Prediction of Indonesian Palm Cooking Oil Exports Based on Competitiveness

Muhammad Teguh[1], Taufiq Marwa[2], Bernadette Robiani[3] and Mukhlis[4]

Abstract

This research seeks to analyze the relationship between the export values of Indonesia's palm cooking oil and their export competitiveness, and to predict Indonesia's palm cooking oil export values for the future For this purpose, this research uses the Generalized Linear Mode, Poisson Regression Model, to examine the relationship between the competitiveness and export performance of Indonesia's palm cooking oil and to predict Indonesia's palm cooking oil exports for the future. Based on the research we find that the competitiveness of Indonesia's palm cooking oil exports has a positive effect on the Indonesia's palm cooking oil exports. In the future, exports of Indonesia's palm cooking oil are expected to continue to increase and Indonesia will continue to dominate the world market. This occurs mainly due to the high and even increasing competitiveness of exports of Indonesian palm cooking oil products compared to its competitors.

Keywords: *Indonesian Palm Cooking Oil Exports, Export Competitiveness.*

INTRODUCTION

Many countries in the world have used exports as a trigger for rapid economic growth in their countries. This situation can be seen from the research results of Goswami et al. (2019), which show that there are at least 5 countries whose economic growth comes from exports, including Indonesia. A similar thing was also stated by Bajo-Rubio (2022), who showed that there was a positive influence of exports on Spanish economic growth even though their contribution was small to average GDP growth.

Expanding product sales to foreign markets in countries that are experiencing growth is a profitable thing. The potential for expansion into international markets becomes important if the domestic market is experiencing saturation or no growth at all (Barnard et al., 2021). Forte and Carvalho (2022) also found that when the domestic market demand was experiencing a decline, exports became the mainstay.

Ngo-Thi-Ngoc and Nguyen-Viet (2021) identified that external market characteristics have a positive impact on Vietnam's agricultural product exports. At a time when Vietnam is experiencing saturation at home, overseas markets are an attractive option for the country's exporters. Exporters seem to need to estimate the reaction of the international competitive climate and the characteristics of importers.

Apart from that, an economic crisis that occurs in a country can also affect a country's export performance. The research results of Arifah and Kim (2022) showed that COVID-19 has increased fluctuations and instability in the exports of agricultural products.

Suparmono et al. (2022) researched the competitiveness of Indonesian products. Some products that have a static comparative advantage consist of the mineral fuel group, mineral oil and distillation products, and the bituminous substance group, such as rock products, animal fats, vegetables, and others. 10 export product groups that have a dynamic comparative advantage, namely natural rubber and its derivative products, cars, and motorized vehicles, fatty acids and their derivative products, brown coal, unrefined tin, wire, cable, copper, and others.

Nurkhoiry (2017) identified that the trend of Indonesia's RCA index for processed products, both palm oil from CPO raw materials and palm kernel oil, was increasing, whereas in Malaysia it was decreasing. In the

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[1] Faculty of Economics, Sriwijaya University, Palembang, Indonesia, Email: mteguh1961@gmail.com, (Corresponding Author)

[2] Faculty of Economics, Sriwijaya University, Palembang, Indonesia, Email: taufiqmarwa@unsri.ac.id

[3] Faculty of Economics, Sriwijaya University, Palembang, Indonesia, Email: robiani64@yahoo.com

[4] Faculty of Economics, Sriwijaya University, Palembang, Indonesia, Email: mukhlis6473@gmail.com

2013–2016 period, the RCA index for RPO between Indonesia and Malaysia was relatively the same, and Indonesia was slightly higher. Indonesia experienced an increase. RCA RPO 0.80 and RPKO 0.72 (2004–2012), increasing to RPO 1.02 and RPKO 1.48 (2013–2016).

As is known, the current state of demand for the world palm cooking oil market, apart from being unstable, also shows a downward trend. In 2019, demand for palm oil fritters continued to increase. Total world exports this year have reached 37,440.34 thousand MT, compared to 37,093.11 thousand MT in 2018. However, in 2020, world exports of palm cooking dropped drastically to reach 34,137.31 thousand MT. In 2021, global palm cooking oil market demand will rise again to 37,151.26 thousand MT. However, in 2022, it will drop drastically again to 34,602.85 thousand MT.

