COMPETITIVENESS AND CHALLENGES OF INDONESIAN CRUDE PALM OIL (CPO) EXPORTS TO THE EUROPEAN MARKET

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Abstract

This study analyzes the competitiveness and main challenges faced by Indonesia's Crude Palm Oil (CPO) exports to the European market using a quantitative approach using the Revealed Comparative Advantage (RCA) and Export Competitiveness Index (XCI) methods. Secondary data during the period 2009-2023 was obtained from UN Comrade for four main destination countries, namely the Netherlands, Italy, Germany, and Spain. The results of the RCA analysis show a significant decrease in the comparative advantage of Indonesian CPO in all export destination countries. XCI's analysis indicates high volatility in export competitiveness with value fluctuations between 0.93-1.08. This decline in competitiveness is due to the evolution of increasingly stringent sustainability regulations, increased competition from alternative suppliers, and changing market preferences for sustainable products. This study recommends the development of a strategy for diversifying high-value-added products, the implementation of an integrated sustainable certification system, and the transformation of the CPO industry towards more sustainable practices to maintain competitiveness in the European market.

Keywords: Crude Palm Oil, Export, International Trade, Competitiveness

1. Introduction

Palm oil commodities play an important role in the Indonesian economy. Palm oil commodities contribute greatly to job creation and its role in Indonesia's exports. This commodity makes a significant contribution to the Indonesian economy through palm oil exports, which is 25 billion US$ in 2023 (BPS RI, 2024). In addition, according to UN Comtrade data, the crude palm oil (CPO) commodity also has a large export dominance in the global market with an average of 53% during the period 2014 to 2023.

Indonesia is the world's largest producer and exporter of CPO with a total production of 46.47 million tons in 2024, with an average production increase of 5.11% in the period 2014 to 2023 (Pusdatin of the Ministry of Agriculture, 2024). Historically, the European market has been an important export destination for Indonesian CPO despite having quite difficult trade dynamics with various trade barriers. The European market is the third largest destination for Indonesia's CPO exports after China and India, with an export contribution of 15% in 2021 but down 14.63% in 2022 to 9.7% of total CPO exports to the European market (BPS RI, 2022).

The competitiveness of Indonesia's CPO exports to Europe is determined by several important factors, namely production cost efficiency, product quality, and ability to meet international sustainability standards (Hamzah & Santoso, 2020). In addition, Indonesia's CPO exports to the European market are influenced by various economic and non-economic factors. Global economic factors such as currency fluctuations, global CPO prices, and economic conditions in export destination countries have a significant impact on the competitiveness and demand for CPO imports (Amiruddin et al., 2021). On the

other hand, there are also non-economic challenges, especially those stemming from trade policies issued by the European Union regarding sustainability issues that can affect CPO exports (Zainurrahmi et al., 2020). The EU Deforestation Regulation (EUDR) policy is a potential obstacle that can reduce market access and the competitiveness of Indonesia's CPO exports to the European market (Putri, 2025).

This condition creates a problem for Indonesia, CPO exports play an important role in the Indonesian economy, besides that Indonesia also has inherent comparative advantages in CPO production such as large economies of scale, a tropical climate that supports high productivity, and an established industrial infrastructure. However, on the other hand, this advantage faces challenges by non-tariff barriers that can reduce the competitiveness of Indonesian CPO and can shift its competitive position in the crucial European market. Critical access to the European market has a strict level of complexity due to its trade barrier policies that can make Indonesia's CPO competitiveness to the European market decrease if it is unable to meet the qualifications of these policies. Failure to respond to these challenges will not only have an impact on the decline in export volumes and values, but also risks the socio-economic stability of workers who depend on palm oil commodities.

To objectively understand Indonesia's position in the dynamics of export competitiveness to the European market, a measurable quantitative analysis is needed. In this study, 2 methods were used, namely Revealed Comparative Advantage (RCA) to measure strong comparative advantage in CPO products (HS 1511) and the Export Competitiveness Index (XCI) method to analyze how the position of Indonesia's CPO market share in the European market from time to time will indicate its level of competitiveness.

