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ORIGINAL ARTICLE

Sustainable investment strategies in the palm oil industry in Indonesia

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ABSTRACT

The purpose of this study is to look at the negative environmental impacts and social problems, which require a government response to maintain the sustainability of the palm oil industry. This research uses Online Research Methods (ORMs) to collect data and information through the internet and other digital technologies. The collected data was then coded using Nvivo 12 Plus. The purpose of this study is to fill the research void left by previous researchers by analyzing investment strategies and services in supporting the sustainability of the palm oil industry in Riau Province. This study shows that to support the potential of the palm oil industry to remain optimal, the central and local governments coordinate to provide investment services and pay attention to the sustainability issues of the palm oil industry. Some important aspects to consider are strengthening regulations, an integrated plantation licensing system, improving access to markets, RSPO certification, realization of foreign investment, downstream industry, replanting programme, plantation revitalisation programme, and sustainable plantation partnerships. However, there are still some crucial challenges, particularly land conflicts, climate change, environmental issues, limited technology and innovation, and export market dependence. These challenges may hamper future investment opportunities.

KEYWORDS

strategy; government services; sustainable investment; palm oil industry; Indonesia

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1. Introduction

Palm oil-producing countries, such as Indonesia, heavily depend on the palm oil industry revenue (Dharmawan et al., 2020). The palm oil industry significantly contributes to the Indonesian economy and the environment. Paying attention to these aspects is the same as carrying out the idea of a sustainable industry. The aspects of sustainability and governance are closely related to the palm oil industry (Prianto et al., 2021). The government plays a vital role in regulating and supervising the palm oil industry to ensure that the industry operates sustainably and does not harm society and the environment. To support this idea, the government needs to have an effective monitoring and regulatory policy mechanism for the palm oil industry to ensure it (Purnomo et al., 2020). According to Directorate General of Plantations, 2021 is the year when palm oil exports experienced the highest increase over the past five years, amounting to US$ 27.6 billion with a growth of 58.79% compared to the previous year (PanganNews, 2022). As a result, palm oil is one of Indonesia's top exports. Oil palm is a plantation crop that is used to make palm oil, a vegetable oil that is the starting point for many goods, including food, cosmetics, and biodiesel fuel (Low et al., 2021; McIntyre-Mills et al., 2023). Oil palm grows in tropical areas such as Indonesia, Malaysia, Thailand, and several other countries such as Africa and Latin America. Indonesia is one of the largest palm oil producers in the world (Paterson, 2020).

The palm oil industry plays a vital role in the Indonesian economy. However, this industry is also associated with negative environmental impacts and social problems, ten of those problems are critically highlighted (Malik et al., 2021; Manik et al., 2013). In addition, palm oil production faces several technical challenges, such as pest and disease attacks (Maluin et al., 2020). This can hinder the sustainability of the industry from running optimally. To maintain the sustainability of production, it is necessary to develop technologies and best practices that are environmentally friendly and to develop plant varieties that are resistant to pests and diseases, including their treatment (Lee et al., 2019; Lim et al., 2021; McIntyre-Mills et al., 2023). In this matter, the government needs to have clear and measurable policies and regulations related to the palm oil industry, such as land use, biodiversity management, adopting green technology, social responsibility, and industry operating according to sustainability rules and requirements (Pacheco et al., 2020). In addition, it is also possible for the government to involve the community in making decisions related to the palm oil industry, such as land use planning, environmental management, and other education (Majid et al., 2021). Community involvement can increase community participation and support in maintaining the sustainability of the palm oil industry. In addition, the government needs to encourage investment and financing that support the sustainability of the palm oil industry, such as investment in environmentally friendly technologies and financing for sustainability programs (Johari et al., 2015; Tan and Lim, 2019).

The literature review described in **Figure 1** identifies and analyzes previous research issues regarding the sustainability of investment in the palm oil industry using the keywords "Palm Oil Industry and Sustainability Development". This research forms the basis of research that focuses on investing in the sustainable palm oil industry in Riau Province, Indonesia.

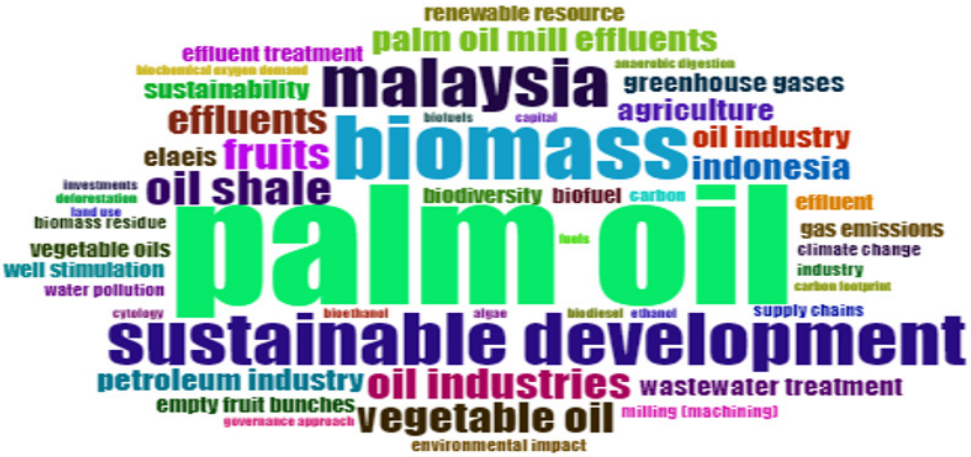

Figure 1. Biblioshiny Identification and Analysis (Wordcloud) from relevant research and related sources analysis using biblioshiny 2023.

