

Impact of Domestic Policies and External Factors on the Competitiveness and Crude Palm Oil Industry Actor's Welfare in Indonesia

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Abstract: *Indonesia must continue developing the palm oil downstream industries than only exporting crude palm oil (CPO), that have very high value added in order to fulfill domestic needs and even be exported, so it can save foreign exchange (if we do not import CPO derivative products) and generate greater foreign exchange value (if we export CPO derivative products). The objectives of this study were to evaluate the impact of domestic policies and external factors on the Indonesian-Malaysian CPO competitiveness and welfare of oil palm farmers and CPO downstream industry actors in Indonesia period 2015-2017. This study was conducted by formulating an econometric model of CPO industry. The model specification was dynamic simultaneous equations that consisted of 71 behavioral and 48 identities equations, while model estimated and simulated by using 2SLS and Newton method. The result showed that domestic policy through facilitation of increasing the production capacity of palm cooking oil, margarine and soap industries, as well as increasing CPO demand by other industries can increase the competitiveness of Indonesian CPO exports, as well as increase the welfare of oil palm farmers and CPO producers also net welfare.*

Keywords: Competitiveness, CPO downstream industries, Oil palm farmers welfare, Net welfare

1. Introduction

The global average productivity of oil palm is 3.96 tons of oil per hectare per year, which amounts to 4 to 8 times per hectare compared to the productivity of other vegetable oils (such as sunflowers and rapeseeds). It is known that rapeseed productivity amounts to 0.99 tons of oil per ha per year, sunflower 0.71 tons of oil per ha per year, and soybean 0.52 tons of oil per ha per year. The global demand for vegetable oil is estimated to be approximately 226.7 million tons in 2025, which means there is an increase of approximately 51 million tons from 2015. If the increase in the global demand for vegetable oil is only provided by palm oil, only 13 million ha of land is needed. While if the land is filled with soybeans, sunflower, or rapeseed, then the land area needed for each category are respectively 98.1 million, 71.8 million, and 51.5 million ha. This concludes that palm oil is the most efficient producer of vegetable oil in regards of land usage (saves up to 90 percent) and is also environmentally friendly (Figure 1). This proves that palm oil plays a role the global forests conservation.

It is known that crude palm oil (CPO) can be processed into more than 300 types of derivative products in food, chemical, and renewable energy segments, including biodiesel. Previously, Indonesia could only produce 47 CPO derivative products, while Malaysia had reached 100 CPO derivative products (Baihaqi, 2013). As time progresses, in 2014 and 2015, Indonesia was able to produce 154 and 169 types of CPO derivative products in food, chemical,

renewable energy segments such as biodiesel (General Director of Agro-Industry, Ministry of Industry, 2015).

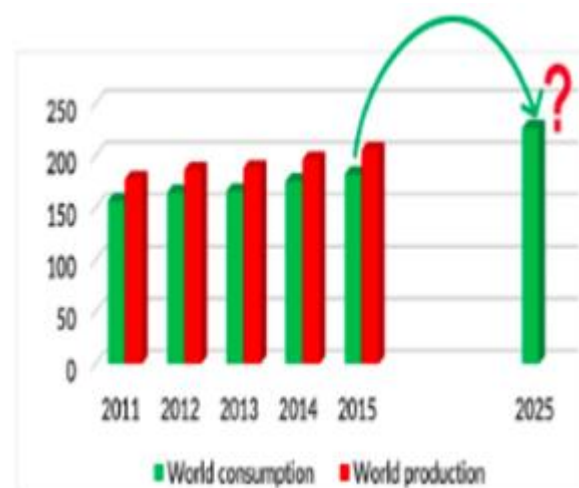


Figure 1: Total of World Production and Consumption of Main Vegetable Oil Period 2011-2015 and Estimated Year 2025

Source: Sitanggang, 2018

This shows that the development of CPO downstream industry in Indonesia is adequate, but some improvements are still needed, especially in its production capacity.