2. Theoretical Background

2.1 International Trade

International trade includes all commercial activities that occur between economic actors from different countries. This activity includes the export of goods and services from one country to another, as well as the import of goods and services from other countries into the country. This trade is not only limited to physical goods, but also includes services such as tourism, consulting, technology, and financial services (Mankiw, 2005).

2.2 Comparative Advantage and RCA

The theory of comparative advantage developed by David Ricardo in the early 19th century remains relevant in explaining the position in global CPO trade (Costinot et al., 2012). Ricardo explained that a country will benefit from specialization in production on goods that have the lowest relative opportunity costs, even though the country may not have an absolute advantage in the production of any goods (Ekananda & Sallama, 2015). Béla Balassa introduced the concept of Revealed Comparative Advantage (RCA) in 1965 as an empirical method for measuring a country's comparative advantage in a given commodity. The RCA method uses actual trade data to identify patterns of a country's export specialization, assuming that the export structure reflects the comparative advantages it has (French, 2017). Indonesia has a clear comparative advantage in CPO production due to the optimal combination of production factors. The opportunity cost of allocating resources to CPO production is relatively low compared to other commodities, given the climatic and soil conditions that are highly suitable for oil palm cultivation (Amiruddin et al., 2021).

2.3 Crude Palm Oil (CPO) and Its Uses

Crude Palm Oil (CPO) or crude palm oil is a vegetable oil extracted from the pulp (mesocarp) of the palm oil palm (Elaeis guineensis) through a pressing or extraction process (Helwani et al., 2021). The uses of CPO are very diverse and cover various industry sectors. In the food industry, CPO and its derivative products are widely used as cooking oil, margarine raw materials, shortening, and various other processed food products. Its stability at high temperatures and relatively low production costs make it a popular choice in the commercial food industry globally (Helwani et al., 2021). In addition to the food industry, CPO and its derivatives are also widely used in the cosmetics, personal care products, soaps, and detergents industries. One of the other important applications is that as a raw material for the production of biofuels, specifically biodiesel, this product is in line with global efforts to find renewable energy sources (Zhang et al., 2025).

2.4 CPO in International Trade

In terms of international trade, CPO is Indonesia's mainstay export commodity that generates a large amount of foreign exchange for the country. In 2021, the value of Indonesia's palm oil exports reached USD 28.68 billion with an export volume of 27.04 million tons, then decreased in 2023, CPO accounted for 33.72% of the country's total foreign exchange, with an export value of US$22.69 billion (Pusdatin of the Ministry of Agriculture, 2024). In the last five years to 2023, the foreign exchange generated from the palm oil sector has consistently ranged from US$22 billion to US$39 billion per year. The ability of the palm oil industry to generate foreign exchange is very important to maintain the trade balance and the stability of the Rupiah exchange rate.

2.5 Challenges in CPO Trade and Sustainability Issues

The diversity of uses of CPO shows the high global dependence on this commodity, which should be one of the main bargaining forces for Indonesia as the largest producer. However, some aspects of its composition, such as its relatively high content of saturated fatty acids, as well as its use as a raw material for biofuels, have become a point of spotlight and criticism in health and sustainability issues, especially in the European market (Arifin et al., 2019). This advantage that makes it economical and versatile is also the source of its vulnerability to negative campaigns and trade barriers, especially in markets with high awareness of environmental and health issues such as Europe. The issue of land use and deforestation for the clearing of oil palm plantations has triggered concerns that have led to policies that respond to high deforestation in CPO-exporting countries, one of which is EUDR (Sulaiman et al., 2024).

