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Analysis of Nuclear-Plasma Partnership Pattern for Sustainable Oil Palm Plantation in Riau Province, Indonesia

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ABSTRACT

The purpose of this study is to determine the existing conditions of the plasma nucleus partnership pattern implementation in the oil palm plantation industry and the factors affecting its development in Riau Province. It was carried out using a qualitative method that explores various patterns of nucleus-plasma partnerships. Data analysis using the Nvivo 12 Plus application was sourced from interviews with each actor in the province. The results showed that the existing conditions for implementation consisted of nucleus-plasma partnerships of companies (42.86%), cooperatives (28.57%), and smallholders (28.57%) who still have problems that need to be addressed immediately. Several factors that also influence the partnership pattern of nucleus-plasma are the aspects of knowledge and technology (50.0%), capital and investment (33.33%), as well as marketing places (16.67%). This indicated that each aspect needs to be supported by a constant level of commitment, trust, communication, and cooperation. Therefore, this study has an urgency and contribution to relevant partnership patterns for sustainable oil palm plantations in Riau Province, where the nucleus-plasma partnership pattern by corporations is considered strategic because it can facilitate the transfer of knowledge and technology from palm oil industry players, so this study is an important recommendation to increase the productivity of smallholder oil palm plantations.

1. INTRODUCTION

Resilient development has become a global issue critical to the stimulation of sustainable economic, social and ecological progress. Currently, every company has been affected by global economic activity and has faced different difficulties when trying to gain a competitive advantage. On the other hand, advances in information and communication technologies (ICT) have encouraged major changes in economic activity, including the agricultural sector [1, 2]. This is because the contemporary corporate climate is influenced by global events and technological advances. In the current context, it is difficult for companies to maintain their position for a long time due to aggressive competition from competitors who are often able to take advantage of business opportunities [3]. According to Teece and Leih, every business industry must have a solid plan to navigate the techno-business environment to gain a sustainable competitive advantage [4]. This concept is inspired by the current era of global competition, where innovation and advances in information technology occur very quickly. Further disclosed by MihaLič, it creates significant changes in production, marketing, human resource management, and consumer transactions [5].

The palm oil business is one of the fields that has been fundamentally changed by globalization. Previous studies have shown that Indonesia is one of the largest industrialized oil palm plantation countries in Southeast Asia, producing an extraordinary and economically significant product. Oil palm plantation activities have changed the economic pattern for rural communities, reducing economic disparities between regions [6-8]. Indonesia has a much larger share of world palm oil production compared to countries such as Malaysia, Nigeria, Thailand, and Colombia. Indonesia has been developing oil palm since the early 1980s, the plantation business has made smallholders an important part of the national scale. Changes in smallholder incomes are an important instrument for improving local livelihoods [9, 10].

The contribution of smallholders to the palm oil industry in Indonesia reached 49 million tonnes in 2021, an increase of 2.9% compared to the previous year's total production of 48.3 million tonnes. Thus, the successful development of the palm oil industry in Indonesia cannot be separated from the contribution of small farmers. Then, Riau Province in Indonesia has 2.89 million hectares of oil palm plantations and has achieved palm oil production with a total of 10.27 million tons, which is the highest number of oil palm plantations and the province that contributes the most in Indonesia in 2021 [11]. Oil palm in Riau Province has boosted economic growth and alleviated poverty. Thus, the government has carried out some activities to increase the role of independent smallholders and maintain sustainable palm oil production [12-14].

In the context of the increasingly rapid development of oil palm plantations in Riau Province, this process has encouraged many plantation business actors, both farmers, and entrepreneurs [15]. Meanwhile, various problems that often

occur due to developmental processes are shown in Figure 1 below:

Figure 1. The problems of oil palm development in riau province

Figure 1 shows that there are various problems in developing oil palm in Riau Province. *First*, land clearing is carried out without procedures, causing environmental damage such as forest and land fires which cause the main problem, namely haze in Riau Province [13, 15]. *Second*, there are global market consequences through free trade campaigns, where this mechanism has created a growing paradigm regarding Indonesia as just a market and as a consumer of Crude Palm Oil (CPO) products with relatively high purchase prices [6, 16, 17]. *Third*, there are issues of sustainable development goals (SDGs) that focus on the environment, poverty alleviation, and improving the economy of local communities which have not yet been fully realized in Riau Province [18, 19].