An increase in CPO production is usually followed by an increase in Indonesian CPO exports, but during the span of

2010 to 2018, Indonesia's CPO exports tend to decline. This decline is due to an increase in CPO demand by the CPO downstream industry in Indonesia with an average growth rate of 8.97 percent during 2010-2018 (Oil World, 2018). The number of Indonesian CPO exports amounted to 5,701.29 thousand tons in 2007, then continued to increase with a growth rate of 29.83 percent to 9,566.75 thousand tons in 2009. Then from 2010 to 2018, Indonesia's CPO exports declined (except for 2015 and 2017) at the rate of 1.98 percent, where Indonesia's CPO exports in 2010 amounted to 9,444.17 thousand tons and 6,554.50 thousand tons in 2018 (UN Comtrade, 2019).

Indonesia should decrease the dependency on foreign exchange earnings from CPO exports, considering that Indonesia also imports CPO derivative products. Indonesia must continue to develop the CPO downstream industry rather than exclusively export CPO, which may bring enormous added value in order to fulfill domestic needs and even export derivative products to save foreign exchange (if CPO derivative products are not imported) and to generate greater foreign exchange value (from exports of CPO derivative products) (Novindra *et al.*, 2013).

During the period 2008-2018, the average demand for CPO by the palm cooking oil, margarine, and soap industries, among others, amounted to 3,997.06 thousand tons, 306.91 thousand tons, 478.95 thousand tons, and 2,507.00 thousand tons per year. While the average share of CPO demand by the palm cooking oil, margarine, soap, and other industries to Indonesia's CPO production was 14.14 percent, 1.09 percent, 1.69 percent and 8.87 percent (CIC, 2018). Furthermore, during 2010-2018, the average growth rate of Indonesian exports of palm cooking oil, margarine, and soap to the world were 13.69 percent, 7.51 percent and 3.23 percent respectively, while the average growth rate of Indonesian imports of palm cooking oil, margarine and soap from the world are respectively 1,589.60 percent, 18.23 percent and 15.46 percent (UN Comtrade, 2019). This shows that investment in the CPO downstream industry must continue to be increased (especially its production capacity) so that domestic CPO demand increases in order to increase production of CPO derivative products thereby reducing imports and even increasing exports of Indonesian CPO derivative products to the world.

In terms of Indonesia's CPO demand and supply, Indonesia's CPO production far exceeds domestic demand. During 2013 until 2018, the average production of Indonesian CPO (33,065.60 thousand tons) was almost 4 times greater than the average domestic CPO demand (8,691.67 thousand tons), but the amount of CPO exports was excessive (for example due to increasing of world CPO prices and/or world crude oil prices) can cause insufficient fulfillment of CPO demand by the domestic CPO downstream industry, thus hampering the development of Indonesia's CPO downstream industry. Therefore the government needs to implement a policy to limit the excessive amount of CPO exports and support the development of the CPO downstream industry including the tariff policy (export duty) of the CPO or domestic market obligation (DMO), followed by policies to facilitate the increase of investment that expands the number and capacity of CPO downstream

industries so that CPO is utilized more by the Indonesian CPO downstream industry.

Based on the description of the problems related to the CPO industry, it is necessary to conduct a research on the impact of domestic policies and external factors on the Indonesian-Malaysian CPO competitiveness and the welfare of oil palm farmers and CPO downstream industry actors in Indonesia.

2. Research Method

The CPO and Derivative Products Supply and Demand Model in Indonesia and World built in this study is an econometric model as a dynamic simultaneous equation system, which consists of 5 blocks, namely: Oil Palm Plantation Block, Palm Oil Block, Palm Cooking Oil Block, Margarine Block, and Soap Block. The formulated model consists of 71 structural equations and 48 identity equations. The model is estimated by 2SLS (two-stage least squares) method, and after a fit estimation result is obtained, the model is validated and simulated using Newton's method to determine the impact of domestic policies and external factors on Indonesian-Malaysian CPO competitiveness and the welfare of oil palm farmers and CPO downstream industry actors in Indonesia.

The type of data used in the study is secondary data with a time series from 1990 to 2017. The data sources in this study were obtained from several agencies namely: Central Bureau of Statistics (BPS), Directorate General of Plantation-Ministry of Agriculture, Ministry Trade, UN Comtrade, Capricorn Indonesia Consult (CIC), FAO and other related agencies or publications. Data processing is done by computer programs, namely: SAS/ETS for Windows 9.4.