2.6 Trade Barriers: Tariff and Non-Tariff

Despite providing many benefits, international trade faces various obstacles. Tariff barriers in the form of import duties imposed on imported goods are a form of protection commonly used by the government. Non-tariff barriers such as import quotas, strict quality standards, and complicated bureaucratic procedures can also hinder the smooth running of trade (Haveman & Thursby, 2000). Paul Krugman and Maurice Obstfeld (2006) in explaining the evolution of trade barriers from traditional tariff instruments to more sophisticated non-tariff barriers. Modern non-tariff barriers include technical standards, sanitary and phytosanitary regulations, labeling requirements, as well as various forms of environmental and social regulation.

2.7 European Union Regulations on CPO Trade

The EU has been a pioneer in the application of sophisticated non-tariff barriers through a range of regulations that integrate trade aspects with environmental and social policy objectives. The Renewable Energy Directive II (RED II) enacted in 2018 sets strict sustainability criteria for biofuels, including those made from CPO. This regulation requires that CPO used for biofuels must meet the criteria of reducing greenhouse gas emissions by at least 50% compared to fossil fuels, and not come from land that has been deforested after 2008 (Nasution & Wulansari, 2019). After RED II, the European Union will begin implementing the European Union Deforestation Regulation (EUDR) which will come into full force in December 2024, a landmark legislation that fundamentally changes the global commodity trade landscape, especially Indonesian CPO. The regulation requires companies that market seven key commodities on the EU market to prove that their products do not come from land that has been deforested or degraded after December 31, 2020. The EUDR adopts a comprehensive supply chain due diligence approach, whereby each operator and trader must gather precise geographical information about the production site, including the geographical coordinates of all plots of land used to produce the commodity in question. For CPO, this means that any shipment entering the EU must be traceable down to the individual level of palm oil plantations with documentation proving that the area has not been deforested within the set cut-off period. EUDR presents a multidimensional challenge for Indonesia's CPO exports that requires a comprehensive and coordinated approach. Success in meeting these challenges will determine Indonesia's ability to maintain and increase its CPO market share in the European Union, while driving the transformation of the palm oil industry towards more sustainable practices.

3. Methods

This research is quantitative descriptive research, with the type of data used is secondary data for 15 years from 2009 to 2023 sourced from the Central Statistics Agency of the Republic of Indonesia (BPS RI), the Data and Information System Center of the Ministry of Agriculture (Pusdatin Kementan), and the United Nations Commodity Trade Statistics Database (UN Comtrade). The type of processed palm oil in this study is palm oil (HS 1511, Palm oil and its fractions; whether or not refined, but not chemically modified). The destination countries in this study are 4 main export destinations for Indonesian CPO in the European market within 15 years, from 2009-20223. The four destination countries for Indonesia's CPO exports are, Germany, Italy, the Netherlands, and Spain. Sampling is carried out by purposive sampling with the aim of obtaining a sample that is able to represent the population.

The method used is the Revealed Comparative Advantage (RCA) to analyze the comparative advantage of Indonesian CPO, and the Export Competitiveness Index (XCI) method is used to analyze the competitive advantage of Indonesian CPO. The RCA method is used to measure the export performance of a commodity from a country by evaluating the export role of a particular commodity in a country's total exports compared to the share of that commodity in international trade. The calculation of RCA is formulated as follows:

$$RCA_{ki} = \frac{X_{ki}/X_i}{W_k/W_t}$$

Information:
RCA_{it}: Revealed Comparative Advantage of CPO commodities from Indonesia.

X_{ki}: The export value of CPO commodities from Indonesia.
X_i: The total value of Indonesia's exports.
W_k: The total value of world CPO commodity exports.
W_t: The total value of world exports.

   If the result is RCA > 1, then the exporting country has a comparative advantage in the international market, if the result is RCA < 1, the exporting country does not have a comparative advantage in the international market (Leromain & Orefice, 2014).

