

THE RELATIONS BETWEEN INTERNATIONAL CPO PRICES AND DOMESTIC PALM OIL PRICES: A CAUSALITY APPROACH

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Abstract

The objective of this research is to analyze the trend of the Crude Palm Oil (CPO) prices in international Market at Rotterdam–Holland for the next two (2) years and to analyze the relations between international CPO prices and domestic palm oil prices in Indonesia.. The researcher uses linier trend method to analyze the trend and Granger causality approach. The results of the research show that the trend of international CPO prices tends to increase in 2008 and 2009. The causality analysis shows that international CPO prices causes domestic palm oil prices in Indonesia, but it is not vice versa. The result also shows that there is a positive relations between these prices. The increasing international CPO prices causes the rising of domestic palm oil prices.

Keywords: *Crude Palm Oil (CPO), palm oil, international prices trend, domestic prices, causality approach.*

BACKGROUND

Palm is one among many important plants in agricultural sector in Indonesia. Crude Palm Oil (CPO) is produced from palm plantation. In 2004, Indonesia was the second rank producer of CPO world producer meanwhile Malaysia was the first. The total width of palm plantation in Malaysia was about 3.7 millions hectares with total CPO production reached about 12 million tons or 46 percent to the total CPO world production. On the other hand, Indonesia had 4.1 millions hectares but only produced 9.6 million ton or 37 percent to the total CPO world production (www.deptan.go.id/ditjenbun, 2004). On the other side, market shares of Indonesian CPO showed that Indonesia also took the second place internationally after Malaysia. From total CPO export in 2005 as much as 26,497,000

tons, shares of Indonesian CPO export was only 38.87 percent meanwhile Malaysia had about 50.73 percent. The biggest importer of Indonesian CPO was India of about 42 percent. (Wahyono et al, 2006).

Indonesian CPO production is dominated by private plantation and followed by public and state owned plantation. In 2005, private plantation contributed about 54 percent to Indonesian CPO total production, see Table 1.

So far, the area of palm plantation in Indonesia had been expanded that reached 5.5 million hectares, CPO of Indonesian plantation had contributed as much as 40.4% in 2005. This CPO production was bigger than the domestic demand that the rest is exported in CPO or RBD Olein form (Siahaan et al, 2006).

Oil or fatty can be made not only from palm seed but also from coconut fruit and others. The consumption of oil is different between household consumption, small industries, food industries and others. Table 2 shows the growth of oil and fatty consumption in Indonesia from 1999 to 2005.

Table 2 indicates that in many types of oil, majority of rural and urban citizens consume palm oil followed by coconut oil. Palm oil consumption always increase every year from 10.6 grams in 1999 to 13.05 grams in 2005. Indonesian citizens consume palm oil for everyday uses such as cooking,

frying food and uses for small industries and household industries. The other oil consumption tends to be lower which less than 0.5 grams meanwhile the demand of palm oil and other oil tend to be steady.

In Indonesia, CPO commodity is not not only depart for export, but also as a basic material to make palm oil for domestic consumption. The sharp increases of CPO prices in the world market will push domestic producers to export them. It will caused the decrease of CPO supplies for domestic consumptions and it will impact the increase of palm oil prices in the domestic market.

Table 1: Indonesian CPO Production in 2001 to 2005

	2001		2002		2003		2004		2005	
	Total	%	Total	%	Total	%	Total	%	Total	%
Public Plantation	2.80	33.33	3.42	35.55	3.52	33.72	3.75	30.66	3.87	29.52
State Plantation	1.52	18.10	1.61	16.74	1.75	16.76	2.01	16.43	2.16	16.48
Private Plantation	4.08	48.57	4.59	47.71	5.71	49.52	6.47	52.90	7.08	54.00
Total	8.40	100	9.62	100	10.44	100	12.23	100	13.11	100

Source: BPS, 2006

Table 2: The Growth of Oil and Fatty Consumption of Indonesian Citizens in 1999 to 2005 (Rural+ Urban) in grams.