3. Result and Discussion

The results of the model validation period 2015-2017 show that each equation has an average root mean square percent error (RMSPE) of 26.93 percent and U-Theil of 0.11. Thus, in general the model built has predictive power that is adequately valid and is well used to carry out simulations.

In the study, the domestic policies are (1) Indonesia's CPO export tax tariff is set at 6%, (2) setting a domestic market obligation (DMO) equivalent to the effect of Indonesia's CPO export tax tariff (set at 6%) in increasing domestic CPO supply, and (3) increasing production capacity of palm cooking oil, margarine and soap industries respectively to 5%, 10% and 40%, and an increase in CPO demand by other industries by 30%, while the change in external factors are the increase in world crude oil prices by 15% and an increase in import tax on CPO by India by 100%.

The impact analysis of domestic policies and changes in external factors on the Indonesian-Malaysian CPO competitiveness and the welfare of oil palm farmers and palm oil downstream industries actors in Indonesia period 2015-2017 are carried out with various alternative of simulation scenarios, namely: (1) Indonesian CPO export tax tariff is set at 6% (S1), (2) Determination of domestic market obligation (DMO), that equivalent to the impact of Indonesia's CPO export tax tariff (set at 6%) in increasing

domestic CPO supply, (3) Increasing production capacity of palm cookingoil, margarine and soap industries respectively by 5%, 10%, and 40%, and an increase in CPO demand by other industries by 30% (S3), (4) Increasing world crude oil prices by 15% (S4), (5) Increasing CPO import tax by India by 100% (S5), (6) Combination of scenario 5 and scenario 3 (S6), (7) Combination of scenario 4 and scenario 1 (S7), (8) Combination of scenario 4 and scenario 2 (S8), (9) Combination of scenarios 1 and scenario 3 (S9), and (10) Combination of scenario 2 and scenario 3 (S10).

Based on Table 1a-Table 1d, the conditions preceding the simulation with comparative advantage index (revealed comparative advantage/RCA index) of Indonesia and Malaysia have a high level of competitiveness in exporting CPO to ten major importing countries. Malaysia is superior to Indonesia in competing with CPO exports to India and Pakistan (in line with Salleh et al. 2016), Netherlands, Spain, Tanzania, England, while Indonesia is superior to Malaysia in competing CPO exports to Singapore, Italy, Germany, and Kenya. Domestic policy simulations through increasing the production capacity of the palm cooking oil, margarine and soap industries by 5%, 10% and 40% respectively, and increasing the demand for CPO by other industries by 30% (S3) led to an increase of Indonesia's CPO exportscompetitiveness to main importing countries (except Germany). Also simulating changes in external factors, an increase in world crude oil prices by 15% led to an increase of Indonesia's CPO exports competitiveness to major importing countries (except Singapore and Tanzania).

Table 1 (a): Impact of Domestic Policies and Changes in External Factors on Indonesian-Malaysian CPO Competitiveness based on RCA Indicator Period 2015-2017

No	Description	Basic Value (Before Simulation)	Changes (Δ)		
			S1	S2	S3
1	RCA- Indonesian CPO Export to India	16.50	-0.06	-0.01	0.01
	RCA- Malaysian CPO Export to India	16.79	0.09	0.02	-0.01
2	RCA- Indonesian CPO Export to Netherlands	35.81	-0.61	-0.74	0.03
	RCA- Malaysian CPO Export to Netherlands	38.05	0.23	0.28	-0.03
3	RCA- Indonesian CPO Export to Singapore	35.61	1.07	0.07	0.03
	RCA- Malaysian CPO Export to Singapore	1.08	0.08	0.01	0.001
4	RCA- Indonesian CPO Export to Italy	136.06	-0.64	-0.40	0.11
	RCA- Malaysian CPO Export to Italy	129.87	1.25	0.73	-0.23
5	RCA- Indonesian CPO Export to Spain	79.85	-0.52	-0.12	0.10
	RCA- Malaysian CPO Export to Spain	112.36	0.81	0.30	-0.19
6	RCA- Indonesian CPO Export to Germany	81.51	-0.25	-0.40	-0.02
	RCA- Malaysian CPO Export to Germany	5.14	0.01	0.02	-0.01
7	RCA- Indonesian CPO Export to Tanzania	23.65	-0.12	-0.01	0.01
	RCA- Malaysian CPO Export to Tanzania	30.77	0.21	-0.01	0.01
8	RCA- Indonesian CPO Export to England	21.80	-3.98	-0.16	0.05
	RCA- Malaysian CPO Export to England	22.11	0.26	0.06	-0.02
9	RCA- Indonesian CPO Export to Kenya	6.72	-0.06	-0.01	0.003
	RCA- Malaysian CPO Export to Kenya	3.60	0.01	0.01	-0.002
10	RCA- Indonesian CPO Export to Pakistan	3.33	-0.17	-0.07	0.02
	RCA- Malaysian CPO Export to Pakistan	31.95	0.25	0.07	-0.02