   The Export Competitiveness Index (XCI) is an indicator that describes the share of exports of certain goods of a country in the international market in a given year (t) compared to the share of exports of certain goods of a number of commodities of a country in the previous year (t-1). The calculation of XCI is formulated as follows:

$$XCI_{ki} = \frac{(X_{ki}/W_k)t}{(X_{ki}/W_k)t - 1}$$

Information:
XCI_{ki}= Export Competitiveness Index of Indonesian CPO commodities.
X_{ki} = the export value of CPO commodities from Indonesia.
W_k = the world's natural CPO export value.
t = running period.
t-1 = previous period.

   The XCI measurement range has the provision that XCI > 1 means that commodity exports have an increasing trend direction and have a competitive advantage, while XCI < 1 means that commodity exports have a declining trend direction and do not have a competitive advantage.

4. Results And Discussion
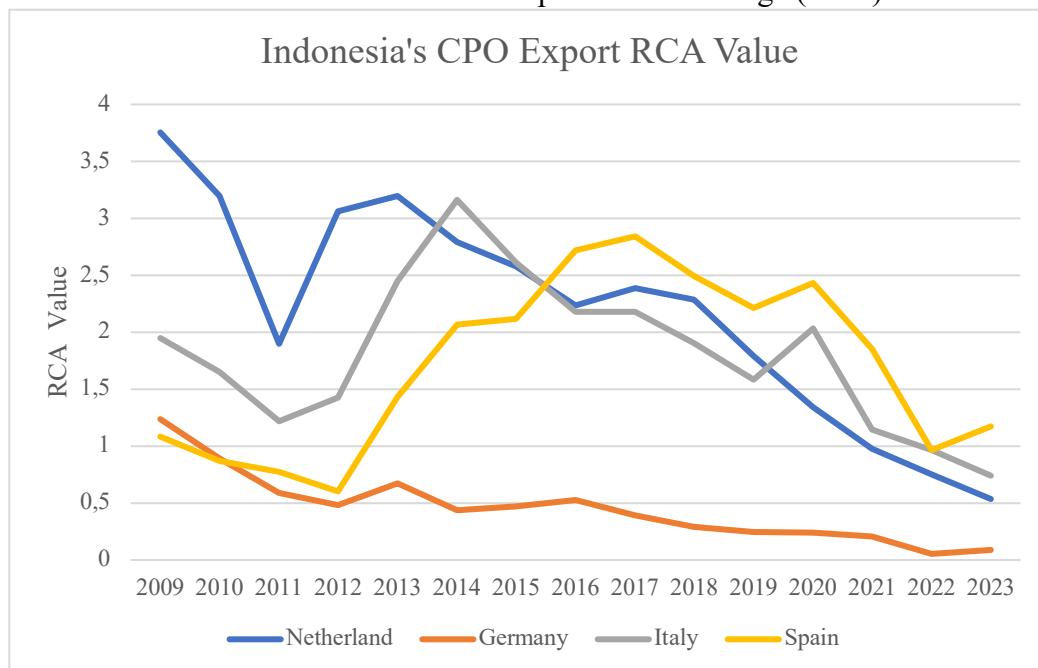4.1 Results and Discussion of Revealed Comparative Advantage (RCA)

Figure 1. Indonesia's CPO Export RCA Value

   The Netherlands showed the most dominant position as Indonesia's CPO export destination at the beginning of the study period. The RCA value reached a high of around 3.7 in 2009, indicating a very strong comparative advantage. However, there was a sharp

decline to around 2.0 in 2011, followed by a gradual recovery to reach 3.2 in the 2012-2013 period. After 2014, the Netherlands experienced a consistent and sustained downward trend, with a significant downward acceleration after 2018, until it reached a low of around 0.5 in 2023. This drastic decline reflects structural changes in import policy and Dutch market preferences towards Indonesian CPO.