Figure 1 above shows thematically the issues related to sustainable investment in the palm oil industry. However, based on the results of research mapping with 96 data using of biblioshiny software, it is known that research on investment in the palm oil industry, challenges and sustainability, is still rare, especially in research located in the Provinces of Indonesia. In the trend of previous research issues that have just been published and are related to this research topic based on the mapping above, it shows that issues regarding sustainable and palm oil industry strategies are still being researched recently, so this is the reason for research to raise the research topic on Sustainable Investment Strategy in the Palm Oil Industry in Indonesia. Based on the trend of previous research shown in **Figure 1**, this research focuses on sustainable investment strategies in Riau Province, Indonesia, which is still under-researched by previous research.

Much research has been done on the palm oil industry. However, there are still few research results that specifically and simultaneously explain this topic by linking it to the topic of discussion on sustainable palm oil investment strategies and services (Yuslaini et al., 2023). However, there is some relevance from the results of previous studies, which are still considered relevant enough to support this research. First, Kalimantan and Sumatra account for the majority of Indonesia's output of palm oil (Afriyanti et al., 2016; Effendi et al., 2017). Second, investment in the palm oil industry is beneficial for expanding production. Investments can be used to expand oil palm plantations, increase crop productivity, and build infrastructure to support production (Nesadurai, 2019; Parvand and Rasiah, 2021). Third, governments can play an essential role in regulating and monitoring investments in the palm oil industry and ensuring that these investments contribute to sustainable development and are in the interests of society and the environment (Tey, Brindal, Djama, et al., 2021; Widianingsih, McIntyre, et al., 2023).

This study aims to fill the research void left by previous researchers by analyzing investment strategies and services in supporting the sustainability of the palm oil industry in Riau Province. Riau Province was selected because it is one of Indonesia's palm oil-producing regions. The research questions are mapped as follows. (a) How is the palm oil investment industry in Riau Province, Indonesia? (b) What is the investment service's potential and contribution to the palm oil industry in Riau Province, Indonesia? (c) What challenges and obstacles must be overcome to ensure the sustenance of the palm oil industry in Riau Province, Indonesia? The answers to these

three research questions can play a crucial role in encouraging the development of sustainable investments that benefit society and the environment.

2. Study methodology

2.1. Research design

This research relies on Online Research Methods (ORMs) to collect data and information via the Internet and other digital technologies (Eid and Diener, 2006; Reips, 2002, 2006; Reips and Bosnjak, 2001). This study aims to fill the research gap left by previous researchers by analyzing investment strategies and services in supporting the sustainability of the palm oil industry in Riau Province. As for the location of this research, it is in Riau Province, Indonesia. The reason for choosing the location, namely Riau Province, is that Riau Province has a vast area of oil palm plantations and has a positive trend in the development of the plantation area with the planting area increasing every year. The reason for choosing the ORMs writing method is that the data is an important report document to see the sustainability investment strategy of the palm oil industry in Riau Province, Indonesia so that from the data, it can help the author explore the palm oil sustainability investment strategy.

2.2. Data collection techniques

Data collection was through secondary data, such as government documents. They are, the Riau Province Plantation Service (Dinas Perkebunan Provinsi Riau, 2023a), Central Bureau of Statistics (Badan Pusat Statistik Provinsi Riau, 2023), Directorate General of Plantations (Direktorat Jenderal Perkebunan, 2023), Ministry of Industry (Kementerian Perindustrian Republik Indonesia, 2023), Coordinating Ministry for Economic Affairs (Kementerian Koordinator Bidang Perekonomian Republik Indonesia, 2023), Ministry of Energy and Mineral Resources (Kementerian ESDM RI, 2023), Agency for the Assessment and Application of Technology (Badan Pengkajian dan Penerapan Teknologi, 2023), Directorate General of National Export Development (Direktorat Jenderal Pengembangan Ekspor Nasional, 2023), Investment and One Stop Service Office of Riau Province (DPMPTSP Provinsi Riau, 2023), and Regional Government of Riau Province (Portal Pemerintah Provinsi Riau, 2023). ORMs have several data filtering techniques that can be used in online research processes. The filter used in this study is based on keywords (oil palm investment; oil palm; Riau, oil palm, and sustainability).

2.3. Data analysis

The data analysis technique in this research is the coding analysis technique (Radez et al., 2021). The steps in this research are identification, classification, mapping, and conclusion. Research analysis is shown in **Figure 2**. The data was successfully collected, while some data that had not been visualized on the website in the form of text information, was coded and analyzed through Nvivo 12 Plus.

Figure 2 shows the analysis process starting with data collection by determining the relevant data sources. Relevant data sources were found from official government websites. Filtering and data collection is done by searching stages based on keywords, identifying information, and the collection process. The collected data is then transferred to the Nvivo 12 Plus analysis tool for

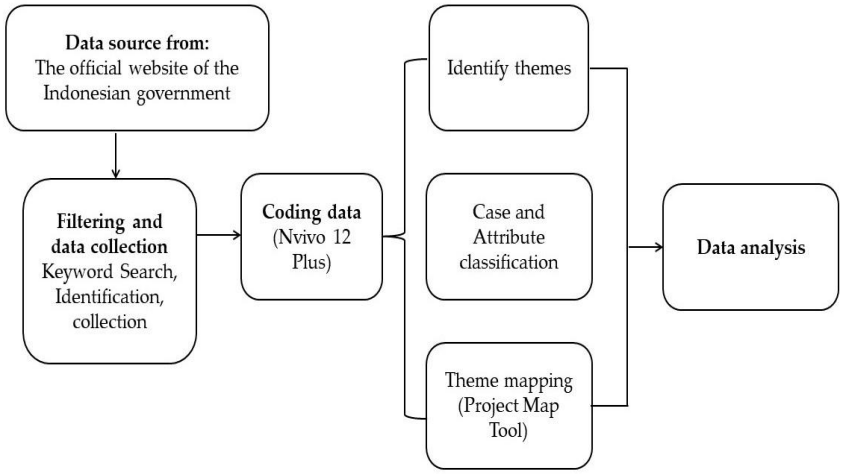

Figure 2. Data analysis process.

data coding. The data coding process maximizes the available analysis features, namely, identify themes, cases and attribute classifications, and theme mapping (Project Map Tool). Identifying themes helps to identify the information contained in the official government website. Cases and attribute classifications are useful for categorizing the collected data. Theme mapping is useful for mapping the overall results of coding data that have previously been categorized. The results of data collection and coding were then analyzed and described to answer research questions.