Table 1(b): Impact of Domestic Policies and Changes in External Factors on Indonesian-Malaysian CPO Competitiveness based on RCA Indicator Period 2015-2017

No	Description	Basic Value (Before Simulation)	Changes (Δ)	
			S4	S5
1	RCA- Indonesian CPO Export to India	16.50	0.0002	-0.002
	RCA- Malaysian CPO Export to India	16.79	-0.02	0.01
2	RCA- Indonesian CPO Export to Netherlands	35.81	0.26	-0.20
	RCA- Malaysian CPO Export to Netherlands	38.05	0.01	-0.02
3	RCA- Indonesian CPO Export to Singapore	35.61	-0.17	0.12
	RCA- Malaysian CPO Export to Singapore	1.08	0.001	-0.002
4	RCA- Indonesian CPO Export to Italy	136.06	0.29	-0.27
	RCA- Malaysian CPO Export to Italy	129.87	-0.41	0.30
5	RCA- Indonesian CPO Export to Spain	79.85	0.19	-0.14
	RCA- Malaysian CPO Export to Spain	112.36	0.19	-0.16
6	RCA- Indonesian CPO Export to Germany	81.51	0.90	-0.71
	RCA- Malaysian CPO Export to Germany	5.14	0.04	-0.03
7	RCA- Indonesian CPO Export to Tanzania	23.65	-0.03	0.003
	RCA- Malaysian CPO Export to Tanzania	30.77	-0.18	0.10
8	RCA- Indonesian CPO Export to England	21.80	0.19	-0.13
	RCA- Malaysian CPO Export to England	22.11	0.22	-0.17
9	RCA- Indonesian CPO Export to Kenya	6.72	0.02	-0.01
	RCA- Malaysian CPO Export to Kenya	3.60	0.03	-0.02
10	RCA- Indonesian CPO Export to Pakistan	3.33	0.01	-0.01
	RCA- Malaysian CPO Export to Pakistan	31.95	-0.18	0.16

Table 1 (c): Impact of Domestic Policies and Changes in External Factors on Indonesian-Malaysian CPO Competitiveness based on RCA Indicator Period 2015-2017

No	Description	Basic Value (Before Simulation)	Changes (Δ)		
			S6	S7	S8
1	RCA- Indonesian CPO Export to India	16.50	0.005	-0.06	-0.01
	RCA- Malaysian CPO Export to India	16.79	0.004	0.07	0.003
2	RCA- Indonesian CPO Export to Netherlands	35.81	-0.17	-0.34	-0.47
	RCA- Malaysian CPO Export to Netherlands	38.05	-0.06	0.24	0.28
3	RCA- Indonesian CPO Export to Singapore	35.61	0.15	0.86	-0.10
	RCA- Malaysian CPO Export to Singapore	1.08	-0.001	0.08	0.01
4	RCA- Indonesian CPO Export to Italy	136.06	-0.15	-0.33	-0.11
	RCA- Malaysian CPO Export to Italy	129.87	0.07	0.83	0.31
5	RCA- Indonesian CPO Export to Spain	79.85	-0.05	-0.33	0.06
	RCA- Malaysian CPO Export to Spain	112.36	-0.35	1.00	0.48
6	RCA- Indonesian CPO Export to Germany	81.51	-0.72	0.65	0.49
	RCA- Malaysian CPO Export to Germany	5.14	-0.04	0.05	0.06
7	RCA- Indonesian CPO Export to Tanzania	23.65	0.01	-0.15	-0.05
	RCA- Malaysian CPO Export to Tanzania	30.77	0.11	0.03	-0.19
8	RCA- Indonesian CPO Export to England	21.80	-0.09	-3.79	0.03
	RCA- Malaysian CPO Export to England	22.11	-0.19	0.49	0.28
9	RCA- Indonesian CPO Export to Kenya	6.72	-0.01	-0.05	0.01
	RCA- Malaysian CPO Export to Kenya	3.60	-0.03	0.04	0.04
10	RCA- Indonesian CPO Export to Pakistan	3.33	0.01	-0.16	-0.07
	RCA- Malaysian CPO Export to Pakistan	31.95	0.14	0.07	-0.10