Research results by Gatti et. al [20], found that the European food industry is currently requesting the Roundtable on Sustainable Palm Oil (RSPO) standard, while the European biodiesel industry is seeking International Sustainability and Carbon Certification (ISCC) [20]. Therefore, the Government of Indonesia requires large-scale and small-scale plantation companies to have Indonesian Sustainable Palm Oil (ISPO), where this certification is expected to be a ticket for plantation companies or self-help groups to remain productive without ignoring environmental and social issues in the palm oil industry national and local [21, 22]. In addition, the solution that can be taken to overcome the problem of oil palm development is a collaboration between companies that act as the nucleus, and oil palm smallholders as plasma to consistently apply the principles of sustainability. Then, to obtain ISPO certification, farmers will be assisted by the company through relevant training, seminars, and socialization activities [23, 24].

In the process, the current palm kernel partnership pattern only focuses on 20% of partnerships through Presidential Instruction 8/2018, as well as the Job Creation Law and its derivatives [25, 26]. Meanwhile, on the other hand, the right partnership pattern has not been found for the development of sustainable oil palm plantations in Riau Province. This then causes many challenges to be faced such as rejuvenating oil palm, improving the trading system for fresh fruit bunches (FFB), and achieving ISPO certification. Therefore, this research is focused on explaining the existing conditions and plasma nucleus partnership patterns that are relevant to the oil palm plantation industry and the factors that influence its development in Riau Province.

2. LITERATURE REVIEW

2.1 Oil palm core-plasma partnership pattern

In the oil palm industry, the partnership pattern has an important position in the long-term development process. This partnership requires different types of actors and groups to work together on tasks and discover how to achieve common goals. The actors include the government, oil palm companies, groups or associations of farmers, non-governmental organizations, financial institutions, research institutions, and universities [27]. According to research Lukman et. al [28], a partnership is a business strategy carried out by two or more parties within a certain period to achieve mutual benefit. This mutual benefit is according to the principle of mutual need and complementarity in line with the evolving agreements [28]. Then, research Obidzinski et. al [29], also stated that the plasma nucleus partnership pattern involves the company/investor as the core, while the farmers are the plasma. It consists of nucleus-plasma partnerships by cooperatives, companies, and smallholders [29]. The results of previous research by Markus et. al [30], the plasma program has not run optimally as expected. There are still many obstacles in the nucleus-plasma partnership program, but the empowerment of farmers in the plasma program has a positive impact on rural communities [30]. The same thing was also expressed by Abdillah et. al [31], the nucleus-plasma partnership pattern still faces various obstacles in its implementation [31].

Several factors that influence this in the oil palm industry are aspects of capital/investment, knowledge and technology, as well as marketing place [32]. However, there is also a partnership pattern that has successfully increased the income of plasma farmers, where both parties carried out their obligations according to the agreement at the beginning of the contract [25]. The success of the partnership system depends on its implementation and the key is to increase the intensity of core and plasma relationships based on mutual trust. Therefore, in a partnership pattern, a mutually beneficial commitment is needed for both the farmers and the company [33]. The existing partnership pattern in Indonesia has not led to the development of sustainable smallholder oil palm plantations. This is because it is still constrained by oil palm rejuvenation, improvement of the fresh fruit bunches (FFB) trade system, and ISPO certification [13]. Previous studies by Syahza and Irianti, explained that the expansion of oil palm areas puts pressure on the forest and surrounding resources [34]. Oil palm farming provides an opportunity to increase family income and can change the lives of farming communities in rural areas, leading to high demand for land [24]. Since oil palm is land-based agriculture and depends on the fertility of the land, Indonesian territory is very suitable for the cultivation of the crop. Oil palm is a tropical plant that requires sufficient temperature, soil type, altitude, and rainfall to get maximum results [34, 35].