3. Result and discussion

3.1. Strategy and government services supporting investment and sustainability in the palm oil industry in Riau Province

To support the potential of the palm oil industry to continue to run optimally, the central and local governments coordinate to provide investment services and pay attention to the sustainability issues of the palm oil industry. Some important aspects considered are strengthening regulations, integrated plantation licensing service system, improving access to markets, RSPO certification, foreign investment realization, downstream industry, replanting programme, plantation revitalization programme, and sustainable plantation partnerships. The government is also undertaking the construction of palm oil effluent-based biogas plants and the development of the Riau Investment Canal (RIC) to support these efforts.

There are several strategies and services considered by the government to support the palm oil industry investment and sustainability issues. These strategies and services are mapped and can be seen in **Figure 3**.

To support palm oil investment and sustainability in Riau Province, the government is coordinating between the center and the regions. The coordination concentrates on individual strategies and services, but has a significant bearing on supporting investment opportunities and the sustainability of the palm oil industry in Riau Province. The central government considers several important aspects, including regulations, an integrated plantation licensing service information system (Siperibun, 2019), improved access to markets (Kementerian Perindustrian Republik Indonesia, 2021b), RSPO certification, realization of foreign investment, provision of technical

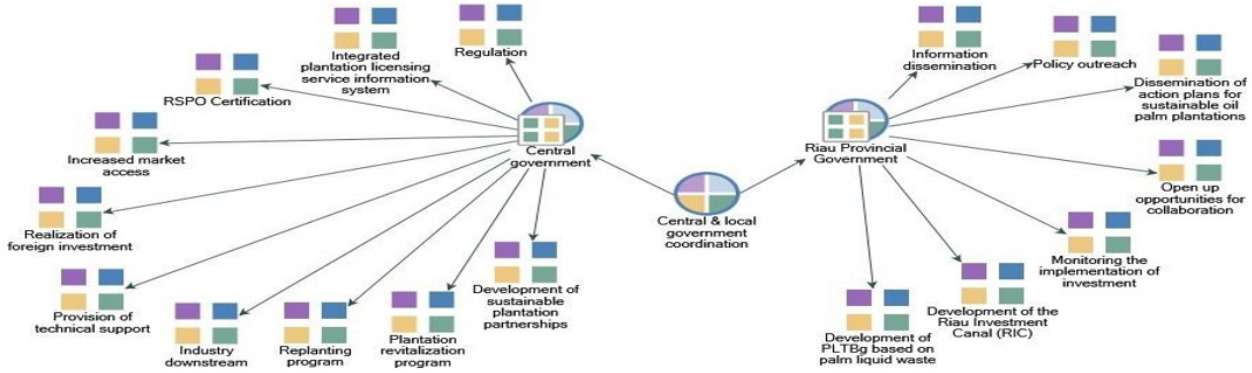

Figure 3. Coordination of the central government and the regional government of Riau Province in supporting investment services and the sustainability of the palm oil industry in Riau Province.
Source: Processed by researchers using Nvivo 12 Plus, 2023.

support, downstream industry (Kementerian Perindustrian Republik Indonesia, 2021a), replanting programme, plantation evitalization programme (Siperibun, 2019), and the development of sustainable plantation partnerships (Kementerian Perindustrian Republik Indonesia, 2021c). The Riau Provincial Government considers several aspects including: dissemination of information, socialization of policies, socialization of action plans for sustainable oil palm plantations, opening up opportunities for cooperation, monitoring the implementation of capital investment (Dinas Perkebunan Provinsi Riau, 2023b; Pemerintah Provinsi Riau, 2018), construction of a biogas plant based on palm liquid waste (Media Center Riau, 2016), and development of Riau Investment Canal (RIC) (Pemerintah Provinsi Riau, 2023).

3.2. Potential and contribution: Investment services and the future of the palm oil industry in Riau Province

Riau Province has excellent potential for developing the palm oil industry, with land area that is very suitable for the growth of oil palm plants and production, which has proven to be one of the largest in Indonesia (Retnaningsih et al., 2022; Syahza et al., 2020). In addition, the palm oil industry also significantly contributes to the economic growth and welfare of the people of Riau (Aulia et al., 2020; Widianingsih, Abdillah, et al., 2023). Land conflicts are conflicts between communities and palm oil plantation companies in Riau Province, Indonesia. The trigger of the problem is the community's dissatisfaction with the decision, resulting in conflict between the community and the company. Another trigger for conflict is companies seizing land without providing compensation (Froese and Schilling, 2019). Area of oil palm plantations in Indonesia can be seen in **Figure 4**.

Riau is one of Indonesia's regions with the most extensive oil palm plantations, accounting for 21.6% of the state's total land area. Consequently, the palm oil industry in Riau has immense investment potential (Rizaty, 2022). Investments in the palm oil industry in Riau Province may include developing plantation areas, processing factories, developing technology, and improving the quality of human resources, especially in supporting the idea of sustainability. In addition, the potential for developing palm oil derivative products such as crude palm oil, olein, stearin, and biodiesel is also huge in Riau (Syahza and Asmit, 2019). This potential is also balanced with the trend of expanding the area of oil palm plantations in Riau Province. It can be seen in **Figure 5**.

