External and Internal Determinants Exports of Crude Palm Oil in Indonesia from 1990-2020

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ABSTRACT

Indonesia has extensive agricultural land. Therefore, most of the population works in agriculture. One of the agricultural sub-sectors is oil palm plantations. This commodity is the heroine in international trade. As one of the global palm oil-producing countries, Indonesia can become a source of export income in foreign exchange. Therefore, palm oil positively influences the Indonesian economy. This study aims to analyze the magnitude of the influence of international CPO prices, exchange rates, production, and land area on the export volume of crude palm oil in Indonesia from 1990 to 2020. The analytical method used was multiple linear regression with Ordinary Least Square (OLS), while the type of data used was secondary data with time series from 1990-2020. The simultaneous test results (F test) showed that international CPO prices, exchange rates, production, and land area simultaneously affected the volume of Indonesian CPO exports. The partial test (t-test) revealed that international CPO prices, exchange rates, production, and land area significantly affected Indonesia's Crude Palm Oil export volume.

Keywords: Plantation, Export, Crude Palm Oil, OLS

1. INTRODUCTION

Plantations, according to Law Number 39 of 2014, are all activities of managing natural resources, human resources, facilities, production, tools and machines, cultivation, harvesting, processing, and marketing related to plantation crops. The development of oil palm plantations provides benefits in increasing income for farmers and the community. The production of palm oil, the raw material for the processing industry, can create added value in the country. One of the plantation commodities that has an important role and positively influences the Indonesian economy is palm oil. The factors that affect the yield of oil palm production include (1) land area, (2) fertilizers, (3) rainfall, (4) seeds, (5) weed control, (6) pests, and (7) labor [1].

Palm oil, also known as crude palm oil, is a derivative product from plantation production. Palm oil is processed through a long stage. Crude palm oil is useful for the community and is processed again into basic human needs such as cooking oil, margarine, and soap [2]. The agricultural sector's competitiveness needs to be continuously improved to provide a strong foundation for the export performance of agricultural sector products [3]. So far, palm oil is still one of the heroine commodities in international trade, so it is necessary to maintain the quality to compete with other countries. Palm oil production must be increased because Indonesia is one of the countries with oil palm plantations that reached an area of 14,456,611 million hectares at the end of 2019 and continues to expand until 2020 with provisional data of 14,858,300 million hectares.

The export performance of Indonesian agricultural products is relatively weak. Almost all agricultural commodities have low competitiveness, except for plantation sub-sector products such as rubber and oil palm, which have quite high competitiveness, the rest of products such as horticulture, food crops, and livestock products have relatively low competitiveness in international commodity markets [3]. According to Law Number 7 of 2014 concerning Trade, export is defined as the activity of removing goods from the customs area. Indonesia is one of the largest palm oil global exporters. Indonesia's contribution to meeting global palm oil supplies can be demonstrated by the volume of Indonesia's exports which continues to increase from year to year. The strong trade in crude palm oil is due to the government's great desire to maintain stability in cooking oil prices as the main domestic need and the government's great interest in increasing foreign exchange earnings [4]. Therefore, crude palm oil

production must be maintained stable as the main non-oil exports commodity [2].

Graph 1-1
Palm Oil Exports by Main Destination Countries The Year 2020 (Thousand Tons)
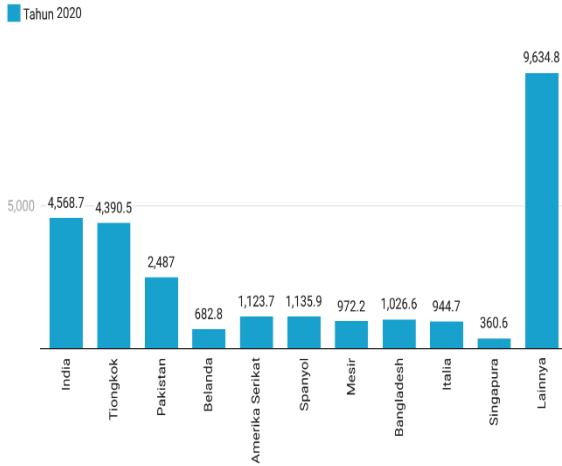
Source: BPS, 2021

Graph 1-1 shows that Indonesia's palm oil exports have several destination countries. The main destination countries for importing crude palm oil produced by Indonesia are India, China, Pakistan, the Netherlands, the United States, Spain, Egypt, Bangladesh, Italy, Singapore, and others. India ranked first with the highest export volume of 4,586.7 thousand per tonne in 2020. China occupied the next with an export volume of 4,390.5 thousand per ton. The export volume that increases every year is due to the high level of consumption. High consumption directly affects the price of crude palm oil. Rising prices in the international market can indicate that an export incentive for domestic CPO entrepreneurs can increase domestic CPO production [5].