	1999	2002	2003	2004	2005
Coconut Oil	8.3	10.4	9.71	8.80	8.98
Palm Oil	10.6	12.0	11.89	12.80	13.05
Others	0.2	0.4	0.32	0.33	0.43

Source: Susenas 1999,2002,2003,2004,2005: BPS processing data by KKP central

This phenomenon is happened on palm oil prices in Indonesia. In 1998 case, dollar exchange rate and the world CPO prices increased sharply. The impact was domestic palm oil price became expensive and the supply decreased. In 2007, CPO prices in world market was rising again extremely, it caused the price of palm oil increased greatly in the last two months of March and April 2007. According to MetroTVnews.com (2007), the increasing of CPO prices in the world market had pushed the increase of palm oil price in the domestic market. According to Liputan 6 SCTV in April 2007, the highest increase of palm oil price was caused by producers of palm oil which preferred to export than supplying what the domestic demands required. Tendency to export became higher when CPO prices were rising extremely.

The CPO world price in 2002 was at US\$ 3,600 level each ton, but in April 2007 it increased sharply to US\$ 12,000 each ton. This situation was used by speculators since this product can be traded for the future market. It was difficult for the government to restrict the speculative action because CPO is not a sensitive commodity. (Metrotvnews.com (2 May 2007)). At the moment, the government applies export tax to the CPO to solve the shocking increase of international CPO prices. The tax is implemented to restrict the number of CPO exports and to give an adequate stock of palm oil products for domestic supply. The final goal is the more stable price of palm oil. For example, when the CPO prices increased in 1998, the government applied tax export for CPO as much as 60% from the international CPO price level.

That policy, according to Arifin (2004), has made palm oil industry in Indonesia dominated by only with a few companies or big investor. Therefore, the government stepped in to limit export volume and allocate it to domestic market

with a lower price. According to him, it was one of many serious economic distortions which formed because only a few entities who will take benefits of the policy, meanwhile the farmers would be the losers.

The price depends on the supply and the demand. If the supply is less meanwhile the demand increases, it will caused the increase of the price. The demand and the supply of CPO and palm oil in Indonesia in 2005 can be seen at Table 3.

Table 3 shows that the relations between supply and demand of palm oil are equal, if the demand increases, it will push the rise of palm oil prices. CPO is the raw material for palm oil industries, so if the international CPO prices increases, it can caused the CPO producer to prefer exporting the product for profit taking.

Table 3: The Supply and the Demand of Palm Oil in Indonesia in 2005 (thousand)

	Crude Palm Oil (CPO)	Palm Oil
Supply	13,698	2,524
Demand	9,306	2,524
Volume	4,392	0
Percentage to the Demand	47,19	0

Source: gizi.net.com

Indonesia as a producer country, in majority consumes palm oil that is made from CPO. The growth of the population and the economic development in other countries will also cause the higher demand of CPO. Consequently, it will impact the rising of CPO price at international market. The high rising of CPO prices will cause CPO major producers tend to increase the CPO export. The impacts are the supply for domestic consumption will decrease and domestic prices will rise.

Efficiency of international trade study can be identified by market integration, i.e. using efficiency market

hypothesis approach. Meanwhile, it also can be done econometrically by cointegration, causality and the asymmetry approaches. Based on efficiency of market price theory, stated that inter place price will enclose to the equilibrium in the weak long term form, which is the prices in the time will be effected by previous prices and in the long term it will always aptitude to create new equilibrium.

Therefore, the researcher want to know the trend of international CPO prices and if there is causality relations between the rising prices of CPO in international market and palm oil in Indonesia.

The previous studies had been done by some researchers. Darwanto (2004) researched on rice, identify that the fluctuation of international prices would transmit directly to domestic market prices especially in the free trade condition.

Simatupang and Situmorang (1988) also researched the price of rubber commodity. The analysis was using auto regression model. Result showed that the rubber price between Jakarta and Singapore had a strong integration, and the prices were formed together, that there were no market that became a price maker. But, the domination price of Singapore market was stronger than Jakarta market.

Purwadi, et al (2004) used cointegrated and error correction models to analyze. The results showed that Robusta coffee price in Indonesia was integrated with Brazil and Vietnam coffee prices and also main importers in long term equilibrium. Indonesia as exporter country of Robusta coffee had important rule in stimulating the moving price not only inside exporter countries but also inside main importer countries.

The other research also has been done by FAO (2005). FAO found about the transmission level of tea price between auction market and international price

references. The price transmission was counted with a co-movement testing, adjustment velocity and percentages of asymmetric respond. The results indicated that the average of tea price in auction market with international references price followed same trend in the long term, meanwhile in the short time, the price in the local price was out from that price. (FAO: 2005).

