oil products. As consumers become increasingly aware of environmental and ethical issues, there is a growing demand for sustainably sourced products. By obtaining RSPO certification, producers can differentiate their products in the marketplace, potentially leading to increased sales and consumer loyalty.

**b. Advancements in Technology**

Innovations in the production and processing of palm oil have the potential to enhance efficiency while minimizing environmental repercussions. Technological advancements can streamline various stages of the palm oil supply chain, from cultivation to processing, thereby reducing waste and resource consumption.

In the processing phase, new technologies can improve extraction methods, increasing the yield of oil from palm fruit while minimizing energy consumption and waste generation. Innovations such as enzymatic extraction and membrane filtration can enhance the efficiency of oil extraction processes, leading to lower greenhouse gas emissions and reduced water usage.

Furthermore, advancements in biotechnology can contribute to the development of more resilient palm oil varieties that require fewer inputs and are better suited to withstand climate change impacts. By breeding palm trees that are more resistant to diseases and pests, producers can reduce their reliance on chemical treatments, further promoting sustainability.

**Threats**

**a. Regulatory Changes**

In recent years, governments around the world have increasingly recognized the urgent need to address environmental issues, leading to the implementation of more stringent regulations aimed at protecting ecosystems and promoting sustainable practices. These regulations often include stricter guidelines on land use, deforestation, greenhouse gas emissions, and biodiversity conservation. While these measures are crucial for ecological preservation and the fight against climate change, they can impose significant financial burdens on palm oil producers. Compliance with new environmental standards may require investments in sustainable farming practices, certification processes, and technology upgrades, which can elevate operational costs. As a result, these increased expenses may impact the profitability of palm oil producers, particularly smaller farms that may lack the resources to adapt quickly to the changing regulatory landscape. Additionally, the need for transparency and traceability in supply chains can further complicate operations and increase costs, potentially leading to higher prices for consumers and reduced competitiveness in the global market.

**b. Market Competition**

Additionally, the rise of health-conscious consumers has increased interest in oils deemed healthier and more sustainable, which could further challenge demand for palm oil. This competitive environment can cause price fluctuations, as manufacturers may need to adjust their pricing strategies to remain attractive to buyers. Government and community efforts to maintain competitive advantage require not only a focus on cost efficiency but also a commitment to sustainability and responsible procurement practices.

**2. Analysis Hierarchy Process (AHP)**

The stages in AHP are carried out by developing research objectives used for the level of sustainable palm oil research in West Kalimantan Province and Central Kalimantan Province. The aim of this research is that in sustainable palm oil plantations there are 4 aspects that can influence policy makers. These aspects are Social Aspects, Legal Aspects, Economic Aspects and Environmental Aspects. Each aspect has criteria and sub-criteria, each of which has a policy strategy. The following are the criteria and sub-criteria which are the analysis indicators that have been determined.