2.2 Sustainable oil palm plantation

The success of the Indonesian palm oil industry cannot be separated from the role of smallholder plantations. In 2017,

smallholders covered 40.01% of the total oil palm area and 22.64% of the total palm oil production in Indonesia [36]. Therefore, the government has made several efforts and policies to strengthen the sustainability of smallholder palm oil production sustainably [12, 13]. The government has also established a policy for raising funds for oil palm plantations as mandated in Article 93 of Law no. 39 of 2014 concerning Plantations. Then, as an implementation step, Government Regulation Number 24 of 2015 concerning the Collection of Plantation Funds and Presidential Regulation Number 61 of 2015 in conjunction with Presidential Regulation Number 24 of 2016 concerning the Collection and Utilization of Oil Palm Plantation Funds have been issued. These laws and regulations form the basis for determining and technically developing oil palm plantations in a planned and directed manner. This is the basis for setting priorities for the development of smallholder oil palm plantations according to their needs. Through this policy, support for oil palm development includes rejuvenation activities, human resource development, as well as facilities and infrastructure assistance. This activity integrates all aspects of oil palm plantation development to increase the productivity of smallholders [12, 22].

In addition, there has been a rise in the amount of money allotted from the Palm Oil Plantation Fund Management Institution to the farmer's palm as a result of the Policy Regulation of the Minister of Agriculture Number 7 of 2019 concerning Human Resource Development, Research and Development, Rejuvenation, and Oil Palm Plantation Facilities and Infrastructure. This in the future will provide institutional strengthening for oil palm smallholders to consciously implement environmentally friendly and sustainable management [21, 22]. The various policies described above have emphasized that the government has provided ample space for smallholders and companies to partner in the context of managing sustainable oil palm plantations in Indonesia [29]. Based on a comparative analysis of research findings [37, 38], it was identified that the commitment of plantation companies to the development of a sustainable palm oil industry is very important and must be supported by adequate human resources (smallholder capacity), as well as the government's role as a regulator in overseeing the policies that have been set. In addition, Indonesia needs a master plan for the palm oil industry that covers the entire supply chain from upstream to downstream to increase the competitive advantage of the palm oil industry through the development of policies that support sustainable palm oil and are mutually integrated between governments, companies, and smallholders.

3. METHOD

This study used a qualitative approach to visualizing a certain phenomenon, which is carried out systematically [39]. The data in this study come from primary and secondary data. The primary data referred to are documents obtained from the Riau Province Plantation Office and the results of interviews with relevant informants. As for secondary data, namely secondary data obtained from journals, proceedings, books, and government websites. Data collection was carried out through documentation and interview techniques focused on the nucleus plasma partnership model for oil palm plantations in Riau Province.

Furthermore, the data analysis technique in this study used the Nvivo 12 Plus application. According to research [39, 40], this application is a qualitative data analysis software that can make it easier for researchers to analyze data from various sources, so the use of this application serves to assist and speed up researchers in processing and classifying data according to the characteristics of qualitative research. With NVivo, qualitative researchers can efficiently and effectively perform analytical coding on the available data [41].

