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Market Liberalization and Performance of Oil Palm Smallholder Farmer's Household

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Abstract

This study aimed to analyze the impact of market liberalization on the performance of oil palm smallholder farmer's households. Data collection was carried out in three provinces of the production center of oil palm in Indonesia i.e. Jambi, Sumatera Selatan, and Bengkulu. One district of oil palm production centers is chosen for each province i.e. Muaro Jambi, Banyu Asin, and Bengkulu Utara, respectively. Total samples in this research are 155 farm households by using a simple random sampling method, consist of 52 samples for Bengkulu Utara, 57 samples for Banyu Asin Selatan and 46 samples for Muaro Jambi, respectively. Primary data are collected from farmer household samples by survey method using questionnaires. The smallholder farmer's oil palm household economic model in this study was formulated in a system of simultaneous equations. The results indicated that liberalization of the output market but still gave protection in the input market at least subsidized fertilizer will contribute positively not only to farming performance i.e. farm production and investment but also to farmer household welfare i.e. increased farming profit and consumption of basic need commodities and other goods which bought in the market.

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INTRODUCTION

From the perspective of macroeconomics, the oil palm industry as the best contributor of non-oil exports in the Indonesian agricultural sector is benefited from the existence of trade liberalization (Susila 1997; Susila and Antara 2004). Nowadays, Indonesia and Malaysia are the two largest exporters of world palm oil (Pirker et al. 2016), however, Hagi, Hadi, & Tety (2012) shows that Indonesian palm oil is more competitive and its export performance is more attractive than Malaysian palm oil for the Asia market. Another fact indicates that Indonesia's palm oil industry is benefited from trade liberalization as shown by Munadi (2007). This research shows that reducing trade barriers by decreasing palm oil export tariffs increasing India's demand for Indonesia’s palm oil. This means that trade liberalization boosts the expansion of Indonesian palm oil in the world market.

Nevertheless, the existence of the palm oil industry makes big business and capital owners better off than smallholder farmers. This phenomenon can be seen from an analysis that shows that the value of the B/C ratio of smallholder farming i.e. 1.05, lower than the B/C ratio for both CPO factory (2.38) and biodiesel plant (2.86) (Hidayat 2018). Because of its B/C ratio value around 1, smallholder farming is vulnerable to face a decrease in the B/C ratio which makes their business are not feasible running financially especially when several important economic variables change such as falling prices of fresh fruit bunches and rising the fertilizer price.

Previous researches showed that what will happen at the farm level when market liberalized i.e. as follows: First, increasing the export demand (Penzhorn and Kirsten 1999). It can be expected that trade liberalization leads to the raising of domestic palm oil prices because of increasing the export demand from the world market and vice versa the decline in domestic oil palm prices due to its world prices falling. Second, farmers respond to trade liberalization by intensifying their farming, looking for a more off-farm working and going out of agriculture. Therefore, trade liberalization could increase the use of production inputs (seedlings, fertilizers, and pesticides), reduce the demand for family labor for their farming because some household members work outside the farming (Hellin, Groenewald and Keleman 2012).

Third, (Janvry et al. 1995; Groenewald and Van den Berg, 2012) find out that farmer households make adjustments to trade liberalization in two ways. 1) diversifying its traditional farming into non-traditional farming e.g from corn to fruit and vegetables; 2) by modernizing their farming to achieve higher productivity so that their business becomes more competitive under new prices. Besides that, it was also followed by an increase in farm size and reduced use of paid labor in their farming. Another phenomenon could happen when liberalization's implemented in low-income agrarian economies as (Barrett 1998) showed that caused growth of output together with smallholder welfare reduction.

Fourth, as Orr et al., (2001) find out that market liberalization has encouraged the diversity of smallholder income sources by giving them new opportunities for commercial cropping and off-farm income. As a result, average incomes have risen. Rising of income causes increasing their household consumption.