Table 1 (d): Impact of Domestic Policies and Changes in External Factors on Indonesian-Malaysian CPO Competitiveness based on RCA Indicator Period 2015-2017

No	Description	Basic Value (Before Simulation)	Changes (Δ)	
			S9	S10
1	RCA- Indonesian CPO Export to India	16.50	-0.05	-0.01
	RCA- Malaysian CPO Export to India	16.79	0.08	0.01
2	RCA- Indonesian CPO Export to Netherlands	35.81	-0.58	-0.71
	RCA- Malaysian CPO Export to Netherlands	38.05	0.20	0.24
3	RCA- Indonesian CPO Export to Singapore	35.61	1.10	0.09
	RCA- Malaysian CPO Export to Singapore	1.08	0.08	0.01
4	RCA- Indonesian CPO Export to Italy	136.06	-0.52	-0.29
	RCA- Malaysian CPO Export to Italy	129.87	1.02	0.49
5	RCA- Indonesian CPO Export to Spain	79.85	-0.42	-0.02
	RCA- Malaysian CPO Export to Spain	112.36	0.63	0.10
6	RCA- Indonesian CPO Export to Germany	81.51	-0.27	-0.42
	RCA- Malaysian CPO Export to Germany	5.14	0.00	0.01
7	RCA- Indonesian CPO Export to Tanzania	23.65	-0.11	-0.01
	RCA- Malaysian CPO Export to Tanzania	30.77	0.22	-0.01
8	RCA- Indonesian CPO Export to England	21.80	-3.93	-0.11
	RCA- Malaysian CPO Export to England	22.11	0.24	0.03
9	RCA- Indonesian CPO Export to Kenya	6.72	-0.06	-0.01
	RCA- Malaysian CPO Export to Kenya	3.60	0.01	0.005
10	RCA- Indonesian CPO Export to Pakistan	3.33	-0.15	-0.06
	RCA- Malaysian CPO Export to Pakistan	31.95	0.23	0.05

According to Table 2a-Table 2d, the simulation that causes the largest increase in the surplus of oil palm farmers (IDR 46.22 billion) is the existence of an increase in the production capacity of palm cooking oil, margarine and soap industries by 5%, 10% and 40% respectively, and an increase in CPO demand by other industries by 30%, because the price of fresh fruit bunch has increased the most. On the other hand, setting a domestic market obligation (DMO) equivalent to the effect of Indonesia's CPO export tax tariff (set at 6%) in increasing domestic CPO supply has caused the largest decrease in the surplus of oil palm farmers (IDR 584.48 billion) because the price of fresh fruit bunch has decreased the most.

Likewise, the simulation that caused the largest increase in the CPO producer surplus (IDR 5,326.44 billion) was if there was an increase in the production capacity of palm cooking oil, margarine and soap industries by 5%, 10% and 40% respectively, and increased CPO demand by other industries by 30%, because the domestic CPO prices experienced the greatest increase. The developing of CPO domestic downstream industries will increase the CPO domestic demand, hence increase the CPO prices that is received by CPO producers (Novindra *et al.*, 2011). On the other hand, setting a domestic market obligation (DMO) equivalent to the effect of Indonesia's CPO export tax tariff (set at 6%) in increasing domestic CPO supply caused the largest decrease in CPO producer surplus (IDR 17,849.11 billion) because the domestic CPO price experienced the greatest decline. This is because the increasing in CPO domestic supply with DMO has not been supported by the development of CPO downstream industries, thus increasing

the CPO domestic supply will decrease the CPO domestic price the most (Novindra *et al.*, 2011).