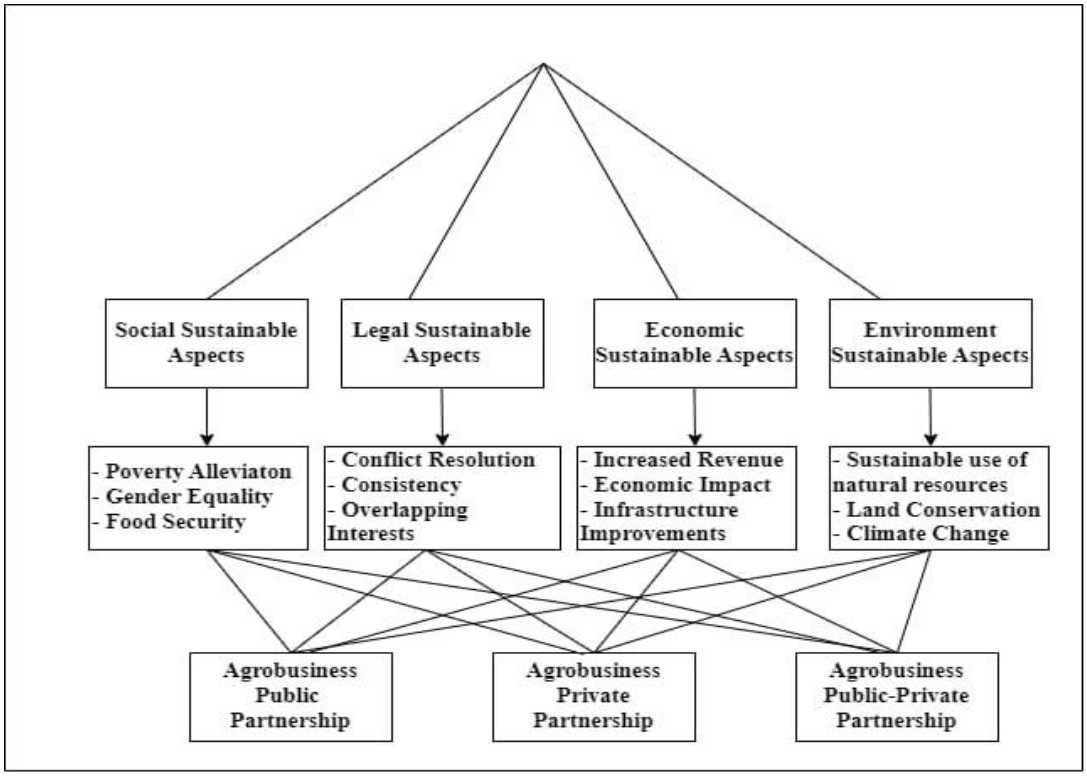



**Figure 2. Four aspects influencing policy makers regarding sustainable palm oil**

## A. Palm Oil in West Kalimantan

West Kalimantan Province is one of the oil palm plantations with the largest land area in West Kalimantan. Strategies and policies are needed so that the sustainability of palm oil is maintained in the future. These four aspects are priorities for sustainable palm oil development in West Kalimantan Province. The following is a ranking of the four aspects of sustainable palm oil in West Kalimantan province

**Table 1. Priority aspects of palm oil sustainability West Kalimantan**

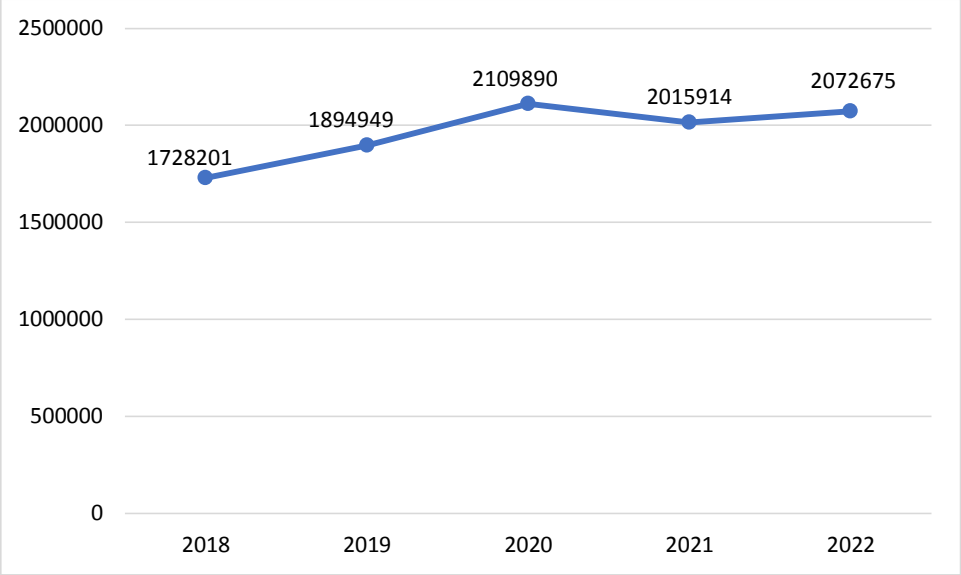
| Goals | Priority |
|---|---|
| Environment Aspect | 1 |
| Economic Aspect | 2 |
| Legal Aspect | 3 |
| Social Aspect | 4 |

Source: data processed by expert choice (2024).

Researchers collect data from respondents in the field through questionnaires and process it, then process it using analytical tools. The results obtained are that the most prioritized aspect is the environmental aspect, followed by the economic aspect. Legal aspects are the third priority, and social aspects are the last priority. The following is an assessment of each aspect:

### 1. Environment Aspect

The development of oil palm land in West Kalimantan is increasingly expanding. The following is the area of oil palm plantations in West Kalimantan from 2018 to 2023:




Source: Data BPS processed (2023).