Italy started the period with an RCA value of around 2.0 in 2009, then experienced significant fluctuations in the early years. There was a decline to 1.2 in 2011, but Italy then showed an impressive recovery with a sharp increase to reach a peak of around 3.2 in the 2013-2014 period. This phase marks the golden period of Indonesia's CPO exports to Italy. After reaching the peak, Italy experienced high volatility with declines and recoveries alternating through 2019. The structural decline began after 2019, with a consistent decline to below 1.0 in 2023.

Spain shows a relatively more stable pattern than the rest of the market, with an initial RCA value of around 1.0 in 2009. The market experienced gradual growth and reached a high RCA value of around 2.8-2.9 in the period 2016-2017, demonstrating a consistent increase in competitiveness for nearly a decade. However, after 2017, Spain also followed a regional downward trend, with a relatively slower decline than the Netherlands and Italy. The RCA value fell to around 2.2 in 2019, then experienced a sharper decline to reach 1.2 in 2023.

Germany consistently showed the weakest performance among the four target markets throughout the analysis period. The RCA value started from around 1.2 in 2009 and decreased to 0.5 in 2012. Despite a slight recovery in the 2013-2015 period with a score of 0.7, Germany has never managed to achieve an RCA value above 1.0 on a sustainable basis. After 2015, this market stagnated with minimal fluctuations, and in 2023 the RCA value was even close to 0.1, indicating the almost loss of Indonesia's comparative advantage in the German market. This condition indicates the existence of significant structural barriers or market preferences that do not support Indonesian CPO.

A significant deterioration in the competitiveness of Indonesia's CPO exports became evident after 2014-2015 in all markets. The Netherlands experienced the most dramatic decline, falling from 3.7 in 2009 to around 0.5 in 2023. RCA Italia also experienced a similar contraction from its 2014 peak of 3.2 to below 1.0 in 2023. Spain's decline has been more gradual but consistent, falling from around 2.8 in 2017 to 1.2 in 2023.

The overall decline in four markets shows systemic challenges affecting the competitiveness of Indonesia's CPO exports in Europe. These trends are likely to reflect a variety of factors including the evolution of EU sustainability regulations, increased competition from alternative suppliers, and changing market preferences regarding palm oil sourcing standards.

The implementation of the Renewable Energy Directive (RED II) which has been in effect since 2018 has had a significant impact on Indonesia's CPO trade (Nasution & Wulansari, 2019). These regulations set strict sustainability criteria, including restrictions on the use of palm oil from areas with high risk of deforestation (high ILUC-risk). The phased implementation timeline through 2030 explains why the decline in RCA has been sharper after 2018 in all target markets.

Malaysia as the main competitor has succeeded in developing a differentiation strategy with a focus on sustainable palm oil certification (MSPO - Malaysian Sustainable Palm Oil), as in the findings (Long, 2021) the government needs to develop standards and policies for agricultural products to be able to compete in the European and US markets. In addition, the European Union has also begun to develop local and semi-local vegetable

oil alternatives such as rapeseed oil and sunflower oil from member countries, which receive policy support within the framework of food security and strategic autonomy. The development of value-added products such as refined palm oil derivatives and specialty fats can increase margins and reduce dependence on CPO commodities that are easily substituted. Similar to studies (Mizik, 2021) and (Matkovski et al., 2022) which found that lack of adequate processing capacity of agricultural products can be an obstacle to higher competitiveness.

The transformation of European consumer preferences towards sustainable products has prompted retailers and manufacturers to adopt zero-deforestation commitments (Cesar de Oliveira et al., 2024). Major companies such as Unilever, Nestle, and Ferrero have set targets of 100% sustainable palm oil, which often excludes Indonesian CPOs that do not have RSPO (Roundtable on Sustainable Palm Oil) certification or similar certifications. Increasingly stringent supply chain transparency requirements are also an obstacle, as Indonesia's traceability system has not been fully integrated to the level of smallholders who account for most of the national production.