Therefore, it is important to identify what happens to smallholder farmers' farming performance and their household welfare when both output and input market is liberalized by the government. Specifically, the objectives of this study are: 1) determining the impact of market liberalization on the farming performance (production, using of labor, seeds, and fertilizer); and 2) analyze the impact of market liberalization on the welfare of farmers' households (farming investment, consumption of basic needs (expenditure on food, clothing, shelter, and housing), consumption of other goods which purchased from the market and farming profit). When empirical evidence is obtained about the real impact of market liberalization on the performance of farming and the economic welfare of smallholder farmers' households, it will help the government to anticipate the adverse impacts and maintain the beneficial impacts.

RESEARCH METHODS

This study was executed from September to December 2016. I chose this period by considering the easiness of collecting data in the research resides because this period was agreed by some community leaders and local field assistants for collecting data. Without being accompanied by them, it was difficult to be accepted by the oil palm smallholders' community whom as the sample of this study. The data used in the study are cross-section primary data related to the household economy of oil palm smallholder farmers. Data collection was carried out in three provinces of the production center of oil palm in Indonesia i.e. Jambi, Sumatera Selatan, and Bengkulu (*Agricultural statistics*. 2017). One district of oil palm production center is chosen for each province i.e. Muaro Jambi represented Jambi, Banyu Asin (Sumatera Selatan), and Bengkulu Utara represented Bengkulu. Then, I randomly selected 155 farm households as samples in the study sites i.e. 52 samples in Bengkulu Utara, 57 samples in Banyu Asin and 46 samples in Muaro Jambi, respectively. Primary data are collected from farmer household samples by survey method using questionnaires.

Agriculture household economic model in this study is formulated in a system of simultaneous equations, consisting of several structural equations and identity equations. The econometric model of agricultural household economic of oil palm smallholder farmer is specified based on empirical evidence as follows:

Production function of oil palm production:

$$Log(Y\_HA\_TH) = k1 + \alpha 1 Log(FLAH) + \alpha 2 Log(\beta LAH) + \alpha 3 Log(JKK/LAH) + \alpha 4 Log(P\_FE) + \alpha 5 DP + U1 \ldots\ldots (1)$$

The expected coefficient value: $a_1, \ldots, a_5 > 0$

Where is Y_HA_TH is annually oil palm production (kg/Ha/year), FLAH urea fertilizer using (kg/Ha), BLAH is the number of planted trees per hectare, JKK/LAH is daily of household labor for oil palm farming per hectare (day), P_FE is price fertilizer (IDR/Kg), DP dummy, 1 is using certified, seedlings and 0 is otherwise, U1 is error term

The demand for household labor (male and female) in owned oil palm farming is the number of their daily working provided for oil palm farming activities. The function of demand for household labor is formulated as follows:

$$Log(JKLA) = k2 + \beta 1 Log(Y\_TH) + \beta 2 Log(WAGE/P) + \beta 3 Log(JKLAH) + \beta 4 DBKL + \beta 5 DSUMSEL + \beta 6 DP + U2 \ldots\ldots (2)$$

The expected coefficient value: b_1, $b_2 > 0$ and, $b_3 < 0$

Where JKLA is working days of all household labor in owned farming (day), Y_TH is production in current year (Kg), WAGE/P is the wage of male labor force per price of production (IDR/Kg), JKLAH is demand for labor from out of household per hectar (day) DBKL is dummy of region, 1 is Bengkulu Province and 0 is otherwise, DSUMSEL is dummy of region, 1 is Sumatera Selatan Province and 0 is otherwise, DP is dummy, 1 is using certified seedlings and 0 = otherwise U2 is error term

Meanwhile equation of demand for paid male labor is formulated as follows:

$$KLP = k3 + c1\ LAH + c2 WAGE + c3 P\_F + c4 P + c5 DBKL + c6 DSUMSEL + U3 \ldots\ldots (3)$$

The expected coefficient value: $c1$, $c4 > 0$ and $c2$, $c3 < 0$

Where: KLP is number of days of paid male labor in oil palm farming, LAH is farm size (Ha) WAGE is wage per day, P_F is Fertilizer price (IDR/Kg), P is price of oil palm fresh fruit bunches (IDR/Kg), DBK is dummy of region, 1= Bengkulu Province and 0 = otherwise DSUMSEL is dummy of region, 1=Sumatera Selatan Province and 0 = otherwis U3 is error term.