**Figure 3. West Kalimantan oil palm land area 2018-2022 (Hectares)**

West Kalimantan has an increasingly extensive oil palm plantation area. Figure 3 proves that the area of oil palm land in West Kalimantan province has continued to increase in the last five years, namely 2018-2022. Increasing land area can result in increased deforestation or land conversion. This could be detrimental to environmental conditions in West Kalimantan Province. Twelve districts in West Kalimantan Province have large areas of oil palm plantations. There are two cities, namely Pontianak City and Singkawang City, which do not yet have oil palm plantations because they are urban areas.

Environmental aspects are the main thing in the development of sustainable palm oil in West Kalimantan Province. The environmental aspect has three criteria, namely, sustainable use of natural resources, ways to conserve land, and climate change. Appropriate and sustainable use of natural resources is a top priority in the development of sustainable oil palm plantations in West Kalimantan province. Then, the next priority is land conservation, which is carried out well and pays attention to the environment. Land expansion for oil palm plantations must be accompanied by policies and regulations that impose tighter restrictions on peatlands, support infrastructure development, and provide economic incentives (Xin *et al.*, 2022). The final priority is climate change, although it is considered very important that climate change that occurs due to the expansion of oil palm plantations must pay attention to the policies that have been established. Apart from focusing on the problem of deforestation, the campaign also utilizes palm oil waste and processes it into a source of biomass as alternative energy (Su *et al*,. 2023). In West Kalimantan, changes in land use and river discharge patterns affect the species within them. Therefore, all species in it require protection (Primananda *et al.*, 2023). Future oil palm expansion must consider the balance between human and environmental needs (Sharma *et al.*, 2019).

## 2. Economic Aspect

The economic aspects of sustainable palm oil in West Kalimantan province include the criteria for increasing income, economic impact, and improving infrastructure. From an economic perspective, increasing income is the main priority. Meanwhile, the economic impact caused by sustainable palm oil development is the second priority. In sustainable palm oil development, improving infrastructure is the last priority, even though it is important

to do this. The Roundtable on Sustainable Palm Oil (RSPO) is a certification that is expected to solve the problems that occur in palm oil management. However, farmers who are unable to meet the Roundtable for Sustainable Palm Oil (RSPO) standards will face rejection from companies that buy their palm bunches (Oliphant and Simon, 2022). Even though it is important, it will not be able to provide environmental and social benefits, palm oil as a whole would be more sustainable if small farmers who consider oil palm not an economically viable option were willing to adopt other forms of land use (Noor *et al.*, 2017).

### 3. Legal Aspect

The role of the palm oil business in Kalimantan in economic growth and positively impacting local communities. Legal aspects can also be the main focus of sustainable palm oil business policies (Prabowo *et al.,* 2017). There are several criteria in the legal aspect, including conflict resolution, consistency and overlapping interests. Conflict resolution is central to sustainable palm oil. According to (Fizzanty and Masyhuri 2013), the uncontrolled expansion of oil palm plantations has a negative impact because it causes agrarian conflicts, deforestation and forest fires, which trigger haze. Therefore, government policy is needed to resolve the conflicts that occur so that the success of oil palm development can run well when viewed from a legal aspect. Then, the consistency criterion becomes the next priority. This is because consistency from all elements of society and stakeholders is important for sustainable palm oil production in West Kalimantan province. Overlapping interests are the last priority that must be implemented.

### 4. Social Aspect

Based on the results of pairwise comparison calculations, poverty alleviation is the fourth priority after the legal aspects chosen by policymakers in West Kalimantan Province for oil palm development. From a sustainable development perspective, it is very important to prioritize aspects of participation and social justice for society through several programs carried out to increase community empowerment. Carrying out community empowerment can increase community income (Amanah *et al.*, 2008). The community or oil palm farmers not only get income from palm oil but also how take advantage of existing opportunities. According to (Mulyasari *et al.*, 2023), he concluded that workers on oil palm plantations do not have access to social health and work safety guarantees. This has an impact on the workforce in the oil palm plantation sector which is not an attractive job for local workers.