Given that Germany has consistently shown a weak performance, Indonesia needs to carry out a different market penetration strategy, focusing on innovation and specialized products rather than CPO commodities. Meanwhile, for the Dutch and Italian markets, which have experienced a drastic decline, a re-engagement strategy with an emphasis on quality and sustainable products is needed.

Based on the trend of increasingly stringent EU regulations, Indonesia must prepare for the full implementation of the EU Deforestation Regulation (EUDR) which will take effect in 2025. This regulation will prohibit the import of commodities related to deforestation, including CPO, thus requiring comprehensive preparation in documentation and verification systems. Policymakers are advised to look beyond traditional indicators such as RCAs when negotiating trade agreements. It is also important to focus on addressing non-tariff barriers and improving the capabilities and business environment of the domestic (Stellian & Danna-Buitrago, 2022) (Kumar, 2007) (Ahmed et al., 2023).

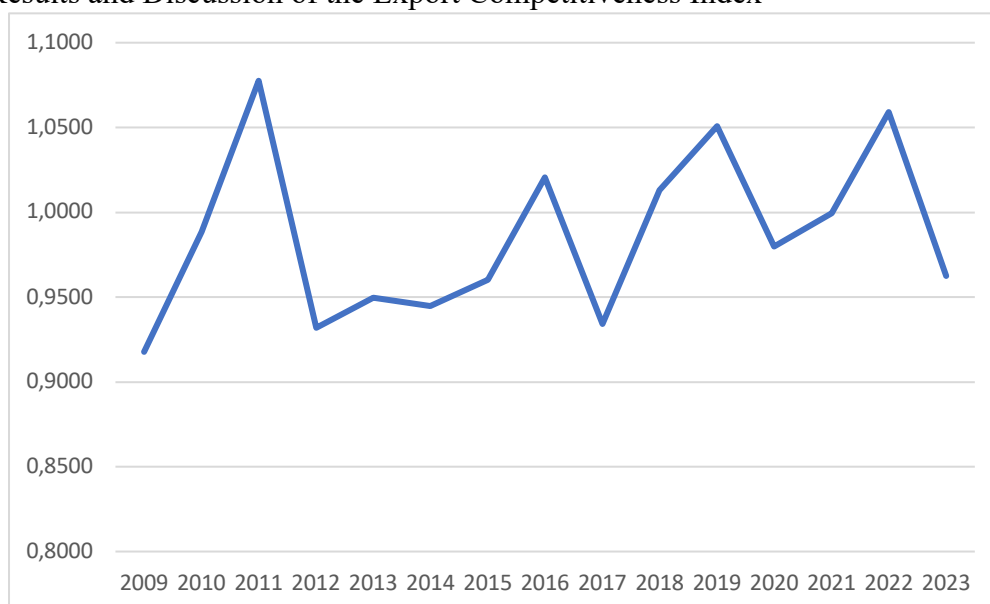## 4.2 Results and Discussion of the Export Competitiveness Index

Figure 2. Indonesia's CPO Export XCI Value

The results of the XCI test showed significant volatility in the complexity of Indonesia's CPO exports throughout the period, with the XCI value fluctuating between around 0.93 to 1.08. This trajectory shows three different phases of development.

The initial phase from 2009 to 2011 showed a dramatic increase in export complexity, with the XCI value rising sharply from around 0.92 to a peak of around 1.08 in 2011. This is the highest complexity value achieved during the overall period and shows a sophisticated increase in Indonesia's CPO export capabilities during those years.

The middle period from 2012 to 2017 showed considerable instability, marked by a sharp decline to around 0.94 in 2012, followed by relatively moderate fluctuations. The XCI value gradually recovered to around 1.02 in 2016 before declining again to around 0.94 in 2017. This volatility presents the challenge of maintaining a consistent level of export complexity.

The final phase from 2018 to 2023 shows renewed upward momentum, with XCI's value rising to around 1.05 in 2019 and 2022. However, this period ended with a marked decline to around 0.97 in 2023, indicating the latest challenge in maintaining export complexity gains.