Demand of seedlings for replanting is formulated as follows:

Log(TREE) = k4 + d1 Log(P_FE) + d2 Log(Y_TH) + d3 Log(P) + d4 Log(WAGE) + d5 DP + U4 ……………………………………………(4)

The expected coefficient value: d1 , d2, d3 > 0 and d4 < 0

Where TREE is number of oil palm seedlings per hectare, P_FE is fertilizer price (IDR/Kg), Y_TH is production in current year (Kg), P is price of oil palm fresh fruit bunches (IDR/Kg), WAGE is wage per day, DP is dummy, 1 = using certified seedlings and 0 = otherwise, U4 is error term

Demand for fertilizer is formulated as follows:

TOT_FLAH = k5+ e1JKP + e2KLP + e3LAH + e4WAGE + e5TREE + e6P_FE + e7(P/WAGE)+ e8 DBKL +e9 DSUMSEL + e10 DP + ……………………………………………………(5)

The expected coefficient value: e2, e6, e7 < 0 and e1, e3, e4, e5 > 0

Where TOT_FLAH is the quantity of all used fertilizer in oil palm farming (kg), JKP is number of days of household male labor in oil palm farming KLP is number of days of paid male labor in oil palm farming, LAH is farm size (Ha), WAGE is wage per day, TREE is number of oil palm tress per hectare, P_FE is price fertilizer (IDR/Kg), (P/WAGE) is price of oil palm fresh fruit bunches in last harvesting/wage per day, DBKL is dummy of region, 1 is Bengkulu Province and 0 is otherwise, DSUMSEL is dummy of region, 1 is Sumatera Selatan Province and 0 is otherwise, DP is dummy, 1 = using certified seedlings and 0 = otherwise, U5 is error term

Farming profit function is an identity equation. It is defined as total revenue of farming minus total of variable cost (total amount of expenditure for buying all variable input). It is formulated as follows:

UNT = NTU – NIV ……………………………(6)

Where UNT is farming profit (IDR) NTU is total revenue of farming (IDR), NIV is total variable cost (IDR)

Farming investment expenditures are non-routine expenditures aimed to improve and maintain fixed assets. Therefore, farming investment expenditure is the source of the formation of farming capital. The function of farming investment is formulated as follows:

IU = f1Y_HA_TH + f2 NTLU_PERSON + f33TAB + U6………………………………………(7)

The expected coefficient value: f_1, f_2 and f3 > 0

Where IU is farming investment in the current year (IDR), Y_HA_TH is annually oil palm production (kg/Ha/year), NTLU_PERSON is household income per capita (IDR), TAB is saving (IDR), U6 is error term.

The item consumption is composed of two variable i.e. expenditure for basic need goods consumption (food, clothing, shelter, education, and health) and other goods. Two variables as consumption approximate are formulated as follow:

Expenditure for basic need goods consumption:

CPL = k7+ g1 NTLU + g2 IE + g3 IU + g4TAB+ U7…………………………………………………(8)

The expected coefficient value: g3, g4<0 and g1,g2 > 0

Where CPL is expenditure for basic need goods consumption (IDR per month), NTLU is income total of smallholder farmer household (oil palm profit + other income from off-farm and on-farm) (IDR), IE is (number of the household member whose age below 15 and above 65) / (number of the household member whose age 16-64), IU is farming investment in the current year (IDR), TAB is saving (IDR), U7 is error term.