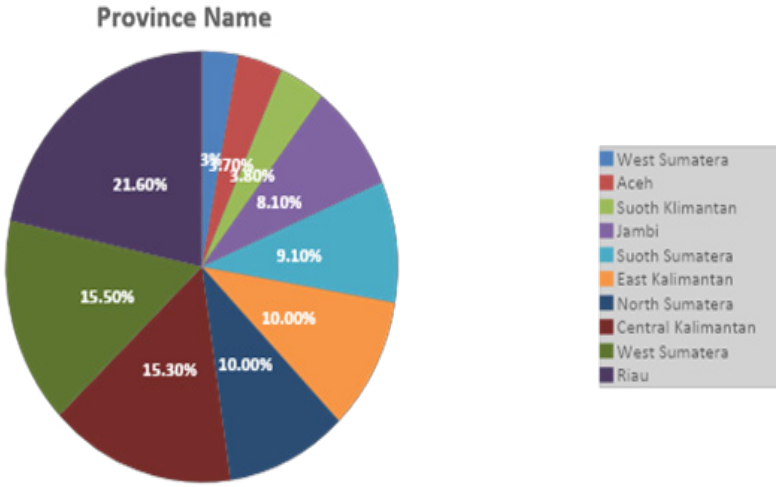

Figure 4. Riau is listed as the province with the most extensive oil palm plantations in Indonesia in 2021, reaching 21.6%.
Source: Ministry of Agriculture report, 2021.

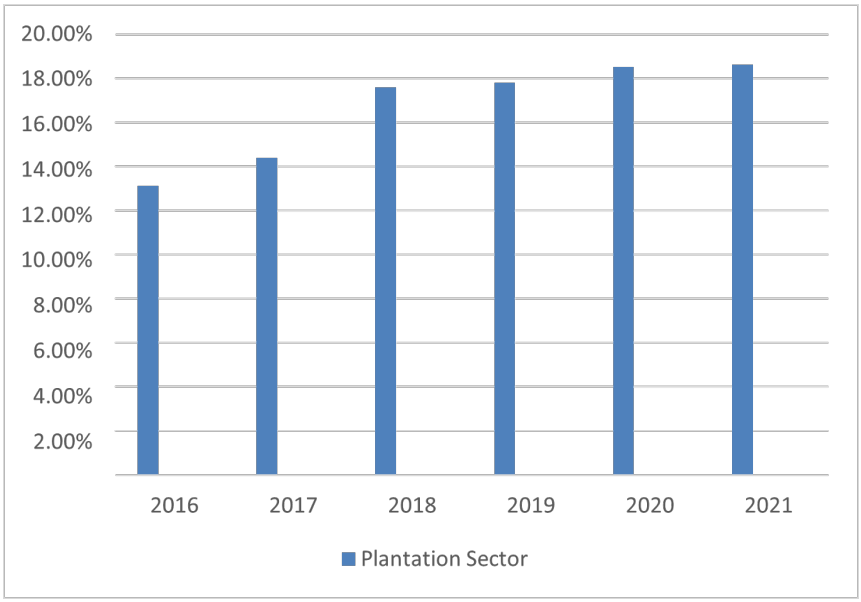

Figure 5. Trends in the development of oil palm plantations in Riau Province.
Source: Kementerian Perindustrian Republik Indonesia, 2021a.

The palm oil industry is an important industry in Riau Province and has attractive investment potential. This is supported by the vast area of oil palm plantations and there is a positive trend in the development of plantation area every year (Kementerian Perindustrian Republik Indonesia, 2021a). According to their cultivation status, most of the oil palm plantations in Riau Province in 2021 were cultivated by smallholder plantations, amounting to 1.76 million hectares (61.65%), 1.02 million hectares (35.72%) were cultivated by large private plantations, and 0.08 million hectares (2.63%) were cultivated by large state plantations. The size and trend of oil palm plantations in Riau Province also contribute to export activities (Badan Pusat Statistik, 2021). The contribution to these exports can be seen in **Figure 6**.

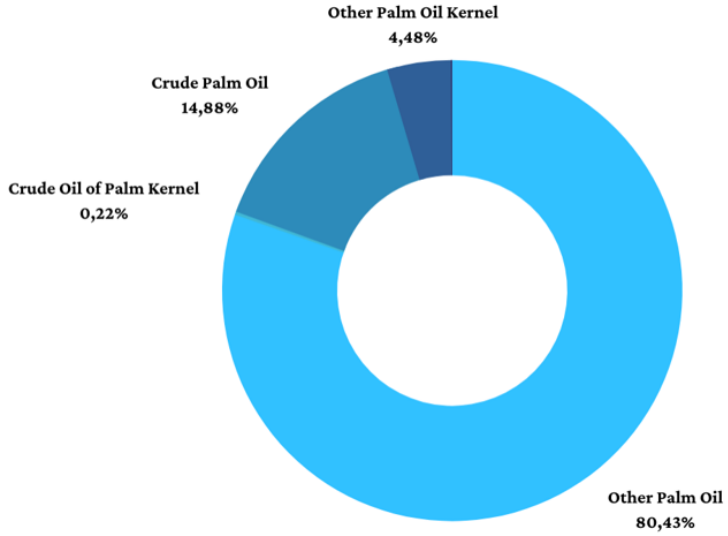

Figure 6. The development of palm oil exports is based on the Harmonized System (HS) group.
Source: Central Bureau of Statistics for Riau Province, 2021.

Based on the Harmonized System (HS) palm oil group, in 2021, the most significant export volume will be "other palm oil", with 80.43% of the total exports of Riau Province palm oil. Furthermore, the contribution of other palm oil exports was "crude palm pil" at 14.88, "other palm oil kernel" at 4.48%, and "crude oil of palm kernel" at 0.22%. The palm oil industry's contribution to Riau Province also influences economic growth. Based on the Gross Regional Domestic Product (GDP) at current prices in 2022, Riau's economy will reach IDR 991.59 trillion, and at constant prices in 2010, it will reach IDR 529.53 trillion. Riau's economy in 2022 grows 4.55%. Riau's economic growth can also be observed in the trend of investment realization of foreign investment and domestic investment in the plantation sector.