The same research had been done by Antik and Indah (2006). The price relations between Indonesian tea prices and the main world of tea producers was tested using cointegration approach. It showed that the price of Indonesia tea mostly was caused by the price moving of Srilangka's market rather than India's market.

Research about palm oil commodity was done by Sinaga and Ketut (2005). Result showed that coconut oil export prices and palm oil export prices responded to the change of each price in international price. Research also indicated that within the palm oil industry, both coconut oil prices and palm oil prices did not response to the change of export price variables and domestic demands of each product. It was caused by the strategic role of palm oil as an important goods for society living, so export activity and the changes of palm oil prices was influenced by the government policy.

Data shows that there are no excess between supply and demand of palm oil in Indonesia. In the other side, the rising of international CPO price is followed by the increase of domestic palm oil price. It is possible because Indonesia is a major CPO producer in the world, the high prices will push export more than the supply for domestic market. It causes the decrease of CPO supply in domestic market. As a raw material of palm oil, the increasing of CPO price will impact the decrease of palm oil production in Indonesia. At the decreasing production state, while the demand of palm

oil is stable, the palm oil prices in domestic market will be rising.

The aims of this study are to analyze the trend of CPO prices in international market for the next two years and to analyze the relations between the rise of international CPO prices in Rotterdam and the rise of domestic palm oil prices in Indonesia.

METHODOLOGY

This is a descriptive research. Data used are secondary data, which data resources taken from Oil World, Food Agricultural Organization (FAO), Central Bureau of Statistics, Centre of Palm Study and literatures. The records used are monthly data for 7 years available from January 2000 through December 2007.

The first aim is the analysis regarding the trend of international CPO prices for the next 2 years, which uses the Trend Analysis method. To choose the best trend method, data were depicted in scatter diagrams to see the trend of data. With SPSS (Statistical Package for Social Science) program, researcher finds the F value. The trend method which has the biggest F value will be chosen as a trend method to predict international CPO prices in the next future.

The second aim is to find out the relations between international CPO price in Rotterdam (Holland) and the palm oil domestic price in Indonesia by using the Granger-Causality analysis. Before data processing step, the time series data must be stationary first, then data processing continues with Granger-Causality testing. To see the causality relation between them, researcher uses Eviews program.

Analysis of price behavior using time series data, theoretically, will make it behaved enclosing to dynamic equilibrium in the long term. Series data will be in the long term if data has co-integration relation.

Therefore, to prove the price integration of inter-market we use co-integration analysis.

According to Purwadi, et al (2004), co-integration analysis had implemented widely as econometric technique analysis for time series data. In the past years, cointegration analysis had been implemented to explain market integration by Silvapulle and Jayasuriya (1994), Karbus and Jumah (1995), Mohanty et al (1996, 1999), Sabohuro and Larve (1997), Yang and Leatham (1998). These analysis were the advances of the market integration analysis with auto regression approaches.

If two data series had a long term equilibrium relation, although in the short time they were significantly different, then the market was called as an integrated market in the long term. Vice versa, if two data series price integrated, it must have long term equilibrium relation and it was called the market integrated. (Spilvapulle and Jayasuriya, 1994)

Causality analysis is used to find out the price from which market that will be the cause of the price change in other market. The model used for this analysis was developed by Granger (1986). The developing of this model need condition that both of prices must be co-integrated and this conclusion could be obtained base on co-integration testing on integration analysis.

To see the stationary data of both prices the researcher uses root test with ADF (Augmented Dickey Fuller) testing that had been done by Dickey and Fuller (1979) and Philip Perron (PP) test. If data series are not stationary, data series have to be processed into first differential until it become stationary.

Co-integration testing of the two variables was done based on stationary residual state from the co-integrated regression. Example, for $P_{Indonesia}$ and $P_{Rotterdam}$ The equation of co-integration equations can be written as:

$$P_{\text{Indonesia}} = \alpha_0 + \alpha_1 P_{\text{Rotterdam}} + e_i$$

To see the causality relation of each price variable, Granger-Causality analysis is applied. Co-integration testing aims to detect the long term relation between the two variables. This research will see the long term relation, if the CPO international prices (Rotterdam) can stimulate the moving of palm oil prices in domestic market (Indonesia).