Increasing the price of international palm oil or crude palm oil will boost Indonesia's economic growth and affect national income, especially national economic development through the plantation sector, namely the oil palm sub-sector.

This study aims to determine the relationship and influence between production, land area, international CPO prices, and exchange rates on crude palm oil export volume in Indonesia using time series data from 1990 to 2020, processed using the Ordinary Least Square (OLS) method. This research refers to several previous studies.

Based on Radifan's (2014) research, the independent variable in the long term had a positive and significant impact on Indonesia's CPO exports. Indonesian CPO producers should increase their production capacity and observe global developments in crude oil prices and movements in the rupiah exchange rate to the US dollar.

Huda & Widodo (2017) found that international CPO prices had a negative and significant effect on Indonesian CPO exports, both in the short and long term. The variable term of trade in the short and long term had a positive and significant effect on exports of CPO, while the variables of palm oil production and the exchange rate of the Rupiah against the US dollar had a negative and significant effect on exports in the short and long term.

A study conducted by Sitepu & Butarbutar (2019) found the factors that had a partially significant effect on CPO exports in the province of North Sumatra, including the domestic price of CPO (X1), the Rupiah exchange rate against US$ (X3), the Rupee exchange rate against US$ (X4), and India's GDP (X5). Meanwhile, the world price of CPO (X2) had no significant partial effect on CPO exports in North Sumatra.

Based on research by Aruan & Setiawina (2019), palm oil production, the rupiah exchange rate against the dollar had a positive and significant effect on the volume of palm oil exports and Indonesia's GDP in 2013-2016, international palm oil prices had a negative and significant effect on the volume of palm oil exports and Indonesia's GDP in 2013-2016, and palm oil production, the rupiah exchange rate against the dollar, and international palm oil prices had a significant and significant impact on Indonesia's GDP through the volume of palm oil exports in 2013-2016.

In their research, Purba & Ardiyanti (2019) revealed an increase in Indonesian-India CPO exports that were negatively and significantly affected by Indonesia's CPO export duties both in the long and short term the growth rate of Indonesia's CPO exports to India fluctuates. The increase in Indonesian palm oil exports volume may be accompanied by changes in the composition of export products.

Triyowati & Sabrina (2020) concluded that the determinants of palm oil exports involved the price of Malaysian palm oil and Indonesian palm oil (fitted). Meanwhile, the exchange rate (fitted) and export duties do not affect Indonesian palm oil exports volume. Meanwhile, the variable price of Indonesian palm oil could be regarded as a mediating variable that acts as an intermediary variable from the relationship of the independent variable (Malaysian palm oil price and export duties) with the dependent variable (export volume of Indonesian palm oil).

The results found by Hamzah & Santoso (2020) stated that the production of CPO and the level of consumption of CPO had a positive effect on the volume of Indonesian CPO exports, the price of CPO and the exchange rate of IDR/USD had a negative effect.

Adventists et al. (2021) revealed that during the period 2000-2019, production, land area, exchange

rates, and international prices experienced fluctuating developments, with an average production development of 10,67 percent, land area of 7,16 percent, exchange rates of 2,67, the international price of 5,52 percent. The regression results showed that the independent variables simultaneously affected investment and labor on the dependent variable. Meanwhile, partially the workforce influenced GRDP while investment did not exist during 2008-2017.

A study done by Prabowo et al. (2020) implied that (1) Indonesia's production and export trends should increase every year (2) Indonesia had a better comparative advantage compared to other major export countries and is at a maturity stage (3) The best CPO market share to develop was China compared to other export destination countries (4) The factor affecting the volume of exports was the international price of CPO.

Yanita et al. (2019), in their study, revealed that Indonesian CPO had comparative and competitive competitiveness in the global market. The results of the multiple linear regression test showed that the factors that comparatively affected the competitiveness of Indonesia's CPO exports in the global market included domestic CPO production, world CPO prices and oil prices, while the factors influencing competitive competitiveness were the area of oil palm plantations, Malaysian export volumes, soybean oil prices and exchange rates. Factors that had a positive effect on the competitiveness of Indonesian CPO included domestic CPO production, oil prices and the area of oil palm plantations. The variable that had no significant effect was the volume of Malaysian exports.

Reynalto (2019) found that CPO production, CPO prices in the international market, CPO prices in the domestic market, crude oil prices in the international market, the exchange rate of Rupiah, and export rate had a significant effect on Indonesia's crude palm oil export.