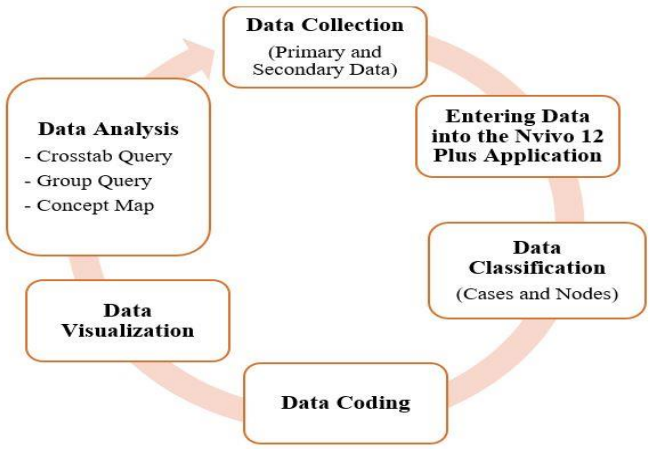

Figure 2. Research flow and data analysis

Figure 2 shows a schematic analysis via the Nvivo 12 plus application that uses the group query, project map, and crosstab query analysis features. The analysis was carried out in three stages which included: *First*, data analysis through the crosstab query analysis feature to determine the percentage of concepts (nodes) used. *Secondly*, analyze the data with the group query analysis feature to determine the informants' perceptions of existing concepts and conduct analysis through the project map feature in mapping the informants' thoughts on concepts and propositions based on variables. The contents of the query that has been coded are various arguments and interview results from each stakeholder such as the government, companies, cooperatives, and also farmers regarding the existing conditions of the palm oil industry partnership pattern. *Thirdly*, conclude and interpret the primary and secondary data that have been analyzed. Therefore, this study aims to analyze the existing conditions of the implementation of the plasma nucleus partnership pattern in the oil palm plantation industry and the factors that influence its development in Riau Province.

4. RESULT AND DISCUSSIONS

4.1 Existing conditions for implementing partnerships for plasma oil palm plantation core patterns in Riau Province

The plasma nucleus partnership pattern for oil palm farmers in Riau Province is an effort to improve the farmers' standard of living. Therefore, the government's policy to develop oil palm plantations will contribute to help farmers' economic growth, especially when the system can be implemented [25, 29]. Based on Minister of Agriculture Regulation Number 18 of 2021 concerning the Facilitation of Community Garden Development, the regulation is a policy for companies to assist plantation development by providing easy access to finance, information, knowledge, and cultivation techniques to

improve community welfare. This is carried out through credit patterns, profit sharing patterns, and other forms of funding that have been agreed upon by all parties, as well as other types of partnerships. Meanwhile, the success of this partnership system depends on how well it is implemented. The key is to strengthen the core and plasma relationships through mutual trust as well as the agreement between the farmer and the company that the partnership will be good for both [22, 25, 33]. In the context of oil palm plantations in Indonesia, Riau Province has the largest oil palm plantation, reaching 2.89 million hectares (19.16%) of the total area in 2021, with a production of 10.27 million tons. This is the largest percentage in the country, which represents 20.66% of the national oil palm production [11]. The area of people's plantations that already have a plantation business permit is 1,752,423,229 hectares, as listed in Table 1:

Table 1. Recapitulation of plantation business permits in Riau province

Number	Regency/City	Plantation Business Permit Data	
		Number (units)	Area (hectare)
1	Indragiri Hulu	35	260,415.66
2	Pelalawan	33	294,370.13
3	Siak	19	160,040.78
4	Kuantan Singingi	15	94,399.48
5	Rokan Hulu	30	160,413.76
6	Dumai	0	0
7	Kepulauan Meranti	1	2,400
8	Pekanbaru	5	6,064.81
9	Kampar	49	199,526.20
10	Bengkalis	12	84,674.62
11	Indragiri Hilir	22	392,123.2
12	Rokan Hilir	11	97,994.59
	Total	**232**	**1,752,423.23**

Source: Riau province plantation office [42].

Table 1 shows that Kampar Regency is the most dominant area in terms of the number (units) that already have plantation business permits, while Pelalawan Regency is the most dominant area in terms of area (ha). The results of the group query analysis in Figure 3 showed that each actor has a different view of the existing condition of the nucleus-plasma partnership pattern on oil palm plantations in Riau Province:

Figure 3 is a group query analysis that maps the perceptions of each stakeholder, which is visualized on each connected line and node. Subsequently, each existing partnership pattern has an arrow area that shows recommendations from each actor. In this condition, individual stakeholder believes that the existing nucleus-plasma partnership in oil palm plantations in Riau Province consists of partnerships by cooperatives, companies, and smallholders. However, based on the existing model, actors (government, companies, and academics) believe that the nucleus-plasma partnership pattern by companies has a level of urgency that is considered relevant in Riau Province. Research Atmiko et. al [43], also stated that the nucleus-plasma cooperation model with private companies is often used in Indonesia because there is a focus on mutually beneficial relationships. Therefore, it encourages providers of production facilities, technical assistance, product marketing, and smallholder production by core companies to increase revenue [43]. The existence of sources of income and the growth of farmers' financial sources will have a good relationship with improving the welfare of farmers.