Indonesia, as the world's largest exporter of palm cooking oil, will have an export value of 58.09 percent in 2022 and 59.15 percent in 2023. Exports of Indonesian palm cooking oil continue to increase from time to time, although there have been disruptions at times. Of course, Indonesia's palm cooking oil exports will also be affected as a result of global palm cooking oil market demand. In 2019, during the world pandemic crisis, the market demand for Indonesian palm cooking oil on the world market fell to 22,164.21 thousand MT, whereas previously in 2018, the world market demand for Indonesian palm cooking oil had reached 22,742.73 MT. In 2020, world market demand for Indonesian palm cooking oil fell again to reach 20,162.31 thousand MT. In 2021, world market demand for palm cooking oil will rise again to 24,399.63 thousand MT, and in 2022, it will fall again to reach 22,777.83 thousand MT, and in 2023 fall sharply reached 18,983.26 thousand MT.

A similar thing also happened; the competitiveness of Indonesia's palm cooking oil exports also increased. If in 2004 the competitiveness index for Indonesian palm cooking oil exports was still 3.53, but in 2022 it has reached 7.88, and in 2023 it has become 6.67. In 2020, the competitiveness index for Indonesian palm cooking oil exports experienced its highest peak, with an index figure reaching 11.29.

This certainly attracts attention to review the prospects for exports of Indonesia's palm cooking oil on the world market for the future as a result of the recent global market competition.

Objective of the Study

This research attempts to analyze the relationship between Indonesia's palm cooking oil export value and its export'competitiveness. Berdasarkan temuan hubungan kedua variabel tersebut, maka penelitian mencoba memprediksikan nilai ekspor goreng kelapa sawit Indonesia di masa datang.

Conceptual Framework

Safari and Saleh (2020) identified that export performance and business strategy both have a reciprocal relationship. If export performance is good, then the export strategy will also be good. If the export strategy is good, export performance will also be good.

The research results of Eshetu dan Goshu (2019) showed that, the trade openness of Ethiopia and its partner countries, population size of Ethiopia, foreign direct investment and institutional quality index of Ethiopia positively and significantly affected on the volume of coffee export to its major trade partners.

Likewise, Uroos et al. researched on Pakistan (2021) showed that Pakistan's exports to the world have shown significant growth between 2003 and 2020. The main causes of Pakistan's export growth were extensive margins, price margins, and quantity margins between 2003 and 2020. The conclusion was that Pakistan's export growth was mainly led by quantity.

Trivan et al. (2018), who conducted research in SEE countries, found that the industrial competitiveness (CE) of these countries had a positive effect on the total exports (TE) of agricultural industrial products in these countries. However, by joining the SEE countries into the European Union to increase competitiveness, not all countries will benefit. Serbia, Bosnia and Herzegovina, and Macedonia are some examples of countries that have a negative relationship between TE and CE.

The same thing was found by Krajisnik dan Popovic (2019) in Bosnia, Fresh food and raw agricultural products adalah sektor-sektor yang mengalami penurunan daya saing sebagai akibat terjadinya pertumbuhan pasar-pasar yang cepat yang disertai adanya perdagangan yang tidak berimbang, dan perbaikan daya saing dari negara-negara pesaing.

Fu et al. (2021) said that the agricultural production costs in Hainan, especially the rising costs of labor, have had a significant impact on the export of fruit. As labor costs increased, the price advantage of Hainan's fruit exports was lost, and the contribution of its competitiveness to Hainan's fruit export growth dropped rapidly.

To export, a strategy is needed. In the concept of trade benefits through economies of scale (gains from scale economies), industrial companies that have a larger scale of operation, the more efficient the use of machines, the longer-term average costs originating from economies of scale decrease. This means that production must increase. The existence of international trade allows countries that specialize in the product in question to achieve economies of scale when exporting the production surplus they have after fulfilling the domestic market (Lipsey & Chrystal, 2015).

Heckscher and Ohlin states that a country will export a commodity that has abundant and cheap production factors, and that country will import a commodity that has rare and expensive production factors (Salvatore, 2013; Appleyard & Field, 2014).

Preciados and Zabala (2019) have tested the truth of Heckscher and Ohlin's theory, and they stated that the Philippines has abundant labor and scarce capital compared to Japan. The results of their research show that the Philippines has a comparative advantage in the production of labor-intensive products and Japan has a comparative advantage in the production of capital-intensive products. The Philippines exports labor-intensive products, and Japan exports capital-intensive products.

Linder states that firms within a country are generally motivated to manufacture goods for which there is a large domestic market. This market determines the set of goods that these firms will have to sell when they begin to export. The foreign markets with greatest export potential will be found in nations with consumer demand similar to those of domestic consumers. A nation's exports are thus an extension of the production for the domestic market (Carbaugh, 2011).