Ramadhani & Santoso (2019) examined the export competitiveness of Indonesian vs. Malaysian palm oil, focusing on the five main importing countries, such as China, Singapore, India, Pakistan, and the Netherlands, from 2001 to 2014. Indonesia's RCA and RSCA indices from 2001 to 2014 were higher than Malaysia's. Hence, Indonesian palm oil was more competitive than Malaysia. Based on the CMS calculations. The findings showed that the palm oil commodity was influenced by high demand from 2001 to 2014 in the five main importing countries; both countries concentrated on export commodities whose markets were growing relatively quickly. Third, Indonesia's palm oil commodity experienced rapid growth in selected markets while Malaysia experienced stagnant growth.

Zuhdi et al. (2021), in their study, showed that in 2017 the performance of Indonesian palm oil exports increased, indicated by an RCA>1, which is 55,47 and an average of 37,22. Indonesia had palm oil competitiveness due to the increasing volume of palm oil exports to major importing countries, such as India,

Pakistan and Europe. Indonesia was still competitive in the European and Asian markets based on the average value of the RCA index.

2. METHOD

The analytical tool used in this research was Ordinary Least Square (OLS) regression analysis which is one of the most powerful and well-known methods in regression analysis models to analyze the direction and magnitude of the effect of the exchange rate, international CPO prices, production (PK), and land area (LH) to export volume. The data used included secondary data obtained from the Central Statistics Agency (BPS), CIF Rotterdam, and Bank Indonesia. The econometric model (estimator) in this research is as follows [17]:

$$LogEXP_t = \beta_0 + \beta_1 KURS_t + \beta_2 PRICE_t + \beta_2 PK_t + \beta_3 LH_t + \varepsilon_t$$

where:

$LogExp$	=	CPO Export Volume (Thousands/Ton)
$Kurs$	=	Exchange Rate (IDR/US\$)
$Price$	=	International CPO Price (US\$/Ton)
PK	=	CPO Production (Tons)
LH	=	Land Area (Ha)
ε	=	Error term
β_0	=	Constant
$\beta_1 ... \beta_3$	=	Independent Variable Regression Coefficient
t	=	year-t

3. RESULTS AND DISCUSSION

Time series data regression was carried out using the Ordinary Least Square (OLS) method with the dependent variable: the volume of CPO exports, and the independent variable used was exchange rate, CPO price, production, and land area during the period of observation with time-series data from 1990 to 2020. The regression results showing the coefficient values of the independent variables can be seen in Table 3-1.

Table 3-1
Econometric Model Estimation Results

Variable	Coefficient	Std. Error
C	6.329468	0.276456
EXCHANGE RATE	-0.115186	0.038866
PRICE	0.000836	0.000471
PK	-0.000144	4.61E-05
LH	0.000702	0.000171

R^2 = 0,7903; *DW-Stat.* = 0,8326; *F-Stat.* = 24,5020; *Prob. F-Stat.* = 0,0000

Source: Secondary data, 2021(Eviews 9)

The regression results show that the export volume of crude palm oil in Indonesia from 1990 to 2020 is influenced by the exchange rate, CPO price, production (PK), and land area (LH). Exchange rate and production variables have a negative sign. Meanwhile, the international CPO price and land area variables show positive results. Therefore, the increase in price and land area variables contributes to an increase in the volume of CPO (Crude Palm Oil) exports. Meanwhile, the increase in the exchange rate and production variables reduces CPO export volume.

The simultaneous test results (F test) and the regression results using Eviews 9 obtain a prob F value of 0,0000. This value simultaneously affects the dependent variable with a probability of 0,0000 ≤ 0,10, which means H_0 rejected. Thus, production, land area, exchange rate, and price significantly affect CPO exports.

Table 3-2
Effect Validity Test Regression Results

Variable	Sig. t	Conclusion
EXCHANGE RATE	0,0064	Significantly influential α = 0,10
PRICE	0,0872	Significantly influential α = 0,10
PK	0,0044	Significantly influential α = 0,10
LH	0,0004	Significantly influential α = 0,10

Source: Secondary data, 2021(Eviews 9)

Based on the effect validity regression (t-test), the exchange rate coefficient variables, international crude palm oil prices, production, and land area as a whole have a significant effect because the four independent variables have a probability (< 0.10).

Table 3-3
VIF Regression Test Results

Variable	VIF
EXCHANGE RATE	4.160632
PRICE	1.520243
PK	57.56071
LH	76.72623

Source: Secondary data, 2021(Eviews 9)

Based on Table 3-3, there are two variables experiencing multicollinearity problems: the production variable (PK) and land area (LH), where each production variable has a VIF value of 57,5607 > 10 while the land area variable (LH) has a value of 76,7262 > 10. Meanwhile, the exchange rate and price variables do not experience multicollinearity because they have a VIF value < 10. Thus, the exchange rate and price affect the volume of CPO exports while production and land area have no effect.