The overall pattern shows that although Indonesia has made progress in developing the complexity of CPO exports compared to the 2009 baseline, the sector faces persistent challenges in achieving sustainable improvement. Repeated volatility indicates that external market conditions, policy changes, or structural factors continue to have a significant impact on Indonesia's sophisticated CPO export profile. The decline observed in 2023 requires special attention, as it represents a setback from the gains achieved in previous years and could signal emerging challenges that require strategic interventions to restore and increase the complexity of Indonesia's CPO export sector. The results of this test indicate the need for an in-depth evaluation of the factors that affect XCI value fluctuations, as well as the development of a more robust strategy to maintain and improve the competitiveness of Indonesia's CPO exports in the global market.

4.3 Challenges of EU trade policies

The fluctuation in the XCI value of Indonesia's CPO exports cannot be separated from the impact of the European Union's import policy, especially the implementation of the Renewable Energy Directive II (RED II) which came into effect in 2018. RED II sets strict sustainability criteria for biofuels, including palm oil, with sustainable certification requirements and a reduction in greenhouse gas emissions of at least 65% for new installations starting in 2021. The implementation of RED II explains the pattern of volatility seen in the data, especially the decline that occurred in the 2017-2018 period. This policy requires Indonesian CPO producers to improve production standards, implement sustainable certifications such as RSPO (Roundtable on Sustainable Palm Oil), and develop a comprehensive traceability system. Efforts to adapt to these requirements contributed to the increase in export complexity seen in the 2019-2022 period.

In addition to RED II, the European Union Deforestation Regulation (EUDR), which comes into full force in 2024, has a significant impact on the decline in the value of XCI in 2023. The EUDR requires strict due diligence to ensure that commodities do not come from land that has been deforested after December 31, 2020. These regulations require a sophisticated geo-tracking system and comprehensive supply chain documentation. Preparations to meet EUDR requirements are likely to explain why there has been a decrease in export complexity in 2023, as many Indonesian CPO exporters are still in the

process of adapting to these complex regulatory requirements. The challenges of implementing geolocation systems, developing documentation that meets EUDR standards, and supply chain restructuring contribute to the temporary decline in export efficiency.

The decline in XCI's value in 2023 reflects a critical transition period for the Indonesian CPO industry in adapting to various European regulations. The industry's success in increasing the complexity of exports in the future will depend heavily on its ability to transform regulatory challenges into competitive advantages.

The development of an integrated continuous certification system, investment in digital tracking technology, and improvement of sustainable production practices will be key to restoring and increasing XCI's value in the medium term. This successful adaptation to European policies can give Indonesia a competitive advantage in a global market that increasingly emphasizes sustainability.

The results of this test indicate that the fluctuation in the XCI value of Indonesia's CPO exports reflects the dynamics of adaptation to the evolution of international trade policies, especially the increasingly stringent sustainability standards of the European Union. A deep understanding of the interaction between international policy and export complexity is fundamental to developing a resilient and sustainable trade strategy.

5. Conclusion

The results of the comparative advantage analysis using Ricardo's theory and the RCA method provide several important implications for Indonesia's trade and industrial policy.

1) Indonesia should maintain and strengthen its dominant position in CPO production and exports through investments in productivity improvement, technology development, and infrastructure improvements.
2) Given the very strong comparative advantage in CPO, Indonesia needs to develop a product diversification strategy to reduce dependence on Crude Palm Oil exports. The development of downstream industries that produce high-value-added products such as oleochemicals, specialty fats, and advanced biofuels can increase the value added of Indonesia's exports.
3) Indonesia needs to develop policies and institutional frameworks that support continuous innovation and adaptation to changing global market conditions. This includes the development of research and development capabilities, human capital development, and strengthening of regulatory frameworks that support the sustainable development of the CPO industry.

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