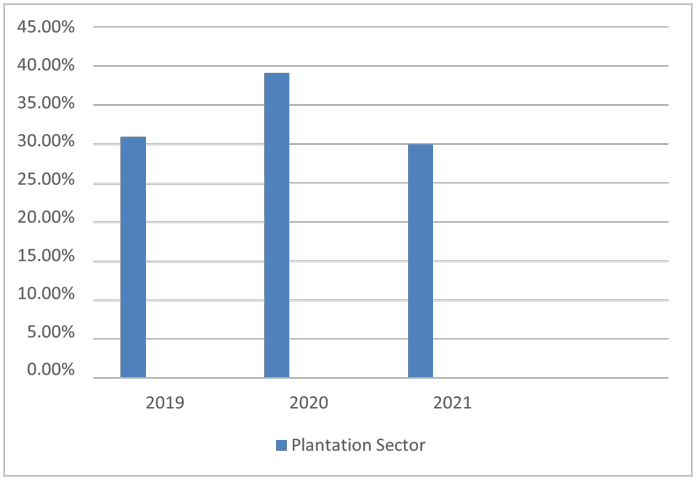

Figure 7. Realization of domestic investment and foreign investment for 2019–2021 in the plantation sector in Riau Province.
Source: One Stop Investment and Services Office, 2023.

Based on **Figure 7** above (the realization of domestic investment and foreign investment in Riau Province), it is known that the palm oil industry, which is included in the plantation sector,

has made a positive contribution, despite experiencing an inconsistent trend. The data shows that in 2019, investment realization in the plantation sector was 30.9% (Rp. 8,762,658,740,000), 2020 was 39.1% (Rp. 11,104,621,540,000), and 2021 was 30.0% (Rp. 8,519.721,640,000). One of the Riau Provincial government's approaches to supporting the sustainability of the palm oil industry is to create policies that increase production through oil palm replanting and new plantings, as well as the conversion of oil palm, rubber, and coconut. In addition, the government is expanding and modernising palm oil mills.

3.3. Challenges faced in supporting investment and sustainability of the palm oil industry

The palm oil industry is a very important industry for the economy of Indonesia and Riau Province in particular. However, there are several challenges faced in supporting investment opportunities and the sustainability of the palm oil industry in Riau Province.

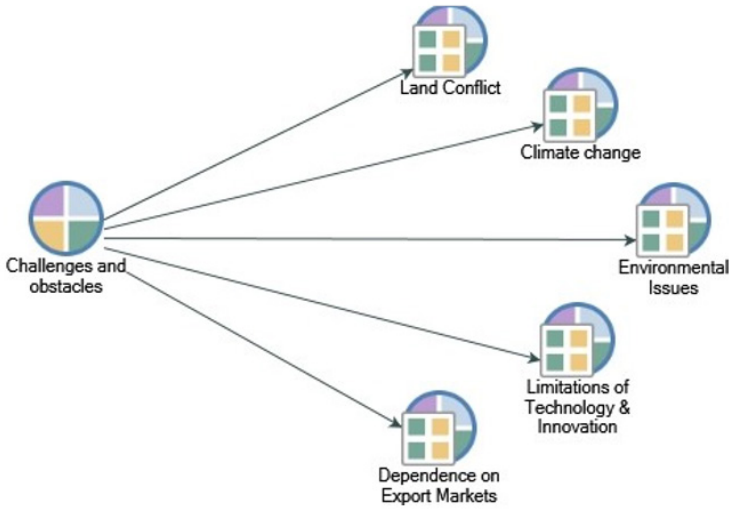

Figure 8. Investing in and sustaining the palm oil industry in Riau Province is hindered by a number of challenges and obstacles.

Source: Processed by researchers using Nvivo 12 Plus, 2023.

Based on **Figure 8** above, challenges faced are land conflicts, climate change, environmental issues, limited technology and innovation, and export market dependence. Land conflicts often occur in Riau, especially between palm oil companies and local communities who claim that their land has been misused by palm oil companies. Land rights disputes, namely: the emergence of a legal dispute stems from a complaint by a party (person/body) that contains objections and demands for land rights, both to the status of the land, and to the status of the land, containing objections and demands for land rights, both to land status, priority, as well as ownership with the hope of obtaining administrative settlement in accordance with the provisions of the applicable regulations (Ayompe et al., 2021).

Based on **Figure 9**, land conflicts still occur in Indonesia from year to year. Riau has the highest conflict vulnerability, with 29 cases throughout 2020. Palm oil plantation disputes account for 20.8% of the total sub-sector conflicts in Indonesia (Abdillah et al., 2023; Yuslaini et al., 2023). Land disputes can impede investment and threaten the sustainability of the palm oil industry (Varkkey et al., 2018). Besides land conflicts, climate change, such as erratic rainfall patterns, environmental issues like deforestation, water and soil pollution, and biodiversity loss, also significantly impact