Expenditure for consumption of other goods:

C_OTHER = k8+ h1 NTLU + h2 NO_TK + h3 IU + h4TAB+ U8 ……………………………………(9)

The expected coefficient value: $h_3, h_4 < 0$ and $h_1, h_2 > 0$

Where C_OTHER is expenditure for consumption of other goods (IDR per month) NTLU is income total of smallholder farmer household (oil palm profit +other income from off-farm and on-farm), NO_TK is (number of the household member whose age below 15 and above, IU is farming investment in the current year (IDR), TAB is saving (IDR), U8 is error term.

Order condition formula for each equation belonging to a system of simultaneous is defined as:

(G-g) + (K-k) ≥ (G-1) or (K-k) ≥ (g-1) ……….(10)

Where G is the number of endogenous variables in the model; g (the number of endogenous variables in each equation); K (the number of exogenous variables in the model) and k (the number of exogenous variables in each equation) (Koutsoyiannis 1977). If (K-k) = (g-1) then the equation in the model is defined as *exactly identified*, if (K-k) < (g-1), is defined as *unidentified*, and (K-k) > (g-1) so the equation identified as *over identified*.

There are 9 endogenous variables and 19 exogenous variables in the model. Based on the order condition formula, I defined each structural equation in the model is over-identified, so estimation of the regression coefficient can use one of three methods of estimation i.e. LIML (Limited Information Maximum Likelihood), FIML (Full Information Maximum Likelihood), 2SLS () or 3SLS (Three Stage Least Squares) (Koutsoyiannis 1977). Two Stage Least Squares (2SLS) has been chosen for estimating method in this study.

Model validation aims to determine the level of suitable of the model as a representation of the real world. Model is validated by using Root Mean Square Error (RMSE), Root Mean Square Percented Error (RMSPE), and U-Theil statistic (Pindyck and Rubinfeld 1991).

$$\text{RMS error} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^s - Y_t^a)^2} \quad \text{.............(11)}$$

Where T is number of periods in the simulation , Y_t^s is simulated value of Y_t, Y_t^a is actual value

A useful simulation statistic related to rms simulation error and applied to the evaluation of historical simualtion or *ex post* forecast is Theil's inequality coefficient, defined as

$$U = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^S - Y_t^a)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^S)^2} + \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^a)^2}} \quad \text{........................(12)}$$

The value of U is 0 to 1. If the value is 0 so it is indicated that the model can predict exactly what the reality is. The closer the value of U to 0, the better the ability the model to represent the reality. Conversely, if the closer the value of U to 1, the worse predictive ability of the model (Pindyck and Rubinfeld, 1991).

We also can defined the proportion of inequality as:

$$U^M = \frac{(\bar{y}s-\bar{y}a)^2}{(1/T)\sum(\bar{y}s-\bar{y}a)^2} \quad \text{............................(13)}$$

$$U^S = \frac{(\sigma s - \sigma a)^2}{(1/T)\sum(\bar{y}_t^s-\bar{y}_t^a)^2} \quad \text{.........................(14)}$$

$$U^C = \frac{2(1-\rho)\,\sigma s\,\sigma a}{(1/T)\sum(\bar{y}_t^s-\bar{y}_t^a)^2} \quad \text{.........................(15)}$$

$$U^M + U^S + U^C = 1$$

Where $\bar{y}^s$ is mean of the series Y_t, $\bar{y}^a$ is mean of the series Y, σ is Standard Deviation, ρ is correlation coefficient, ρ is (1/ σs σaT) $\sum(Y_t^s - \bar{y}^s)(Y_t^a - \bar{y}^a)$

The proportion U^M, U^S and U^C are called bias, the variance, and the covariance proportion, respectively. U^M or the bias proportion is a clue of systematic error since it measures the extent to which the average value of the simulated and actual series deviate from each other. U^M would be close to zero. A large value of UM (above 0.1 or 0.2) would be quite troubling so that revision of the model is necessary. The variance proportion U^S indicates the ability of the model to replicate the degree of variability in the variable of interest. If U^S is large, it means that the actual series has fluctuated considerably while the simulated series shows little fluctuation or vice versa. This would also lead to a revision of the model. Finally, the covariance proportion U^C measures unsystematic error; i.e. it represents the remaining error after deviation from average values have been accounted for. Therefore, for any value of U >0, the ideal distribution of inequality over the three sources is UM $=U^S=0$ and $U^C=1$.