Although there are many integrated economic variables with ordo 1, econometric analysis seems always based on the stationary assumption for both series, variable itself and the alternative around determined time trend. Regression of a variable I (1) with another usually give high R^2 and t count that biased to reject of null hypothesis, that is no relation, although the fact not (Granger and Newbold 1974, Philips 1986) in Hutabarat and Sumedi (2001). The relation of variable regression I (1) with the other will be spurious if these variables are not integrated. This is one of the benefits of co-integration analysis.

It is important to check whether a series is stationary or not, before using it in a regression. The formal method to test the stationary of a series is the unit's root test. In this research, researcher uses Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test for unit root test by using EViews software.

Before analyzing the relations between two prices by using co-integration analysis, integration ordo of each series has to be determined first, it is because the series variables researched integrated with same ordo. It is caused by many series data in original form which is not stationary.

Co-integration technique analysis include 3 steps of analysis technique, i.e.: 1) testing is data from variable researched has stationary or on what ordo data indicated stationary 2) If the two variables researched belong same stationary ordo. 3) Co-

integration test can be done if two variables have same stationer ordo, if not we cannot do co-integration testing. To analyze the stationary of series data of this research researcher uses ADF and PP tests. If series data are not stationary then they must be stationary first by using differencing method.

Granger-Causality

After series data are stationary, processing is continued with Granger-Causality test. It will see the causality relation between domestic palm oil prices and CPO international prices. For testing the first hypothesis that CPO international prices within the next 2 years will increase, the researcher uses trend analysis with SPSS program. It will investigate the relations between variables that will be predicted with another variable. The variable that will be estimated is the CPO prices in next 2 years. Estimated analysis is done to the data with many trends method. The result shows that the biggest F value is the linier equation. Therefore, the researcher chooses linier trend (least square method) to forecast the next price. The basic equation of linier trend is:

$$y = a + b x$$

Where,

y = trend value

a = constanta (value of y when x=0)

b = coefficient (slope is marginal of y value if x added 1 unit)

x = period value (month) because data (2000-2007) then x value are -7, -5, -3, -1, 1, 3, 5, 7.

Statistic hypothesis:

Ho: $b \leq 0$, meaning that trend of CPO international price tend to decrease

Ha: $b > 0$, meaning that trend of CPO international price tend to increase

Testing criteria: If sig value < 0.05 , It means that Ho is rejected and Ha is accepted or the

hypothesis that trend of CPO international prices tend to increase.

To test the second hypothesis that there is relationship between the rising of international CPO prices with the rising of domestic palm oil prices (Indonesia) researcher uses Grager-Causality analysis. Grager-Causality testing is implemented to see the causality relation between domestic palm oil prices in Indonesia and CPO prices in international market (Rotterdam). Hypothesis testing Ho is:

Ho: x (International CPO price) does not cause Granger y (domestic palm oil price) in the first regression and y does not cause Granger x in the second regression.

The existence of causality relationship is indicated from probability value (P). If P value is less than 0.01, null hypothesis is rejected, that is mean that x variable does not cause y variable (in the first regression) is rejected. In other word, x variable become causer of y variable. This also happened on the second regression. If P value more than 0.01, null hypothesis is not rejected. It means that the first variable does not cause the other variable.

If known that there is only one way relation (only one variable that become causer and not effect to each other), so the analysis is continued with a simple linier regression to know the effect of independent variable to dependent variable. The equation is: $y = a + bX$

Where,

y = domestic palm oil prices

a = constant value (y value when x=0)

b = coefficient (slope)

x = international CPO prices

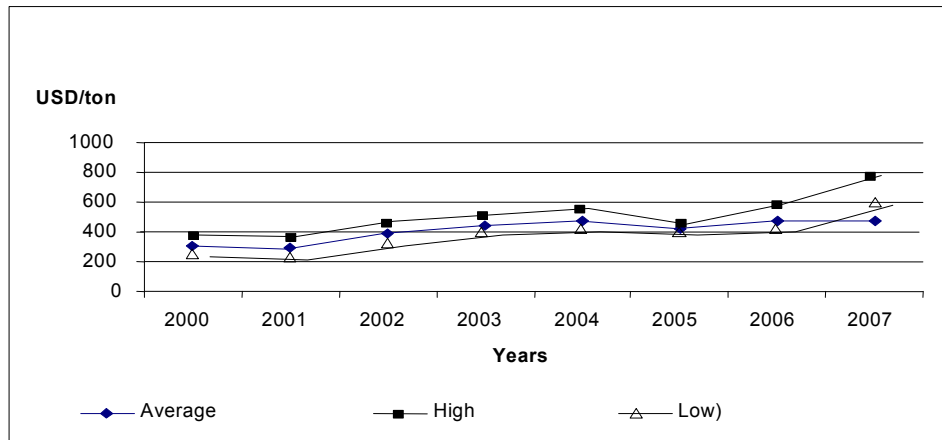
Testing criteria:

If sig value of x variable < 0.05 , mean that international CPO prices effect to domestic palm oil prices significantly. If sig value > 0.05 mean that international CPO prices do not effect to domestic palm oil prices significantly.