3.1 Effect of Exchange Rate on CPO Export Volume

An exchange rate is an exchange between two currencies, which compares the value or price between the two currencies [2]. Table 3-1 shows that the exchange rate variable has a regression coefficient of -0,1152. The relationship pattern between the exchange rate variable and the export volume is linear-logarithmic. If the exchange rate variable increases by 1 US$, the export volume will increase by 0,1152. On the other hand, if the exchange rate variable decreases by 1 US$, the export volume will increase by 0,1152.

This study results follow Huda & Widodo's (2017) research, which analyzed the determinants and stability of Indonesian crude palm oil exports. This study indicated that the Rupiah's exchange rate against the US dollar had a negative and significant effect on exports. The increase in the value of net exports would influence increasing real aggregate demand to affect increasing investment. On the other hand, if the rupiah exchange rate appreciates, it will cause a decrease in the value of exports because the price of domestic products becomes relatively expensive.

The exchange rate can have positive and negative effects on exports. A positive effect occurs when strengthening the exchange rate can affect exports to increase. The negative effect of the exchange rate occurs when the exchange rate weakens, so exports increase or decrease. The exchange rate can affect the price of an exported good so that when the rupiah exchange rate against the dollar strengthens, the price of export goods will increase [18].

3.2 Price Effect on CPO Export Volume

The output of the regression results showed that the CPO price variable had a regression coefficient of 0,0008. The pattern of the relationship between the variable price and export volume is linear-logarithmic. That is, if the price variable increases by 1 US$, the export volume will decrease by 0,0008. On the other hand, if the price variable decreases by 1 US$, the export volume will decrease by 0,0008.

This result is similar to the research conducted by Radifan (2014), which analyzed the factors that influenced the export of Indonesian crude palm oil in international trade. The world crude oil price had a positive and significant effect on Indonesia's CPO exports. Global crude oil prices continue to rise due to rising demand. On the other hand, crude oil is a non-renewable energy source. The increasing number of CPO exports can directly increase the country's foreign exchange. When the price of goods increases, the quantity demanded of that goods will decrease, and when the price decreases, the quantity demanded will increase [18].

3.3 Effect of Production on CPO Export Volume

The growth in Indonesian production and exports is driven by global demand, increasing every year. The Production Variable (PK) had a regression coefficient of -0,0001. The pattern of the relationship between production variables and export volume was linear-logarithmic. That is, if the production variable increases by 1 US$, the export volume will increase by 0,0001. On the other hand, if the production variable decreases by 1 US$, the export volume will increase by 0,0001.

This finding follows Huda & Widodo's (2017) research, which analyzed the determinants and stability of Indonesian crude palm oil exports. Palm oil production had a negative and significant effect on Indonesian exports. When production increases, the availability of domestic goods increases, so the supply of goods at home and abroad also increases. When production increases, the volume of exports also increases.

3.4 Effect of Land Area on CPO Export Volume

The variable area of land (LH) had a regression coefficient of 0,0007. The relationship pattern between the variables of land area and export volume was linear-logarithmic. That is, if the variable land area increases by 1 US$, the export volume will decrease by 0,0008. On the other hand, if the variable land area decreases by 1 US$, the export volume will decrease by 0,0007.

This result aligns with Irawan's (2019) research analyzing the factors that influenced Indonesian palm oil exports (1995-2015). The variable land area had a positive effect on the volume of palm oil exports because, according to the records of the ministry of agriculture, the government continued to expand oil palm land aggressively, thereby increasing the quality of domestic production for export to foreign countries, although it still fluctuates in several years. Last in the agricultural statistics book records, but the area of productive land will positively influence the level of Indonesian palm oil exports.

4. CONCLUSION

Based on the analysis, the following conclusions can be drawn:

(1) OLS regression results showed that production had a negative and significant effect on the volume of CPO exports. The variable of the land area had a positive and significant effect on the volume of CPO exports. The exchange rate variable had a negative and significant effect on CPO. Meanwhile, the international CPO price variable has a positive and significant effect on CPO exports.

(2) The coefficient of determination (R^2) of the estimated model showed the predictability of the estimated model. Table 3-1, the (R^2) shows a value of 0,7903, meaning that 79,03% variation of the variable exchange rate can be explained by international CPO price, Production (PK), and land area (LH). The rest, 20,97%, is influenced by other variables or factors not included in the estimated model.

(3) Based on the regression analysis of the effect validity test (t-test), each independent variable significantly affected

(4) Based on the regression analysis of the F test, the independent variables had a simultaneous effect on the dependent variable.

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