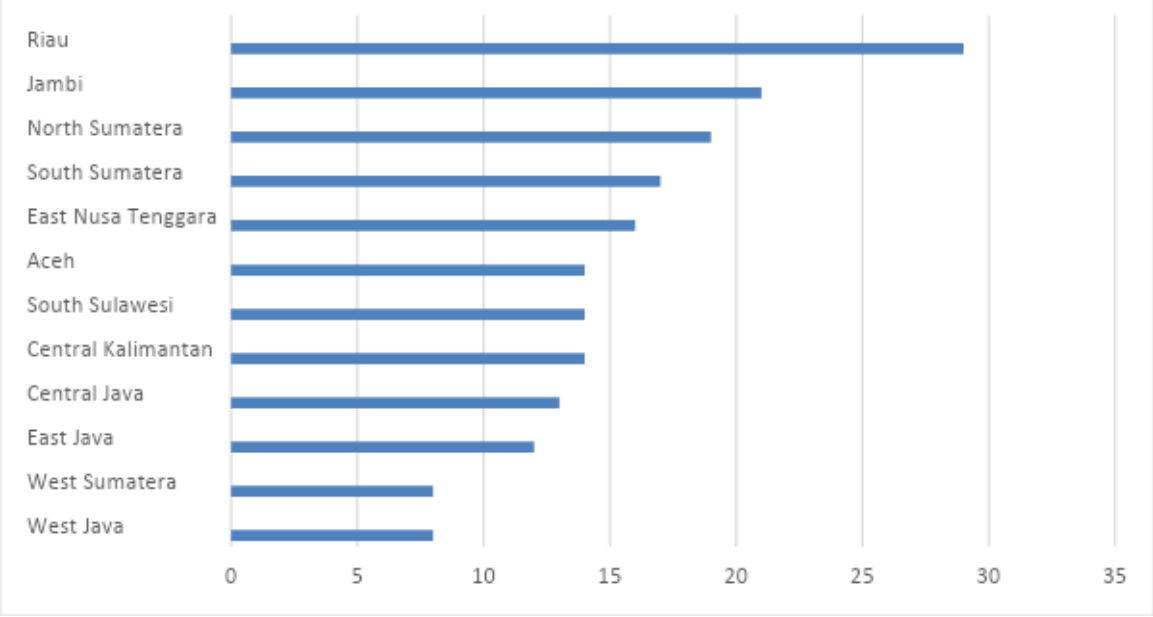

Figure 9. Riau Province is one of the areas that often experienced land conflicts in 2020.
Source: Processed by researchers in 2023.

investment opportunities (Azhar et al., 2021; Blach-Overgaard et al., 2010). Limitations on technology and innovation, such as relying on traditional technology in production, are also seen as hindering investment opportunities (Hansen and Nygaard, 2014). At the same time, the problem of dependence on export markets (Davy, 2021), especially from European and Asian countries, is also a challenge in opening up opportunities for investment and influencing the sustainability of the palm oil industry in Riau Province, Indonesia. The challenges of palm oil investment include technology, information, input access, market access, and financial access which can hinder access to certificates and global markets.

3.4. Sustainable investment strategies in the palm oil industry in Indonesia

Coordination between the central and regional governments is essential in providing investment services and the sustainability of the palm oil industry. The palm oil industry involves many aspects, such as forestry, plantation, environment, and social, which the central and regional governments manage. Central and regional governments cooperate in monitoring and enforcing policy regulations against violations and opportunities in palm oil industry activities. This coordination aims to prevent illegal practices and protect the environment and communities affected by the activities of the palm oil industry. Good coordination between the central and regional governments in providing investment services and supporting the sustainability of the palm oil industry is essential to ensure that the activities of the palm oil industry are carried out sustainably and following applicable regulations.

In addition to these regulatory aspects, the Indonesian government is also improving the information system for integrated plantation licensing services. Improving the information system for integrated plantation licensing services is a critical investment and sustainability service for the palm oil industry. An integrated information system can make it easier for investors to obtain accurate and complete information on oil palm plantation permits, such as location permits, environmental permits, and plantation business permits (Putri et al., 2022). An integrated

information system can also help increase efficiency and transparency in the licensing process, and minimize delays or repetition of permit applications. Thus, an integrated information system can improve the speed and quality of oil palm plantation licensing services.

In addition to regulatory aspects and improving the information system for integrated plantation licensing services, the Indonesian government is also improving market access. Increasing market access is one of the service strategies to open investment opportunities and sustain the palm oil industry. The Indonesian palm oil industry is one of the world's largest producers of palm oil and contributes more than the world's palm oil production (Farobie and Hartulistiyoso, 2022). Thus, access to a broader and better-quality market can help the Indonesian palm oil industry, especially Riau Province, meet the global market's requirements and increase its credibility as a sustainable palm oil producer. One of the efforts to improve market access is to carry out RSPO or Roundtable on Sustainable Palm Oil certification (Johnson, 2022; Tey, Brindal, Darham, et al., 2020).

In addition to considering RSPO certification when supporting investment opportunities and sustainability concerns for the palm oil industry in Riau Province, the central government is also contemplating a number of other crucial factors. The Indonesian government has backed Roundtable on Sustainable Palm Oil (RSPO) certification, a global standard for the production of sustainable palm oil. Furthermore, the Indonesian government has mandated that all palm oil produced in Indonesia be RSPO-certified by 2020. Generally, RSPO certification is conducted by an independent and accredited third party through an auditing procedure (Rodthong et al., 2020). This process verifies sustainable practises throughout the palm oil supply chain, from production to distribution (Nupueng et al., 2022). RSPO certification helps companies gain the trust of consumers and other stakeholders, by demonstrating that the company adheres to high sustainable standards in palm oil production. However, RSPO certification also has some drawbacks, such as the high cost and complexity of the certification process (Wassmann et al., 2023). In addition, several studies also assess that RSPO certification still needs to be stricter and still requires evaluation in reducing the environmental and social impacts of the palm oil industry (Degli Innocenti and Oosterveer, 2020; De Vos et al., 2021). Even so, RSPO certification is still considered an essential effort in supporting the sustainability of the palm oil industry (Macdonald, 2020; Varkkey et al., 2018). In addition to RSPO certification, the Indonesian government also carries out the realization of foreign investment. In this context, foreign investment can help increase the production capacity and quality of the palm oil industry, thereby increasing competitiveness and expanding market share at home and abroad.

To attract foreign investment, it is necessary to increase palm oil industry promotion and marketing on the international market. In addition, the government can also improve the quality of services and investment facilities, such as providing infrastructure, security, and energy availability. Conducive and stable investment policies are essential in supporting foreign investment. In this case, the role of government and industry players is vital to create conducive and attractive conditions for foreign investors to invest in the palm oil industry. Moreover, to seek the realization of capital investment, the government also provides technical support.

Providing technical support, such as education, training, and technology development, is an essential component of the palm oil industry's investment and sustainability services. This can help improve the productivity and efficacy of oil palm plantations, thereby increasing the quality and quantity of sustainable palm oil production (Abdul-Hamid et al., 2020; Martin et al.,

2015). A second effort is downstream of the industry. The industrial downstream is the process of transforming basic materials into finished goods with greater added value. In the context of the palm oil industry, downstream operations can be conducted by converting refined palm oil products, such as palm oil and palm kernel, into completed products with a higher value-added, such as soap, margarine, and biodiesel (Ali et al., 2015; Aziz et al., 2020).