Table 2 (a): Impact of Domestic Policies and Changes in External Factors on Welfare of Oil Palm Farmers and Palm Oil Downstream Industry Actors in Indonesia Period 2015-2017

No.	Description (Billion Rp)	Changes		
		S1	S2	S3
1	Δ Oil Palm Farmers Surplus	-11.22	-584.48	46.22
2	Δ Palm Oil Producer Surplus	-560.46	-17849.11	5326.44
3	Δ Palm Cooking Oil Producer Surplus	-1.95	-50.34	-411.50
4	Δ Margarin Producer Surplus	-1.16	-18.74	-231.70
5	Δ Soap Producer Surplus	-0.14	-2.54	-94.53
6	Δ Producer Surplus	-574.93	-18505.21	4634.94
7	Δ Palm Oil Consumer Surplus	178.62	5712.99	-1792.74
8	Δ Palm Cooking Oil Consumer Surplus	0.27	7.03	57.16
9	Δ Margarin Consumer Surplus	0.03	0.43	5.20
10	Δ Soap Consumer Surplus	0.04	0.76	26.91
11	Δ Consumer Surplus	178.96	5721.20	-1703.48
12	Δ Government Income from CPO Export Tax	2887.34	0.00	0.00
13	Δ Government Income	2887.34	0.00	0.00
14	Δ Net Surplus	2491.37	-12784.01	2931.46
15	Δ Palm Oil Foreign Exchange Income	-83.67	-226.06	50.43
16	Δ Palm Cooking Oil Foreign Exchange Income	2.79	62.79	609.53
17	Δ Margarin Foreign Exchange Income	0.02	0.26	8.63
18	Δ Soap Foreign Exchange Income	0.01	0.10	4.12
19	Δ Foreign Exchange Income	-80.85	-162.91	672.71
20	Δ Palm Oil Foreign Exchange Expenditure	0.01	0.03	-0.01
21	Δ Foreign Exchange Expenditure	0.01	0.03	-0.01
22	Δ Balance of Trade	-80.84	-162.88	672.70

Table 2(b) Impact of Domestic Policies and Changes in External Factors on Welfare of Oil Palm Farmers and Palm Oil Downstream Industry Actors in Indonesia Period 2015-2017

No.	Description (Billion Rp)	Changes	
		S4	S5
1	Δ Oil Palm Farmers Surplus	16.85	-15.12
2	Δ Palm Oil Producer Surplus	648.52	-480.58
3	Δ Palm Cooking Oil Producer Surplus	2.03	-1.31
4	Δ Margarin Producer Surplus	0.98	-0.40
5	Δ Soap Producer Surplus	0.13	-0.06
6	Δ Producer Surplus	668.50	-497.48
7	Δ Palm Oil Consumer Surplus	-206.62	153.16
8	Δ Palm Cooking Oil Consumer Surplus	-0.28	0.18
9	Δ Margarin Consumer Surplus	-0.02	0.01
10	Δ Soap Consumer Surplus	-0.04	0.02
11	Δ Consumer Surplus	-206.97	153.37
12	Δ Government Income from CPO Export Tax	0.00	0.00
13	Δ Government Income	0.00	0.00
14	Δ Net Surplus	461.54	-344.10
15	Δ Palm Oil Foreign Exchange Income	679.61	-525.35
16	Δ Palm Cooking Oil Foreign Exchange Income	-2.70	1.53
17	Δ Margarin Foreign Exchange Income	-0.02	0.00
18	Δ Soap Foreign Exchange Income	-0.01	0.002
19	Δ Foreign Exchange Income	676.89	-523.82
20	Δ Palm Oil Foreign Exchange Expenditure	0.14	-0.11
21	Δ Foreign Exchange Expenditure	0.14	-0.11
22	Δ Balance of Trade	677.02	-523.93