RESULTS AND DISCUSSION

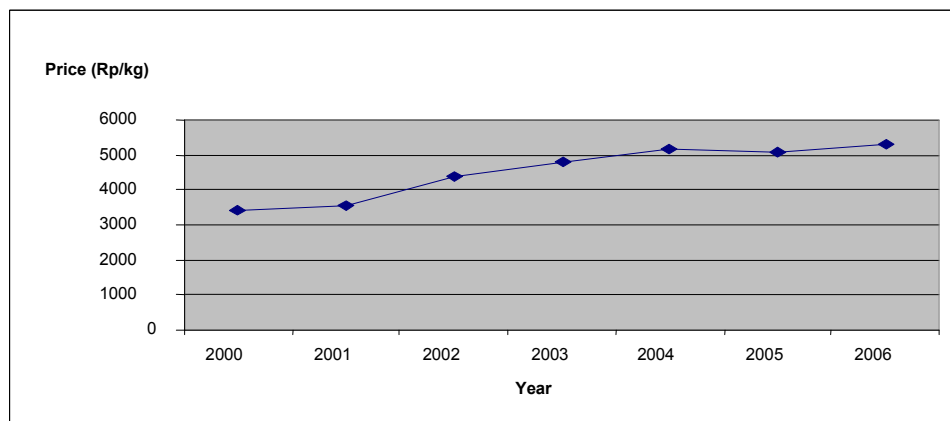
Indicator of CPO international prices is CPO prices in Rotterdam (Holland) market. Holland is a country in North Europe that had become the biggest importer of international CPO. Trend of monthly international CPO prices in Rotterdam market can be seen in Figure 1.

Figure 1 shows that CPO prices in international market tend to increase from 2000 to 2007 although the price in 2005 tends to decrease. The highest monthly prices happened in 2007 with price reached US\$ 800/ton. The lowest price happened in 2001 about US\$ 200 for each ton. The rising price was caused by the high demand of CPO as an alternative of bio-energy resources (bio-fuel). Besides, the rising demand was also caused by the high demand from China and India as countries that have faster economic growth.



Sources: FAO. (2007)

Figure 1: The Trend of International CPO Prices From 2000 to 2007



Source: Bulog (2007)

Figure 2: The Trend of Palm Oil Prices in Indonesia

The rising of CPO prices is hypothesized will effect the rising of domestic palm oil prices. The trend of domestic palm oil prices in Indonesia can be seen in figure 2. To solve the rising prices of palm oil in domestic market, Indonesian government usually applied export tax to stabilize CPO supply and palm oil prices in domestic market. However, according to Arifin

(2004) this policy did not effect to the palm oil prices in domestic market effectively. It is because the market structure of palm oil in Indonesia tends to be oligopolistic. About 60 percent to 65 percent of palm oil market share in domestic market is monopolized by two major groups company namely Salim Group and Sinar Mas Group which are integrated from upstream to downstream;

such as plantation, CPO processing, palm oil industry and the palm oil marketing itself. According to him, the rising of palm oil prices was not connected with the change of export tax application. The rising of palm oil prices in domestic market is mainly caused by the demand momentum such as Lebaran (Eid's), Christmas' and New Year's. The application of those taxes will restrict not only the export volume but also restrict the investments related to the export.

Before processing the trend of the data, scatter diagram is described. Then, curve fit analysis is done by using SPSS software. The result shows that to estimate the next price is used linier regression. This analysis is chosen because this method has the biggest F value compare with the other methods such as quadratic and exponential methods. F value for linier regression as much as 18.952, quadratic trend is about 12.899, and exponential trend is about 16.645 respectively. Therefore, in order to know the trend of international CPO prices in the future we can use linier trend method.