The results of the interviews with each actor who has been analyzed through the crosstab query feature are shown in Figure 4. It was discovered that each actor has a different view of the existing condition of the nucleus-plasma partnership pattern in oil palm plantations in Riau Province.

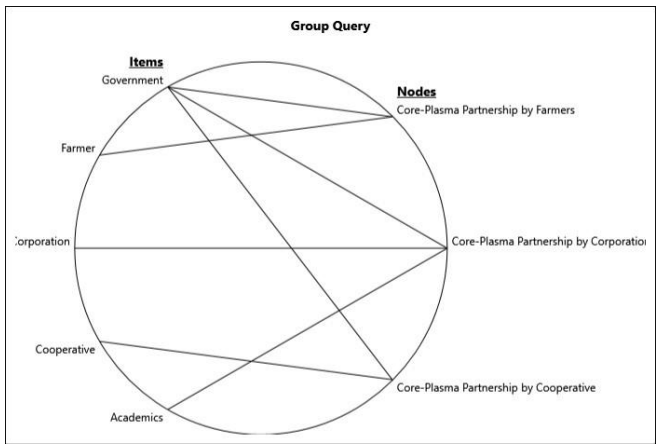

Figure 3. Inter-actor perceptions of the core-plasma partnership pattern for oil palm plantations in Riau province

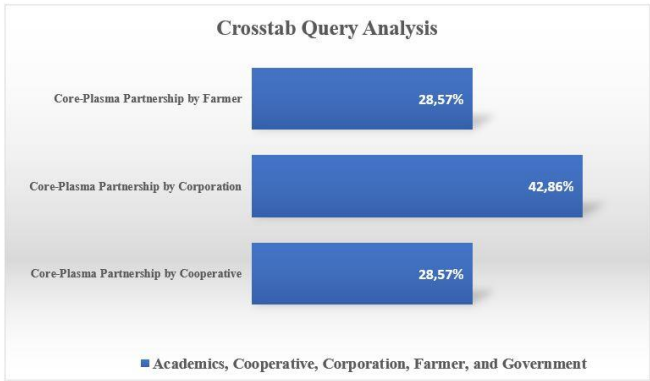

Figure 4. Crosstab query analysis of inter-actor perceptions of the core-plasma partnership pattern for oil palm plantations in Riau province

Figure 4 shows that the nucleus-plasma partnership pattern by the company is the most dominant aspect which a value of 42.86%, followed by cooperatives and farmers who have the same percentage, namely 28.57%. When examined further, the pattern of nucleus-plasma cooperation by the company is considered strategic because it allows the transfer of knowledge, skills, and technology of industrial players. Therefore, each stakeholder will experience and research-based knowledge regarding optimal oil palm production practices for smallholders to increase productivity and farmers' income. To increase the production of fresh fruit bunches (FFB) for plasma smallholders, transparency and business commitment are needed in the management of oil palm plantations, as well as tangible benefits for plasma smallholders in Riau Province. Research results by Markus et. al [30], explained that the application of the plasma core partnership model by companies has increased the welfare of farmers by providing income, job opportunities, expanding knowledge, and administrative skills [30]. However, several problems need to be addressed immediately, this includes the

lack of attention to the legal aspects of land ownership for plantation businesses, insufficient capital for the provision of superior seeds and plant maintenance, as well as the low price of oil palm FFB received by farmers. Due to complex marketing channels, there is a need for equality to exist between farmers and companies in the implementation of the nucleus-plasma partnership pattern [25].