The simulation that increases the surplus of the largest CPO consumers (IDR 5,712.99 billion) is the determination of a domestic market obligation (DMO) which is equivalent to

the impact of Indonesia's CPO export tax tariff determination (set 6%) in increasing CPO domestic supply. This is because the increase in CPO domestic supply due to the DMO has caused the largest decline in domestic CPO prices. On the other hand, the simulation of increasing production capacity of palm cooking oil, margarine and soap industries by 5%, 10% and 40% respectively, and increasing CPO demand by other industries by 30%, caused the largest decrease in consumer CPO surplus (IDR 1,792.74 billion) due to the domestic CPO prices experiencing the biggest increase.

Table 2 (c): Impact of Domestic Policies and Changes in External Factors on Welfare of Oil Palm Farmers and Palm Oil Downstream Industry Actors in Indonesia Period 2015-2017

No.	Description (Billion Rp)	Changes		
		S6	S7	S8
1	Δ Oil Palm Farmers Surplus	31.09	5.63	-568.06
2	Δ Palm Oil Producer Surplus	4845.22	87.92	-17214.99
3	Δ Palm Cooking Oil Producer Surplus	-412.82	0.08	-48.34
4	Δ Margarin Producer Surplus	-232.12	-0.18	-17.76
5	Δ Soap Producer Surplus	-94.60	-0.02	-2.41
6	Δ Producer Surplus	4136.77	93.44	-17851.57
7	Δ Palm Oil Consumer Surplus	-1630.97	-28.02	5509.13
8	Δ Palm Cooking Oil Consumer Surplus	57.34	-0.01	6.75
9	Δ Margarin Consumer Surplus	5.21	0.004	0.41
10	Δ Soap Consumer Surplus	26.93	0.005	0.72
11	Δ Consumer Surplus	-1541.49	-28.02	5517.01
12	Δ Government Income from CPO Export Tax	0.00	2923.74	0.00
13	Δ Government Income	0.00	2923.74	0.00
14	Δ Net Surplus	2595.28	2989.15	-12334.56
15	Δ Palm Oil Foreign Exchange Income	-475.24	594.56	449.64
16	Δ Palm Cooking Oil Foreign Exchange Income	611.06	0.09	60.12
17	Δ Margarin Foreign Exchange Income	8.63	0.01	0.25
18	Δ Soap Foreign Exchange Income	4.13	0.001	0.09
19	Δ Foreign Exchange Income	148.57	594.66	510.09
20	Δ Palm Oil Foreign Exchange Expenditure	-0.12	0.15	0.16
21	Δ Foreign Exchange Expenditure	-0.12	0.15	0.16
22	Δ Balance of Trade	148.46	594.81	510.26

Then, the simulation that caused the biggest increase in the surplus of CPO downstream industries producers (palm cooking oil, margarine and soap) (IDR 3.13 billion) is if there is an increase in world crude oil prices by 15%, due to the price of palm cooking oil, margarine and soap experiencing the greatest increase. However, the simulation of a 15% increase in world crude oil prices caused the largest decrease in the consumer surplus of the CPO downstream industries. (IDR 0.34 billion). This is because increasing in world crude oil price makes increasing in the world CPO import and the world CPO prices. Then, Indonesian CPO export increases and makes CPO domestic supply decrease. Decreasing in CPO domestic supply makes CPO domestic price increase. Increasing CPO domestic prices are causing CPO demand by the palm oil downstream industry to decline (Hartoyo *et al.*, 2011). Declining in CPO demand by the CPO downstream industries make the production of CPO derivative products decrease and then the price of CPO derivative product increase (palm cooking oil, margarine and soap).

The domestic policy that causes the greatest increase in net welfare (surplus) (IDR 5,433.24 billion) is the increasing of Indonesia's CPO export tax tariff by 6% and an increase in the production capacity of palm cooking oil, margarine and soap industries by 5%, 10% and 40%, as well as an increase in CPO demand by other industries by 30%. While the determination of domestic market obligation (DMO) that equivalent with impacts the increasing of Indonesian CPO export tax tariff by 6% in increasing domestic CPO supply causes the greatest decrease in net welfare (IDR 12,784.01 billion). The DMO caused decreasing in producer surplus (IDR 18,505.21 billion) larger than increasing in consumer surplus (IDR 5,721.20 billion), so that net welfare is decreasing (IDR 12,784.01 billion).