RESULTS AND DISCUSSION

The econometric model of agricultural household economic of oil palm smallholder farmer which is used for simulating is formulated as follows:

Production function of oil palm production:

Table 1. Regression Result

Variable	Coefficient	t-stat	R2
LOG(Y_HA_TH)	9.7246	9.835	0.656
LOG (FLAH)	0.001367	0.0283	
LOG (BLAH)	0.1424	1.249	
LOG (JKK_ LAH)	0.0628	2.556	
LOG (P_FE)	-0.2308	-2.371	
DP	0.7150	12.471	

Where: ***, **, * are significant at 1, 5 and 10% probability level, Y_HA_TH is annually oil palm production kg/Ha/year), FLAH urea fertilizer using (kg/Ha), BLAH is the number of planted trees per hectare , JKK/LAH is daily of household labor for oil palm farming per hectare (day), P_FE is price fertilizer (IDR/Kg), Dpis dummy, 1 is using certified seedlings and 0 = otherwise.

Demand for household labor in owned oil palm farming:

Table 2. Regression Result

Variable	Coefficient	t-stat	R2
LOG(JKLA)	3.7106	-5.002	0.656
LOG(Y_TH)	0.6732	16.7658	
LOG(WAGE/P)	- 0.2292	-2.0061	
(JKLAH)	0.7037	19.844	
DBKL	- 0.1519	-2.194	
DSUMSEL	- 0.02680	-1.5024	
DP	- 0.53739	12.099	

Where: where: ***, **, * are significant at 1, 5 and 10% probability level, respectively JKLA is working days of all household labor in owned farming (day), Y_TH is production in current year (Kg), WAGE/P is the wage of male labor force per price of production (IDR/Kg) JKLAH is demand for labor from out of household per hectar (day), DBKL iS dummy of region, 1 is Bengkulu Province and 0 is otherwise DSUMSEL is dummy of region, 1 is Sumatera Selatan Province and 0 is otherwise DP is dummy, 1 is using certified seedlings and 0 = otherwise. Demand for paid male labor:

Table 3. regression Result

Variable	Coefficient	t-stat	R2
KLP	- 10.526	0.5887	0.6059
LAH	13.833	13.3552	
WAGE	- 0.0001	-0.6102	
P_F	0.0005	0.6799	
P	0.0002	0.0142	
DBKL	24.205	3.770	
DSUMSEL	- 0.5335	-0.3297	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively, KLP is number of days of paid male is labor in oil palm farming, LAH is farm size (Ha), WAGE is wage per day, P is price of oil palm fresh fruit bunches DBKL is dummy of region, 1= Bengkulu Province and 0 = otherwise, DSUMSEL is dummy of region, 1 is Sumatera Selatan Province and 0 is otherwise. Demand of seedlings for replanting:

Table 4. Reggression Result

Variable	Coefficient	t-stat	R2
LOG(TREE)	-28.610	-5.916	0.594
LOG(P_FE)	0.2882	1.194	
LOG(Y_TH)	0.9378	12.171	
LOG(P)	0.329	1.466	
LOG(WAGE)	1.8367	5.577	
DP	- 0.665	-6.807	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively, TREE is number of oil palm seedlings per hectare, P_FE is fertilizer price (IDR/Kg), Y_TH is production in current year (Kg), P is price of oil palm fresh fruit bunches (IDR/Kg), WAGE= wage per day, DP is dummy, 1 is using certified seedlings and 0 = otherwise, Demand for Fertilizer:

Tabel 5. Regression Result

Variable	Coefficient	t-stat	R2
TOT_FLAH	-222.85	-0.8328	0.652
JKP	0.7113	0.9662	
KLP	- 0.9509	-1.2567	
LAH	88.505	1.95	
WAGE	0.0039	1.77	
TREE	0.6126	1.67	
PFE	- 0.0397	-1.126	
P/WAGE	- 7995.2	-0.907	
DP	61.90	1.89	
DBKL	231.89	3.887	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively, TOT_FLAH is the quantity of all used fertilizer in oil palm farming (kg), JKP is number of days of household male labor in oil palm farming , KLP is number of days of paid male labor in oil palm farming LAH is farm size (Ha), WAGE is wage per day, TREE is number of oil palm tress per hectare, P_FE is price fertilizer (IDR/Kg), (P/WAGE) is price of oil palm fresh fruit bunches in last harvesting/wage per dayDBKL is dummy of region, 1 is Bengkulu Province and 0 is otherwise, DSUMSEL is dummy of region, 1 is Sumatera Selatan Province and 0 = otherwise DP is dummy, 1 = using certified seedlings and 0 = otherwise. Farming profit:

UNT = NTU – NIV

Where UNT is farming profit (IDR), NTU is total revenue of farming (IDR), NIV is total variable cost (IDR)

Table 6. Regression Result

: Variable	Coefficient	t-stat	R2
Y_HA_TH	355.06	355.06	0.909
NTLU_PERSON	1.167	1.167	
TAB	0.7050	0.7050	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively
IU is farming investment in the current year (IDR), Y_HA_TH is annually oil palm production (kg/Ha/year), TAB is saving (IDR) NTLU_PERSON is household income per capita (IDR), Expenditure for basic need goods consumption:

Table 7. Regression Result

Variable	Coefficient	t-stat	R2
CPL	373184.70	2.739	0.7413
NTLU	0.080	14.96	
IE	152382	0.864	
IU	-0.0026	-0.576	
TAB	-0.0814	-15.26	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively, CPL is expenditure for basic need goods consumption (IDR per month), NTLU is income total of smallholder farmer household (oil palm profit + other income from off-farm and on-farm) (IDR) IE is (number of the household member whose age below 15 and above 65) / (number of the household member whose age 16-64) IU is farming investment in the current year (IDR)TAB is saving (IDR) Expenditure for consumption of other goods:

Table 8. Regression Result

Variable	Coefficient	t-stat	R2
C_OTHER	-728228.84	-7.07	0.779
NTLU	0.045	12.19	
NO_TK	-94741.96	-1.27	
IU	0.02071	6.53	
TAB	0.0702	-18.86	

Where: ***, **, * are significant at 1, 5 and 10% probability level, respectively C_OTHER is expenditure for consumption of other goods (IDR per month), NTLU is income total of smallholder is farmer household (oil palm is profit + other income from off-farm and on-farm), NO-TK is (number of the household member whose age below 15 and above 65), IU is farming investment in the current year (IDR) TAB is saving (IDR)

A summary of the validation results of all structural equation that constructing the oil palm smallholder farmer household economic model is shown in Table 1. Referring to the results of model validation as shown in table