### Palm Oil in Central Kalimantan

Based on the results of pairwise comparison calculations or pairwise comparisons for the main criteria or objectives (priority aspects) which consist of social displacement aspects, legal displacement aspects, economic displacement aspects, environmental displacement aspects prioritizing environmental displacement aspects. Description of priority ranking as in the table below:

**Table 2. Priority Aspects of Palm Oil Sustainability Central Kalimantan**

| Goals | Priority |
|---|---|
| Environment Aspect | 1 |
| Economic Aspect | 2 |
| Legal Aspect | 3 |
| Social Aspect | 4 |

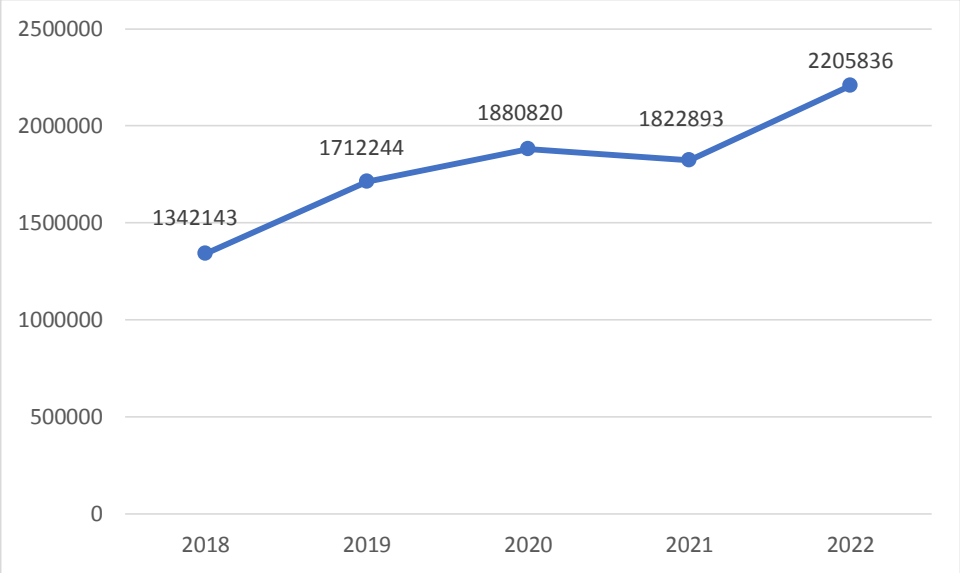
Internal analysis consisting of the strengths and weaknesses of the palm oil business as well as external analysis including business opportunities and challenges, a hierarchy is formed that can be used as a priority in developing sustainable palm oil plantations. The final targets or objectives expected in the development of sustainable palm oil plantations are divided into four aspects: Social Sustainability Aspects, Legal Sustainability Aspects, Economic Sustainability Aspects and Environmental Sustainability Aspects.

Environmental sustainability aspects are the first priority in palm oil development. In this aspect, policymakers consciously carry out all forms of activities, including production activities that have an impact on the environment. Second, the priority is on aspects of economic sustainability. The economic aspect is something that continues to develop among palm oil entrepreneurs and policymakers and has an impact on the income that workers and owners receive. Third, the priority chosen is the aspect of legal sustainability. Fourth, prioritize social sustainability. For each of the goal criteria above, which sub-criteria should be prioritized will be explained.

Starting from the smallest priority in the Social Aspect criteria. Social aspects form sub-criteria consisting of poverty alleviation, gender equality and food security. The following results are obtained, namely:

## 1. Environment Aspect

The environmental aspect criteria are sub-criteria for sustainable resource use, land conservation and climate change. The environmental aspect is an aspect that must be considered, starting from the impacts and overcoming the impacts caused by the existence of oil palm plantations in Central Kalimantan province.




Source: Data BPS processed (2023).