4.2 Factors affecting the nuclear plasma pattern partnership in the oil palm plantation industry in Riau province

The factors that influence the nucleus-plasma partnership pattern in the oil palm industry in Riau Province include aspects of capital and investment, knowledge and technology, and marketing places [13, 32]. This is shown in the results of interviews with each actor that have been analyzed through the crosstab query feature in Figure 5:

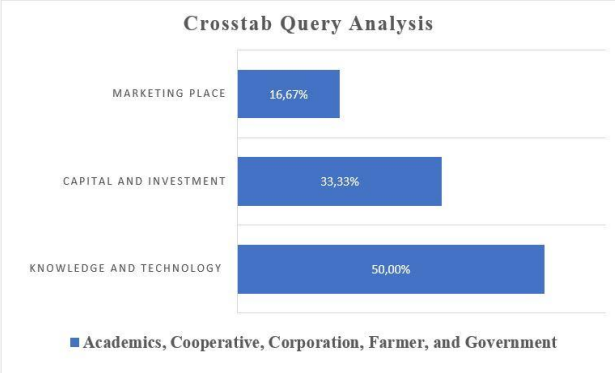

Figure 5. Crosstab query analysis of factors affecting the nuclear plasma pattern partnership in the oil palm plantation industry in Riau province

Figure 5 shows that the dimensions of knowledge and technology, which is 50.0% are the most dominant aspects in influencing the nucleus-plasma partnership for oil palm plantations, followed by capital and investment with 33.33% and marketing place, namely 16.67%. When examined in more detail, the dimensions of knowledge and technology will enable an increase in the quality of production in the agricultural and plantation sectors, making it easier for managers to achieve optimal work. However, technology in the agricultural and plantation sectors in Riau Province cannot be widely applied. This is because there is a need to consider several factors, including natural conditions, experts who operate the equipment, and community knowledge about the technology. Previous studies by Syahza et. al [34], Syahza and Irianti, explained that to increase added value for small-scale oil palm farmers, it is very important to carry out a partnership pattern to provide valuable benefits for farmers [24, 34]. The results of interviews with each actor, which include academics, cooperatives, companies, farmers, and the government in Riau Province, which were coded through the Nvivo 12 Plus software using the Concept Map feature showed several parts that affect the pattern of the nuclear plasma in oil palm plantations. As presented in Figure 6.

Figure 6 is a visualization of the factors influencing the nucleus-plasma partnership pattern in the oil palm industry in Riau Province. According to academics, people's understanding and use of technology are the two most influencing factors. When all parties understand the importance of partnership, the sustainable management of oil palm plantations will be achieved for the benefit of all parties involved. The company also believes that the level of knowledge and understanding of technology is a determining factor in the structure of the partnership. Smallholders working together for proper management will more effectively benefit from increasing everyone's awareness of the role of partnerships in ensuring sustainability in the plantation sector. However, the ideal choice in Riau Province has not been discovered, and efforts are still being made to determine the right partnership model. Research Abdillah et. al [31], reported that to increase bargaining power in the agricultural sector, farmers need to form groups. This group partners with business actors related to commodities, which will provide benefits and bargaining power [31].

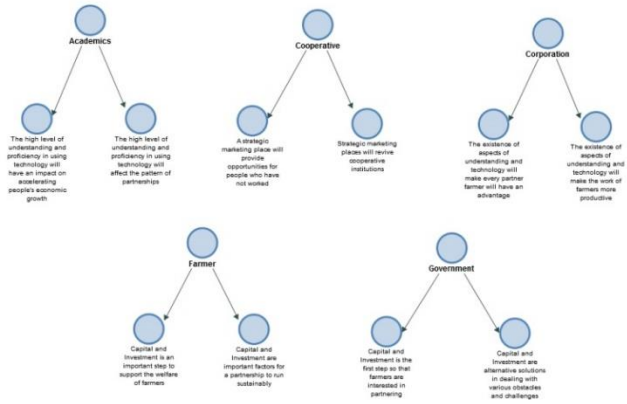

Figure 6. Concept map analysis of factors affecting the pattern of core plasma partnerships for the oil palm plantation industry in Riau province