The theory of supply and demand in the international economy explains how much a country is willing to export products to obtain imported commodities in a certain amount. The supply and demand curve of a country shows the extent to which that country's availability is importing and exporting at various relative price levels that are currently in effect (Viphindrartin & Bawono, 2021).

Quality plays a very important role in the agriproduct sector, especially in foreign trade. Over the decades, international trade of agricultural products has rapidly increased between countries that have different environmental and development standards. This situation also increases the relevance of quality management in the international trade of agriproducts (Chandrasekaran & Raghuram, 2014).

The research's results of Issabekov (2019) showed that Kazakhstan's main export products are fuel, minerals, metals, vegetables and chemicals. There was a positive trend in RCA Kazakhstan during 2014-2016 for all the products mentioned above. However, products with a RCA of less than one are stone and glass products, food products, animals, hides, various textiles and clothing, wood plastic or rubber, footwear and transportation.

Liew et al. (2021), who researched the competitiveness of Malaysian agricultural commodity exports, showed that of the 186 agricultural commodities they observed, 56 of them were competitive. They also found that the determining factors of competitiveness were the price of the commodity in question, GDP per capita, labor participation, and capital formation. According to them, price factors, GDP per capita, and the economic crisis that occurred are negatively related to Malaysia's competitiveness. In contrast, labor participation and capital formation are positively related to Malaysia's competitiveness.

Haryadi and Amril (2020), who researched exports and the export competitiveness of Jambi province, found that five commodities had more than one competitiveness (RCA), namely vegetable oil, rubber, plywood, paper,

and fuel. The determining factors for Jambi province's exports come from the prices of commodity exports and raw material imports, the stability of the rupiah exchange rate, and the growth of Jambi province's GDP.

Riyani et al. (2018) identified that demand for Indonesian agricultural commodity exports continues to increase despite an increase in agricultural commodity export prices and agricultural commodity import tariffs in China. The Indonesia's agricultural commodities exported to China were competitive and were needed by China to maintain the continuity of its industrial processes.

Usman et al. (2019) identified that Indonesia has stronger competitiveness than Thailand in the world market with an RCA index value (30.2) which is higher than Thailand (28.6) in natural rubber exports. Indonesia's exports to the United States have strong competitiveness, with a RCA index value of 80.3, while Thailand has a RCA of only 18.2. Thailand has strong natural rubber export competitiveness to China with a RCA index of 36.4, while Indonesia has a RCA of 16.5 in the Chinese market. Indonesia's natural rubber exports to China are of low quality so efforts need to be made to improve the quality by using superior clones and maximum management.

Bierut & Dybka (2019) found that the determining factors of export competitiveness between European Union countries, namely the factor of technological advances and institutional factors. Both of them have a direct positive effect on all exports as well as a transformational impact. Apart from that, manufacturing exports have benefited from the better quality of government regulations, especially policies that keep inflation low and stable, and this factor has made the highest contribution to exports from European Union countries. Another factor is the free trade factor, which has a positive influence on the transformation of the export structure of European Union countries.

Matkovski et al. (2022) identified that almost all countries in the Western Balkans have a comparative advantage in agricultural-based food products, except Albania. According to them, there has been a significant change in the level of comparative advantage from both macroeconomic and microeconomic aspects. Liberalization also posed a threat to the agricultural food sector, the results of their research indicated that additional efforts were needed to increase competitiveness.

The effects of the crisis can also affect export competitiveness. Hayy et al. (2024), researching the influence of the war between Russia and Ukraine on wheat exports from wheat-producing countries, showed that the war between them has reduced the competitiveness of wheat exports from Ukraine. The three large wheat-producing countries, namely Australia, Canada, and the United States, experienced rapid progress due to the war crisis that occurred in Russia and Ukraine as wheat-producing countries.

METHODOLOGY

This research uses secondary data from international trade statistics, WITS, published by World Bank. The export data sample used in this research is during the observation period 2004-2023. The trade commodities observed are commodities with the codes HS 151190 and HS 151329. Furthermore, the term palm cooking oil commodity observed in this research is combined data from HS 151190 and HS 151329.

In the modern economy, the output market for a domestic industry is not only limited to the domestic market, but has also spread to the international market. One marketing policy option is for producers to produce domestically, and sell products in the domestic market to meet domestic market demand, and export the resulting products to meet foreign market demand. The export value variable (XP) in this research is the sales value of Indonesian palm cooking oil products on the world market. Because the research object observed is palm cooking oil exports, the export value in this study is the export value of palm cooking oil from Indonesia.