**Figure 4. Central Kalimantan oil palm land area 2018-2022 (Hectares)**

Figure 4 explains that the province of Central Kalimantan in the five years 2018-2022 has increased and is very significant. Therefore, Central Kalimantan's province has the highest productivity level among all provinces on the island of Kalimantan. Based on the results of pairwise comparison calculations, the first sub-criteria that must be prioritized in order to develop oil palm is land conservation. Oil palm land conservation is part of the protection, restoration, improvement and maintenance of land functions in accordance with land capabilities and use. Land conservation is

also a form of awareness among policymakers to maintain the existence of oil palm by increasing productivity, quantity and quality of soil and groundwater. Second, sustainable use of natural resources. This sub criterion is the second priority with the aim of sustainable development as well as the balance of life and environmental preservation in the future. The third change in advertising. Several other countries consider that palm oil is a source of carbon release from irresponsible cultivation processes (Supriyanto *et al.,* 2023). In this sub-criterion, policymakers have not really felt the impact of climate change, even though the issue of climate change is quite high and has become an urgent matter for researchers throughout the world. Not the government, but entire communities can protect the parts of the forest necessary to preserve all target species (Primananda *et al.,* 2023). On the island of Kalimantan there is an oil palm landscape conservation area which has an important role in preserving existing species (Ramadhan *et al.* 2023).

**2. Economic Aspect**

The economic aspect criteria are in the form of sub-criteria consisting of increasing income, economic impact, and infrastructure improvements. Based on the results of pairwise comparison calculations, the sub-criteria that must be prioritized to be able to develop oil palm is increasing income. Increasing income is the hope of all palm oil workers. Increasing income also increases welfare. Second, infrastructure improvements. This is because road access to oil palm plantations is still not good. Apart from that, access to connecting roads between districts and provinces still requires a longer travel time. Third, the economic impact. The economic impact is less of a priority for policymakers because human resource management still does not require a large workforce. The labor they use is usually manual labor which is mostly used during harvesting and planting. The sustainability of vegetable oils may not be in line with environmental sustainability, so the government must consider which vegetable oils are able to continue to meet needs and pay attention to the environment (Lieke *et al.,* 2023).

Policies that pay attention to the agricultural sector can influence economic growth in the long term (Ideh *et al.,* 2021). Other countries provide negative information regarding the use of oil palm plantations, causing large economic losses (Qaim *et al.,* 2020). Chrisendo *et al.* (2022) believe that implementing oil palm cultivation can i's Average poverty in rural areas tends to be lower, and GRDP tends to be higher in areas with oil palm productivity. Prove the standard of living and the formation of human resources in community households.

**3. Legal Aspect**

The criteria for the legal aspect form sub-criteria consisting of conflict resolution, consistency and a high level of importance. Based on the results of pairwise comparison calculations, the sub-criteria that must be prioritized to be able to develop oil palm is conflict resolution. Next is the level of consistency of the laws applied. Lastly, there is overlapping inequality that still occurs among palm oil business actors. Oil palm plantations that use forests as plantation land have in recent years become the main cause of deforestation in Central Kalimantan (Setiawan *et al.,* 2016). This is not just an economic issue, but issues regarding economic growth, productivity, forest protection, landscape mosaics, land ownership rights, sustainability certification, and the inclusion of small farmers are policy objectives (Qaim *et al.,* 2020). Policies to develop profitable oil palm in areas where local communities experience problems of poverty, poor health, malnutrition or food insecurity (Shahputra and Zen 2018).

**4. Social Aspect**

Based on alternative options that can be taken by policymakers, namely agribusiness public-private partnership (Ag-PPP) - a

public-private partnership for agribusiness development. This alternative is expected to be able to realize sustainable agricultural development involving small farmers, Aseete *et al*. (2023) stated that this alternative could provide positive results for farmers and encourage increased production from targeted interventions. The existence of this alternative can increase productivity, sales volume and the share of output marketed. Of course, selecting alternative policies must take into account existing development policies. Sustainability is the basis for improving environmental sustainability risks so that there are alternatives that can be implemented (Lieke *et al.*, 2023).

**Policy alternatives Central Kalimantan and West Kalimantan**

The obstacles that occur in the palm oil business provide lessons for all parties to pay more attention to all aspects. There are many things that can be done to contribute to sustainable palm oil policies. Stakeholders must provide appropriate policies and good governance in the palm oil business. The government needs to focus on aspects of policy implementation related to the conservation value and benefits of biodiversity by implementing sustainable palm oil governance (Astari and Lovett, 2019).