The Indonesian government is also carrying out a replanting program and a plantation revitalization program to open investment opportunities and sustain the palm oil industry in Riau Province. Several studies have also determined that replanting and plantation revitalization programs can be effective in facilitating investment opportunities and promoting the industry's viability (Chazdon and Guariguata, 2016; Woodham et al., 2019). The first step in carrying out a plantation replanting and revitalization program is to identify the needs and current conditions of the plantation (van Hille et al., 2021). This can be done by conducting surveys and assessing existing oil palm plantations. After identifying the needs, the next step is to select superior varieties of oil palm that suit environmental conditions and market needs. Meanwhile, good land preparation is essential for the success of replanting and revitalization programs (Lestari et al., 2021).

In addition to these aspects, there is another crucial aspect that the Indonesian government is carrying out in opening up investment opportunities and supporting sustainable ideas, namely by developing sustainable plantation partnerships (Prianto and Abdillah, 2023; Widianingsih, Abdillah, et al., 2023). Developing sustainable plantation partnerships is identifying potential partnerships between smallholders and investors. Plantation owners can carry out an analysis of the needs and potential of plantations, while investors can carry out an analysis of investment opportunities. Plantation owners can provide facilities and technical support such as superior seeds, fertilizers, and agricultural tools. Investors can provide financial support. In addition, they can also cooperate in terms of using environmentally friendly agricultural technologies and practices. This can reduce the negative environmental impact caused by the palm oil industry's efforts to overcome environmental problems like this to open up investment opportunities, especially in Riau Province.

From **Table 1**, it is explained that the policy regulations regulated by the central government and local governments regarding oil palm plantations in Riau Province, Indonesia are still a positive investment trend. However, local government policies are only an extension of the central government, so there are still many disputes over land for oil palm plantations due to overlapping central and regional regulations. For this reason, the central and regional governments need to coordinate to provide investment services and pay attention to the sustainability of the palm oil industry. Palm oil industry policies aim to increase the added value of commodities in the country and improve people's welfare. The palm oil processing industry in the country is growing.

3.5. Investment and sustainability of the palm oil industry: Local government

In addition to the central government's response, the Provincial Governor of Riau plays a significant role, particularly in terms of disseminating information, promoting policies, promoting action plans for sustainable oil palm plantations, facilitating cooperation, and monitoring investment implementation. Dissemination of information and dissemination of policies on sustainable oil palm plantations can help investors understand the requirements and standards that must be met to make investment sustainably. In addition, disseminating action plans for sustainable oil palm plantations can also help stakeholders understand the steps to be taken to improve the sustainability of the palm

Table 1. Policies of the central and regional governments of Riau Province regarding oil palm plantations in Indonesia.

No	Name	Description	Year
1	Law Number 22 of 2019.	Law No. 22/2019 on Sustainable Agricultural Cultivation System.	2019
2	Law Number 23 Year 2014.	Law No. 23/2014 on Regional Government.	2014
3	Law Number 39 Year 2014.	Law No. 39/2014 on Plantations.	2014
4	Peraturan Menteri Pertanian RI Nomor 11 Tahun 2015.	Peraturan Menteri Pertanian RI Nomor 11 Tahun 2015 tentang Sistem Sertifikasi Kelapa Sawit Berkelanjutan Indonesia (Indonesian Sustainable Palm Oil Certification System/ISPO).	2015
5	Regulation of the Minister of Agriculture No. 11 Year 2015.	Decree of the Director General of Plantations Number: 29/KPTS/KB.120/3/2017 on Guidelines for Replanting Oil Palm Plantations of Smallholders, Human Resources Development and Facilities and Infrastructure Assistance in the Funding Framework of the Palm Oil Plantation Fund Management Agency.	2017
6	Decree of the Director General of Plantations, Number 191/Kpts/RC. 110/7/2014.	Decree of the Director General of Plantations, Number 191/Kpts/RC.110/7/2014 on the Maximum Cost Unit for Plantation Development of Participants in the Plantation Revitalization Program on Dry Land in 2014.	2014
7	Decree of the Director General of Plantations, Number 192/Kpts/ RC.110/6/2013.	Decree of the Director General of Plantations, No. 192/Kpts/RC.110/6/2013 on the Maximum Cost Unit for Plantation Development of Participants in the Plantation Revitalization Program on Dry Land in 2013.	2013
8	Decree of the Director General of Plantations, Number 60/Kpts/RC.110/4/08.	Decree of the Director General of Plantations, No. 60/Kpts/RC.110/4/08 on the Maximum Unit Cost of Plantation Development for Participants in the Plantation Revitalization Program on Dry Land in 2008.	2008
9	Riau Province Governor Regulation Number 47 of 2020.	Governor Regulation (PERGUB) of Riau Province Number 47 of 2020 concerning the Establishment of Technical Implementation Units at the Riau Province Plantation Service.	2020

Source: Processed from various sources 2023.

oil industry.

Opening opportunities for cooperation with various parties, including the government, the private sector, and the community, can help create synergies in carrying out investments and ensuring the sustainability of the palm oil industry. In this regard, the government can play an essential role in connecting investors with potential partners and helping to facilitate mutually beneficial cooperation (BPPT, 2019). In addition, monitoring the implementation of investment in the palm oil industry is very important to ensure that investment in the palm oil sector is carried out sustainably and follows established standards. Good monitoring can help identify problems and challenges that arise from the start so they can be dealt with immediately and ensure that investments can have a long-term positive impact on the environment and surrounding communities.

Of the several efforts made by the Riau provincial government, there have been several other

efforts, namely by constructing Biomass Gasification Power Plant based on palm liquid waste and developing the Riau Investment Canal (RIC). The construction of the Biomass Gasification Power Plant based on palm liquid waste is one possible solution to overcome the problem of palm liquid waste and energy needs in the oil palm plantation area.