The result from trend linier analysis shows that international CPO prices in the future tends to increase. It indicates from sig value as much as 0.005 that is lower than 0.05, thus the hypothesis can be accepted. The result shows that there are positive coefficients as much as 13.473 and constanta value as much as 409.936 which means that international CPO prices in the next year will increase. The equation can be written as:

$$y = 409.936 + 13.473x$$

The analysis shows that coefficient as much as 13.473, means that international CPO prices will rising every year about US\$ 13.473/ton. Thus, CPO international prices is predicted will be increased for the next years. The forecasting of international CPO prices in the next 2 years is shown on Table 4.

Table 4: CPO International Prices Forecasting in 2008 and 2009

Year	Forecasting Prices Average (US\$/ton)
2008	531,191
2009	558,137

As the first step in time series data analysis, unit root test is applied to determine the level of integration for every univariance series data. Null hypothesis is rejected on alpha 1% or 0.01 level significance. This model contains constanta, trend and season's dummy.

The Auto-correlation analysis shows that series data of domestic palm oil prices and CPO prices are not stationary. These can be seen from unit root test result by using ADF test and PP test. Analysis shows that the probability value (P) of domestic palm oil prices and international CPO prices in Rotterdam is more than 0.01, which means that series data of each price is not stationary. The testing with ADF test shows that the probabilities value of palm oil prices and CPO prices are about 0.12 and 0.11, respectively. Meanwhile, the probabilities value of PP test are 0.66 and 0.553, respectively.

Because the series data is not stationary, so it must be changed into first order differential. Result of domestic palm oil prices and international CPO prices after first differential shows that probability value as much as 0.00 less than 0.01 on both ADF test and PP test. It means that data have been stationary. Therefore, series data of palm oil prices and international CPO prices uses first order difference (I). Afterwards, these data is used to see the relations between two prices.

Granger -Causality Test

After series data become stationary, testing is continued with Granger-Causality test. Result shows that international CPO

prices in Rotterdam market causes domestic palm oil prices in Indonesia. It is indicated from the probability value as much as 0.0071 less than 1%, which means that the hypothesis of international CPO prices in Rotterdam market do not cause domestic palm oil prices in Indonesia. Thus, palm oil prices in Indonesia tend to be caused by international CPO prices in Rotterdam market. But, it is not vice versa that domestic palm oil prices in Indonesia cause the increasing of CPO prices in international market because the probability value as much as 0.1591 more than 1%.

These analysis indicated that international CPO prices effect to the rising of palm oil prices in Indonesia although Indonesia is one of the major producer of CPO in the international market. The rising prices of international CPO have made Indonesian CPO producers prefer to export CPO than supplying CPO for domestic consumption. Consequently, supply of domestic CPO for palm oil consumption will decrease. It will impact to the increasing of palm oil prices in the domestic market.

To keep the stability of domestic palm oil prices, the government usually applied tariff policy namely export duty for CPO export. By implementing this duty, the government hopes that the producers will decrease their export volume of CPO. However, until now this policy is not popular and also ineffective because it only causes the reducing of palm oil prices insignificantly and also create an impact to the reducing of productivity of palm oil processing industries. Therefore, this kind of policy have to be balanced with the diversification of CPO in domestic products. And so, it will improves the general CPO production and the usage. To improve domestic supply, it is done by giving investment incentives especially for CPO processing industries.

The result indicates that government needs to observe the trend of international CPO prices because it will effect the domestic palm oil prices. This is really important because Indonesia as the second main producer of CPO consume CPO for palm oil, which is one of the Indonesian staple food. Therefore, the stability of staple food prices have to be kept by maintaining the domestic CPO stock and giving profits for the producer. The profits can be obtained by making variant of CPO based products. These strategies will give significant additional values for the products and at the same time will reduce the number of exports of CPO.

CONCLUSION

Based on this research, the researcher encloses two conclusions. Firstly, the monthly prices of international CPO in Rotterdam in the next two years tend to increase. Secondly, that increase will cause the increase of the domestic palm oil prices in Indonesia.

By looking at the trend of international CPO price in Rotterdam market, Indonesian government must be prepared to face the rising of international CPO prices by stabilizing palm oil supply in the domestic market. Besides, it is possible for Indonesian government to support the producers or investors in agribusiness development. It includes the upstream and downstream industries especially on palm plantation, such as supporting the in-land expansion and also giving incentives for processing industries that produce CPO and the variants. This policy could lead Indonesia to become a major producer of CPO in the world, giving a value added for the society and at the same time decreasing the CPO export for more domestic supply.

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