A common measure of export competitiveness that is widely used by economic researchers is the trade specialization index, the export index of revealed comparative advantage (XRCA), which was developed by Balassa and Noland and is widely used by economic researchers, including Irsahd & Xin (2017), Liew et al. (2021) and Rindayati & Akbar (2022), which is defined as the ratio of exports of certain commodity categories of a country to the share of export trade and can be written as follows:

$$RCA = X_{ij} / \textstyle\sum_i X_{ij} \ / \ \textstyle\sum_i X_{ij} / \textstyle\sum_i \textstyle\sum_j X_{ij} \tag{1}$$

X is exports, and the subscripts i and j indicate the related industry (product category) and country.

Export competitiveness in this research uses a measure of export competitiveness following the generally accepted Balassa method.

Another way to measure competitiveness is to use the Trade Specialization Index (TSI). The Trade Specialization Index (TSI) is a comparison between the difference in export value and the import value of a region compared to the total export value and import value of the region, or in other words, TSI is a comparison between the net trade value difference with the total trade value of a region (Daulika et al., 2020).

To determine the relationship between the export competitiveness of palm cooking oil products and the export value of Indonesian palm cooking oil and to predict exports for the future, this study uses the Generalized Linear Model (GLM), Poisson Regrssion Model (PRM), see Gujarati (2015) and Greene (2018), which can be written as follows:

$$\lambda i = E\,(XP|RCAI) = e^{\,\alpha + \beta RCA} \tag{2}$$

A log-transformation of equation gives:

$$Ln\,\lambda i = \ \alpha + \beta RCA \tag{3}$$

XP is the export value of Indonesian palm cooking oil; RCA is the export competitiveness of Indonesian palm cooking oil.

FINDINGS AND ANALYSIS

Exports, Competitiveness and Growth Data

The increase in exports of Indonesian palm cooking oil to the world market that has occurred so far is inseparable from the availability of abundant sources of production raw materials owned by the Indonesian state. Indonesia is the country that has the largest CPO production in the world. World CPO production is dominantly in Indonesia, and Indonesia ranks first in world CPO production, with production in 2022 reaching 59.31 percent. The state of Indonesia's CPO production also appears to continue to increase from time to time. In 2022 alone, Indonesia's CPO production will increase by 9.52 percent compared to the previous year. Malaysia ranks second, with CPO production reaching 23.71 percent. Then, Thailand ranks as the third-largest producer, with CPO production reaching 4.40 percent.

Table 1. Export Value and Export Competitiveness, 2004–2023.

Years	XP (000 USD)	RCA
2004	2114037.75	3.5299
2008	6066034.37	5.2140
2009	4837665.35	4.5697
2010	6081124.46	3.4560
2011	8958035.01	3.6531
2012	11506607.98	5.1646
2013	11808934.07	5.8256
2014	14409553.78	7.7453
2015	12046727.71	7.7378
2016	12661074.50	8.3729
2017	15647010.83	8.5914
2018	14319584.16	7.5476
2019	11943504.08	6.8589

Year	Value	Competitiveness
2020	13704586.44	9.1745
2021	25822437.73	11.2878
2022	26246832.91	7.8808
2023	19222276.17	6.6711

Source: Processed from WITS Data, World Bank, 2024.

As a result of the competitive advantage in the form of the availability of abundant sources of production raw materials, this has partly encouraged exports of Indonesian palm cooking oil to increase. Table 1 shows the development of Indonesian palm cooking oil exports and their export competitiveness. The export value of Indonesian palm cooking oil appears to continue to increase from time to time. It's just that in 2015, 2017, 2018, 2019, and 2023, Indonesia's palm cooking oil exports experienced disruption, resulting in a decline compared to before. The export value of Indonesian palm cooking oil will reach its peak in 2022. In 2022, the share of the Indonesian palm cooking oil export market will reach 58.09 percent.

Indonesia's palm cooking oil exports in 2023 have fallen sharply, namely by 26.76 percent. Even though Indonesia's palm cooking oil exports in 2023 fall sharply, Indonesia's export market share increases to 59.15 percent.