Table 2 (d): Impact of Domestic Policies and Changes in External Factors on Welfare of Oil Palm Farmers and Palm Oil Downstream Industry Actors in Indonesia Period 2015-2017

No.	Description (Billion Rp)	Changes	
		S9	S10
1	Δ Oil Palm Farmers Surplus	34.98	-536.25
2	Δ Palm Oil Producer Surplus	4764.73	-12341.92
3	Δ Palm Cooking Oil Producer Surplus	-413.47	-461.54
4	Δ Margarin Producer Surplus	-232.92	-250.90
5	Δ Soap Producer Surplus	-94.68	-97.23
6	Δ Producer Surplus	4058.64	-13687.84
7	Δ Palm Oil Consumer Surplus	-1603.92	4171.95
8	Δ Palm Cooking Oil Consumer Surplus	57.43	64.06
9	Δ Margarin Consumer Surplus	5.22	5.61
10	Δ Soap Consumer Surplus	26.96	27.65
11	Δ Consumer Surplus	-1514.31	4269.28
12	Δ Government Income from CPO Export Tax	2888.91	0.00
13	Δ Government Income	2888.91	0.00
14	Δ Net Surplus	5433.24	-9418.56
15	Δ Palm Oil Foreign Exchange Income	-33.04	-172.94
16	Δ Palm Cooking Oil Foreign Exchange Income	612.32	670.99
17	Δ Margarin Foreign Exchange Income	8.66	8.88
18	Δ Soap Foreign Exchange Income	4.13	4.22
19	Δ Foreign Exchange Income	592.07	511.14
20	Δ Palm Oil Foreign Exchange Expenditure	0.002	0.02
21	Δ Foreign Exchange Expenditure	0.002	0.02
22	Δ Balance of Trade	592.07	511.16

The second largest positive trade balance (IDR 672.70 billion) is when there is an increase in the production capacity of palm cooking oil, margarine and soap industries by 5%, 10% and 40% respectively, also an increase in CPO demand by other industries by 30%. This is in line with the high flow of CPO and its derivatives export, so that this simulation can increase the competitiveness of Indonesian CPO exports. The biggest negative trade balance (IDR 523.93 billion) is when India increases its CPO import tax by 100%. This is because when India increase their import tax tariff so Indonesian CPO export to India is decrease.

4. Conclusion and Suggestion

4.1. Conclusion

Based on the results and discussion, a number of things can be concluded as follows:

- 1) Domestic policy through facilitating the increase of production capacity of the palm cooking oil, margarine and soap industries, as well as the increase CPO demand by other industries can heighten the competitiveness of Indonesian CPO exports to major importing countries (except Germany) and improve the welfare of oil palm farmers and CPO producers because they increase the largest surplus for oil palm farmers and CPO producers.
- 2) Domestic policy through the increase of CPO export tax tariff and the increase of production capacity of palm cooking oil, margarine and soap industries, also the increase of demand for CPO by other industries can heighten the largest net welfare and produce a positive trade balance.
- 3) Increased import tax on CPO by India caused a decline in net welfare, and it can be anticipated by increasing the production capacity of palm cooking oil, margarine and soap industries, as well as increasing CPO demand by other industries, which then increase the net welfare.

4.2. Suggestion

Some things that can be suggested from this study are as follows:

- 1) In order to facilitate an increase in the production capacity of the CPO downstream industry in Indonesia, the government needs to increase a CPO export tax tariff to fulfill the CPO needs of its downstream industry and the government needs to continue to provide investment incentives for CPO downstream industries such as tax allowances, tax holidays, investment promotions and import duty exemptions on the import of machinery and goods and materials for industrial development in the context of investment.
- 2) In order to deal with the determination of CPO import tariff by India and other major importing countries, the government should facilitate an increase in the production capacity of the CPO downstream industry in Indonesia.

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Author Profile



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