Palm liquid waste has the potential to be used as fuel in power plants, thereby reducing dependence on fossil energy sources and reducing the environmental impact generated by palm oil liquid waste (Yek et al., 2021). Empirical information about the development of Biomass Gasification Power Plant based on palm liquid waste in Riau Province can be seen in **Figure 10**.

Figure 10. The government continues to encourage the development of renewable energy to be utilized massively by developing the potential for palm oil effluent or POME as a raw material for biogas which can be used as fuel for power plants.
Source: Agency for the Assessment and Application of Technology, 2019.

The Indonesian government considers that palm oil liquid waste can be processed to produce biogas and even used as electrical energy, a solution in areas where electricity is still challenging to reach. Several studies explain that processing palm oil wastewater into biogas is done through an anaerobic process. This waste utilizes biogas produced from the liquid waste treatment process to produce electrical energy. Biogas produced from palm oil liquid waste can drive power generators or generators. The methane gas contained in biogas will burn and produce energy that can be converted into electricity (Sodri and Septriana, 2022). Thus, the processing of palm oil liquid waste is also confirmed to support the idea of sustainability. The government is developing the Riau Investment Canal (RIC) in addition to the Biomass Gasification Power Plant based on palm liquid refuse to support the sustainability of the palm oil industry and influence investment opportunities (ANTARA, 2020). Riau Investment Canal (RIC) is a proposed canal project in Riau Province. This canal is expected to open access to trade and sea transportation in the Riau region and improve the people's economy. In addition, this project is also expected to reduce flooding in the Riau region by accelerating the flow of water from upstream to downstream. To support sustainability and minimize environmental impacts, the government must pay attention to sustainability aspects and involve local communities in implementing their development projects.

3.6. Potential, contribution, and obstacles: Investment services and the sustainability of the palm oil industry in Riau Province

Riau has a vast land area for oil palm development. This makes Riau Province one of Indonesia's

largest palm oil-producing regions. Palm oil products have significant domestic and international market potential (Jelsma et al., 2019). The palm oil industry has an attractive investment potential. This is supported by the positive trend in the development of plantation areas every year, including influencing regional and national economies. To support investment opportunities, the central and regional governments have made several efforts in Riau Province, one of which is by carrying out the idea of sustainability. Adopting the idea of sustainability in the palm oil industry is considered to have influenced new investment opportunities. Industries that promote the idea of sustainability have investment potential and influence the perspective of other investors in the industry.

Even though this industry has excellent potential and contributes to the regional and national economy, a number of challenges must be considered going forward to support investment opportunities and their sustainability. This study succeeded in mapping out several challenges that became obstacles, including the frequent occurrence of land conflicts. Several other case examples consider that land conflicts can hinder industrial progress. Generally, land conflicts occur when there is a disagreement between parties with claims or rights over land (Benjaminsen et al., 2012). Land conflicts can cause various problems, such as delays in the licensing process and land legality, disruption of the development process or industrial expansion, and even lead to social conflicts detrimental to all parties involved (Benjaminsen et al., 2012), including the potential to disrupt investment.

Apart from land conflicts, another obstacle identified was the problem of climate change. Several other case studies confirm that climate change can hinder industrial progress because it can affect environmental conditions and economic stability (Dafermos et al., 2018; Prianto and Abdillah, 2023; Widianingsih, Abdillah, et al., 2023). In addition to climate change concerns, environmental concerns impede the development of the palm oil industry in Riau Province. Environmental pollution from industrial activities, such as industrial refuse, can endanger the health of humans and animals and harm the environment. The limitations of innovation and technology also exacerbate this difficulty. Thus, the government needs to consider environmental issues in strategic planning and adopt sustainable practices that can reduce negative impacts, especially in developing sustainable technology to support the palm oil industry in Riau Province. The purpose of this study is to fill the research void left by previous researchers by analyzing investment strategies and services in supporting the sustainability of the palm oil industry in Riau Province, Indonesia.

4. Conclusion

The palm oil industry in Riau Province significantly impacts the national economy. This is supported because the largest area of oil palm plantations is also located in the province. To facilitate the optimal operation of the palm oil industry, the central and regional administrations collaborate to provide investment services and consider the industry's sustainability. The government considers several aspects, especially the central government, in maintaining investment opportunities and industry sustainability, namely with regulations, integrated plantation licensing service information systems, increased access to markets, RSPO certification, the realization of foreign investment, provision of technical support, industry downstream, replanting program, plantation revitalization program, and development of sustainable plantation partnerships. The Regional Government of Riau Province is considering several aspects, including the dissemination of information, socialization of

policies, socialization of action plant for sustainable oil palm plantations, opening opportunities for cooperation, monitoring the implementation of investment, construction of Biomass Gasification Power Plant based on palm liquid waste, and development of Riau Investment Canal (RIC).

These efforts are made to ensure investment opportunities and the sustainability of the palm oil industry in Riau Province. Even so, there are still several challenges that the government must pay attention to, namely land conflicts, climate change, environmental issues, limitations in technology and innovation, and dependence on export markets. These challenges may hinder future investment opportunities. The limitation of this research lies in the data source. The data sources used in this study must fully include enough understanding from the perspective of the subjects studied, such as direct experience and adequate observation. To overcome these limitations, further research is needed to take a broader range of data sources, involve subjects in research, and consider different points of view to gain a more comprehensive understanding.

Author contributions

Conceptualization, NY, RWSS, MF, AA, ALP and DF; methodology, NY, RWSS and AA; software, NY, AA and ALP; validation, NY, MF and AA; formal analysis, NY, MF and AA; investigation, NY, RWSS, AA, ALP and DF; resources, NY, RWSS and ALP; data curation, NY, AA and ALP; writing—original draft preparation, NY, MF and ALP; writing—review and editing, NY, RWSS, AA, ALP and DF; visualization, NY, AA and ALP; supervision, NY, RWSS and ALP; project administration, NY and AA; funding acquisition, NY, RWSS, MF, AA and ALP. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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