In Table 1, it can also be seen that the competitiveness of Indonesian palm oil cooking oil exports continues to increase. The competitiveness of Indonesian palm oil cooking oil exports relatively decreased in 2015, 2018, 2019, 2022, and 2023. The competitiveness of Indonesia's palm cooking oil exports reached a peak in 2021 and decreased again in the following year. Even though the export competitiveness of Indonesian palm oil cooking oil has recently appeared to have decreased, the competitiveness of Indonesia's palm oil cooking oil exports is still in relatively good condition compared to the export competitiveness of its main competitor, namely Malaysia. In 2015 Malaysia's competitiveness only reached 3.3291, then in 2018 it reached 2.9450, in 2019 it reached 2.9297, in 2022 it reached 4.2016, and in 2023 Malaysia's export competitiveness only reached 3.8188.

Table 1 at a glance shows that there appears to be a relationship between the competitiveness of Indonesian palm cooking oil exports and the value of Indonesian palm cooking oil exports. However, to find out the truth, this needs to be tested further, whether these two variables really have a relationship, and how they are related.

The Relationship of Palm Cooking Oil Exports and Export Competitiveness

This research tries to see changes in the value of Indonesian palm cooking oil exports that are directly linked to the export competitiveness variable of the commodity in question.

Table 2. The Effect of Export Competitiveness on Exports during 2004–2023.

Dependent Variable: XP				
Method: Generalized Linear Model (Newton-Raphson / Marquardt steps)				
Sample: 2004-2023				
Family: Poisson Quasi-likelihood				
Dispersion fixed at 1				
3.0000)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	14.79512	0.361227	40.95800	0.0000
RCA	0.213706	0.040623	5.260642	0.0000
Mean dependent var	11347609	S.D. dependent var		6994544.
Sum squared resid	3.41E+14	Quasi-log likelihood		3.49E+09
Deviance	28740610	Deviance statistic		1596701.
Restr. Deviance	83814490	Quasi-LR statistic		55073879
Prob(Quasi-LR stat)	0.000000	Pearson SSR		30296336
Pearson statistic	1683130.	Dispersion		1.000000

Source: Processed from WITS data, World Bank, 2024.

The equation in Table 2 is the best regression equation with almost perfect statistical probability and good data dispersion. In other words, the equation can be used to make decisions from the relationships of observed variables. The competitiveness of Indonesian palm cooking oil exports (RCA) appears to have a positive and significant effect on Indonesian palm cooking oil exports. The influence of the competitiveness of Indonesian palm cooking oil exports on Indonesian palm cooking oil exports reached 21.37 percent. With an elasticity coefficient of 0.21371, this means that every time there is an increase in the competitiveness of Indonesian palm cooking oil exports by 1 percent, this will cause an increase in Indonesian palm cooking oil exports of 0.21371 percent. In other words, if the competitiveness of Indonesian palm cooking oil exports increases, then the export value of palm cooking oil will increase. On the other hand, if the competitiveness of Indonesian palm cooking oil exports decreases, the value of Indonesian palm cooking oil exports will decrease.

The test results shown in Table 2 are in line with theoretical views and the results of previous research. According to Heckscher and Ohlin's theory, a country will export a commodity that has abundant and cheap sources of production materials. Likewise, Linder's theory, states that exports increase because of large foreign demand. The results of this research also show similar findings. Indonesia has abundant raw materials for palm oil, so Indonesia exports palm cooking oil and Indonesia can control most of the world's palm cooking oil export market. Likewise, the results of research by several researchers, including Issabekov (2019), Liew et al. (2021), Haryadi and Amril (2020), and Matkovski et al. (2022), stated that the commodity exports of the countries they observed had export competitiveness. The results of this research also show similar evidence that Indonesian palm cooking oil exports have a positive relationship to the export competitiveness of the commodity in question; the competitiveness of these exports tends to be higher compared to competing countries.

Export Predictions

Based on the equation in Table 2, it is known that the rate of increase in Indonesian palm oil cooking oil exports is determined by the export competitiveness factor of the commodity in question. The increase in export competitiveness has caused exports of Indonesian palm cooking oil to increase.