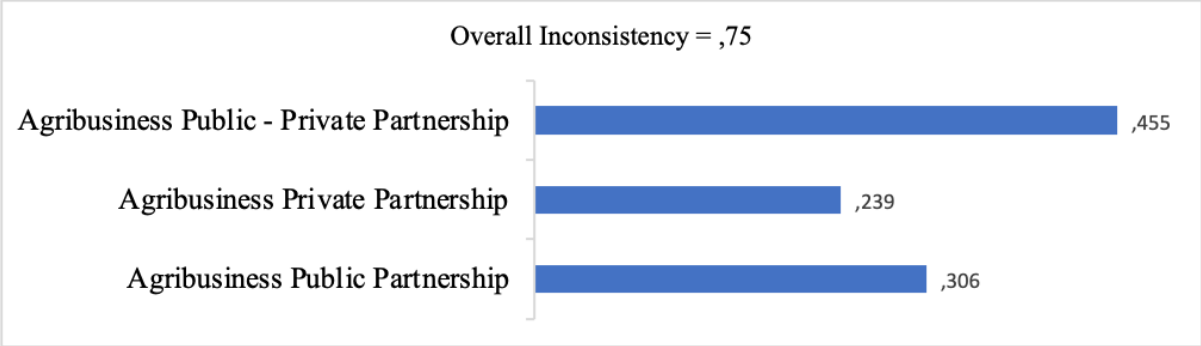



**Figure 5. Policy alternatives by Expert Choice software**

Figure 5 shows that the results obtained from calculations using the AHP model produce 3 policy alternatives. Government Agribusiness - Private Partnership received a score of 0.455 as the first and main priority. Agribusiness Public Partnership is the second priority with a value of 0.306. The Agribusiness Private Partnership Policy is one of the policy alternatives that are the final priority that can be implemented.

Based on alternative options that can be taken by policymakers, namely agribusiness public-private partnership (Ag-PPP) - a public-private partnership for agribusiness development. This alternative is expected to be able to realize sustainable agricultural development involving small farmers. In the Indonesian agricultural sector, especially oil palm plantations, it is possible to create good partnerships that support oil palm plantations through a public-private partnership system. Partnership schemes increase profitability and expand markets, thereby potentially creating new centers of economic growth. The existence of this alternative can increase productivity, sales volume and the share of output marketed. Of course, selecting alternative policies must take into account existing development policies. The development of oil palm in the next few years will expand land so that it can increase palm oil production. Palm Oil Partners, both government and private, are expected to gain benefits in the short, medium, and long term. Through the production and sale of certified rice seeds, farmers will receive direct benefits in the form of income that exceeds the value of Gross National Product (GNP) per capita. Alternative policies that can be implemented are land use and spatial planning to support oil palm development (Sharma *et al*,. 2019).

Sustainability is the basis for improving environmental sustainability risks so that there are alternatives that can be implemented (Lieke *et al.*, 2023). Policies to harmonize the growth of oil palm plantations and reduce deforestation require good institutions (Sharma *et al.*, 2019).

## Conclusions

Oil palm plantations in Kalimantan, both West Kalimantan and Central Kalimantan, each have their characteristics. West Kalimantan still has many obstacles to developing the oil palm business. One of the problems is social conflict, and oil palm farmers must own ISPO certification. The policies implemented in West Kalimantan must be a priority for the government in developing a sustainable oil palm business.

The results of the process hierarchy analysis in West Kalimantan oil palm plantations show that the most important aspect in sustainable oil palm plantations is the environmental aspect which is the first priority, followed by the economic aspect. Legal aspects are the third priority, and social aspects are the last priority. Likewise in Central Kalimantan, environmental aspects are the main focus in sustainable palm oil plantations and policy direction. The analysis uses AHP with the expert choice application and compares two provinces that have extensive land and oil palm production, namely West Kalimantan and Central Kalimantan. So, this shows that sustainable palm oil development needs to pay attention to environmental aspects. The policy that can be implemented is a partnership between the government and the private sector. This must be done jointly by all parties for the sustainability of the palm oil business according to the required standards. This alternative policy is expected to be able to realize sustainable agricultural development involving small farmers, companies and the government. The government must be able to provide support for the success of public-private partnerships. In the Indonesian agricultural sector, especially oil palm plantations, it is possible to create good partnerships that support oil palm plantations through a public-private partnership system.

## Conflicts of Interest

We as authors declare that there is no conflict of interest in this article.

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