Actors such as the government argue that the aspect of capital and investment is the first step to becoming an important value for farmers. This will arouse their interest in partnering and provide alternative solutions to various obstacles faced by farmers. This is also supported by farmers who stated that capital and investment are important factors to improve welfare and enhance sustainable partnership systems. According to cooperatives, it was stated that the revitalization of cooperative organizations in rural areas through strategic marketing places is the most important characteristic of partnerships in terms of improving people's living standards and working conditions. Previous research also reported that to increase regional economic growth, it is necessary to develop other sectors that have high potential such as oil palm plantations and the processing industry in line with the Sustainable Development Goals [44-46]. The results of previous research by Pramudya et. al [35], in efforts to implement sustainable plantation development, incentives from the government are needed. These incentives are in the form of funding, regulatory action, technical assistance, promotion, and recognition of good practices to facilitate and support compliance with sustainable plantation development [47].

Therefore, each factor that influences the pattern of nucleus-plasma partnership such as the dimensions of knowledge and technology, capital and investment, and the dimensions of marketing places have varying levels of urgency in the oil palm industry in Riau Province. Each of these dimensions needs to be supported by a strong commitment factor, which

will partially have a dominant influence on the partnership pattern. The factors of commitment, trust, communication, and cooperation will simultaneously affect the pattern of nucleus-plasma partnership in the oil palm industry in Riau Province. Research results by Syahza and Asmit, explained that oil palm farming activities provide a multiplier effect on the regional economy through the opening of job opportunities in rural areas [48]. Subsequently, with the existence of plantation companies, local community livelihoods are no longer limited to the primary sector but have expanded their business space in the tertiary sector [14]. In line with these plantation activities, oil palm plantation activities need to be on a sustainable basis. Research Mustofa et. al [26], also confirmed that oil palm plantation development activities offer additional benefits for sustainability related to socio-economic, environmental, and biodiversity [26]. To ensure the sustainability of oil palm development, several obstacles must be overcome to obtain measurable solutions such as the use of oil palm land that does not damage the environment as well as the participation and partnership of the government, companies, smallholders, and cooperatives [49].

5. CONCLUSION

This study examined the existing conditions of nucleus-plasma partnerships in oil palm plantations in Riau Province. The results showed that the conditions consist of nucleus-plasma partnerships by companies, cooperatives, and farmers with values of 42.86%, 28.57%, and 28.57%, respectively. In practice, several problems need to be addressed including the lack of attention to the legal aspects of land ownership for plantation businesses. Furthermore, the lack of capital for the provision of superior seeds and plant maintenance, and the low price of oil palm fresh fruit bunches (FFB) received by farmers through complex marketing channels. This makes it necessary to have equality between farmers and companies in the implementation of the nucleus-plasma partnership pattern.

Several factors that influence the nucleus-plasma partnership pattern in the oil palm industry in Riau Province are aspects of knowledge and technology, capital and investment, and marketing location, with values of 50.0%, 33.3%, and 16.67%. In the oil palm sector, the level of urgency related to each component that affects the nucleus-plasma partnership pattern appears to be different. This is because each dimension needs to be supported by a strong commitment factor that will have a dominant influence on the partnership pattern. However, the nucleus-plasma partnership pattern in the oil palm industry in Riau Province will simultaneously be influenced by factors of commitment, trust, communication, and cooperation.

This study provides recommendations to stakeholders in the palm oil sector to consider a nucleus-plasma partnership pattern by the company (the company as the nucleus, and the smallholders as the plasma). This is considered strategic because it allows palm oil sector actors to transmit information and technological skills. This research approach has limitations because it only evaluates data from a certain period. As a result, further investigations are needed to gain knowledge over a more complete period. This study also proposes that additional research can map thoroughly the existing conditions in the partnership pattern of the palm oil industry.

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