Figure 1 shows the predicted results of the competitiveness of Indonesian palm cooking oil exports until 2028, using the ARMA method, see Narasanov et al. (2018). This research uses the Moving Average Model (MA) after selecting two models, namely the Auto Regressive Models (AR) and the Moving Average Model (MA), which MA is the best model. In Figure 1, shows the prediction results of the competitiveness of Indonesia's palm cooking oil exports has a tendency to increase. This prediction result is the best result with low variance. The relationship between the actual value and the predicted value has the same direction; if the competitiveness of previous exports increases, then the competitiveness of exports in the future will also increase.
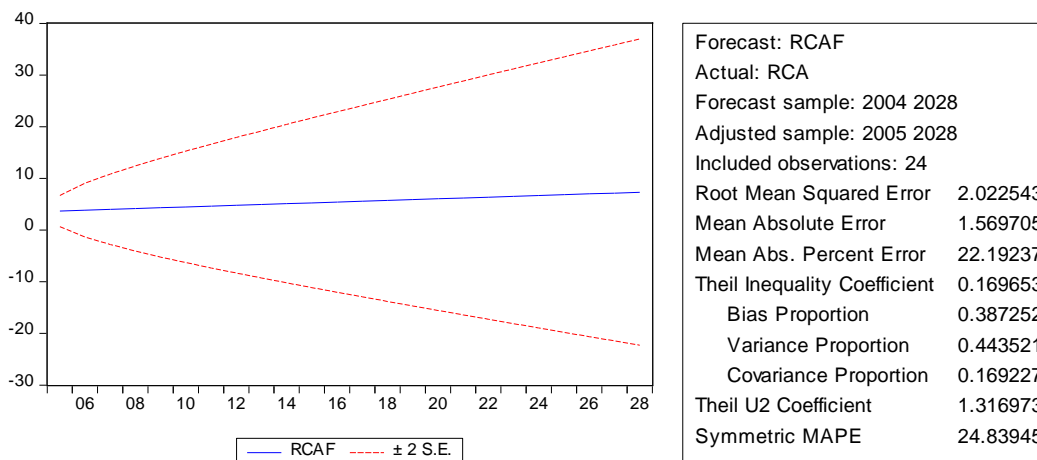

Forecast: RCAF	
Actual: RCA	
Forecast sample: 2004 2028	
Adjusted sample: 2005 2028	
Included observations: 24	
Root Mean Squared Error	2.022543
Mean Absolute Error	1.569705
Mean Abs. Percent Error	22.19237
Theil Inequality Coefficient	0.169653
Bias Proportion	0.387252
Variance Proportion	0.443521
Covariance Proportion	0.169227
Theil U2 Coefficient	1.316973
Symmetric MAPE	24.83945

Figure 1. Prediction Results of Export Competitiveness.

Source: Processed from WITS data, World Bank, 2024.

Based on the RCA prediction results in the Figure 1, it can be estimated the future values of Indonesian palm cooking oil exports. The predicted results of the future value of Indonesian palm cooking oil exports using the Poisson Regression Model (PRM) method are shown in Table 3.

Table 3. Predictions for Indonesian Palm Cooking Oil Exports for 2024-2028.

Years	RCAF	ΔRCAF (%)	ΔXP (%)
2023	6.52942	-	-
2024	6.68729	2.41783	0.51672
2025	6.84516	2.36075	0.50452
2026	7.00303	2.30630	0.49288
2027	7.16090	2.25431	0.48177
2028	7.31877	2.20461	0.47115

Source: Processed from WITS data, World Bank, 2024.

In table 3, it can be seen that the prediction results for Indonesian palm cooking oil exports (XP) show an increasing trend. The prediction results using the PRM method take into account the increase in the competitiveness of Indonesian palm cooking oil exports (RCA). The increase in exports of Indonesian palm cooking oil is in line with the increase in the competitiveness of exports of the commodity in question. If export competitiveness increases, then exports of Indonesian palm cooking oil on the world market will also increase. Semakin tinggi kenaikan daya saing ekspor, maka nilai ekspor akan turut semakin tinggi pula

Thus, even though the world market is relatively unstable, it is estimated that Indonesia's palm cooking oil exports will continue to increase in the future.

CONCLUSION

From the previous explanations, it is known that the competitiveness of Indonesian palm cooking oil exports has influenced Indonesian palm cooking oil exports both positively and significantly. The higher the competitiveness of exports, the higher the exports of Indonesian palm cooking oil will also increase. Indonesia has high competitiveness in palm cooking oil exports. The high competitiveness of Indonesian palm cooking oil exports is mainly determined by the static and dynamic comparative advantage factors that Indonesia has, namely in the form of endowment factors and government policy factors. Another factor is the increase in market demand for palm cooking oil around the world.

In the future, it is estimated that Indonesian palm cooking oil exports will continue to increase even though the world economy is still experiencing a downturn. Indonesia's exports of palm cooking oil in the future will continue to increase and remain dominant in the world palm cooking oil market, in line with the increase in world market demand for palm cooking oil products.

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