1, it can be said that all the equations that build up the household economic model of oil palm farmers are categorized as good model (U-theil is less than 0.1) and fairly models (U-theil is less than 0.3), respectively. Therefore, agricultural household model for oil palm smallholder farmer of this study is suited for the criteria of a feasible model and can be used for forecasting and simulation because all equations that constructing the model have the criteria whose U^M and U^S equal or close to 0 and U^C equals or close to 1. Two simulation scenarios are implemented. The scenario I based on the assumption that free-market implementation occurs. The main character in this phenomenon is the absence of the government's role in both the output and input markets. This happens when in the output market, the government eliminates the barrier tariffs by removing the palm oil export tax. Thus, there will be an increase in demand for palm oil exports (Hasan, Reed and Marchant 2001). The increase in export demand will cause an increase in domestic palm oil prices (Marks, Larson and Pomeroy 1998) and according to (Hella, Haug and Kamile 2011), the rise of the production price could improve smallholder farmer's livelihoods especially for the production surplus area. On the other hand, the liberalized input market by the elimination of important input subsidies for farmers e.g. fertilizers, seedlings, and other input caused the rising input prices. Thus, the absence of protection and subsidies in the input market will raise farming variable costs. Based on the above assumption, I executed the simulations that represent scenario I namely: firstly, raising the price of oil palm fresh fruit bunches (P) and variable cost (NIV) in the same proportion. Thus, in the simulation both variables rise as much a 5 percent. Secondly, raising the price of oil palm fresh fruit bunches (P) is higher than the variable cost (NIV).

Table 9. Validation result of all structural equations in the model of the agricultural household for oil palm smallholder farmer

Endogenous Variable	U-Theil	U^M	U^S	U^C	conclusion
Annually oil palm production (Y_HA_TH)	0.098585	0.011692	0.155575	0.832734	good
Working days of all household labor in owned farming (JKLA)	0.098585	0.011692	0.155575	0.832734	fair
Number of days of paid male labor in oil palm farming (KLP)	0.2815	0.00000	0.118415	0.8815	fairly
Number of oil palm tress per hectare (TREE)	0.221611	0.000256	0.00676	0.9929	fairly
The quantity of all used fertilizer in oil palm farming (TOT_FLAH)	0.185428	0.000000	0.097990	0.90201	fairly
Farming investment in the current year (IU)	0.133478	0.001160	0.018001	0.980838	fairly
Expenditure for basic need goods consumption (CPL)	0.185436	0.000000	0.072435	0.927565	fairly
Expenditure for consumption of other goods (C_OTHER)	0.238476	0.000000	0.060408	0.939592	fairly

Note: U^M = Bias proportion, U^S = Variance proportion, and U^C = Covariance proportion
Source: own elaboration (2016)

So for simulation, it has been set the rise of the price of oil palm fresh fruit bunches as much as 10 percent, and 5 percent for the increase of the variable cost. Thirdly, increasing the price of oil palm fresh fruit bunches (P) is smaller than the variable cost (NIV). So for simulation, it has been set the rise of the price of oil palm fresh fruit bunches as much as 5 percent while the rise of the variable cost as much as 10 percent. The results of three simulation alternatives as the impact of liberalization of output and input market on the farming performance and welfare of farmer household for scenario I are shown in table 2. The assumption of scenario II is implementing a liberalization in the output market but the government still subsidizes in the input market especially fertilizer. Therefore, the main characteristics of this condition are indicated by both the abolition of export taxes and still give farmer fertilizer subsidy. Technically, the implemented simulation based on this assumption is shown in the decrease in price fertilizer (P_FE) and an increase in production in the current year (Y_TH).

So there are three alternative simulations in scenarios II, namely; firstly, decreasing the fertilizer price and increasing production in the current year as much as 5 percent, respectively. Secondly, lessening the fertilizer price as much as 10 percent and at the same time production in the current year increase as much as 5 percent, and thirdly, cutting the fertilizer price down as much as 5 percent and meanwhile production in the current year increase as much as 10 percent. The result of three simulation alternatives as the impact of market liberalization on the farming performance and welfare of farmer's household for scenario II is shown in table 3.

Simulation of three alternative conditions of market liberalization in the scenario I increases the annual oil palm production achieve up to 0.03, 0.04, and 0.03 percent respectively. Meanwhile, in the simulation of three alternative conditions in scenario II, lead to an increase in the annual oil palm production up to 1.27, 2.5, and 1.21 percent, respectively. This evidence support Getne (2008) that shows that market liberalization could increase production.This finding is in line with evidence found out by (Hellin, Groenewald and Keleman 2012) and (Groenewald and Van den Berg 2012) for maize farmers in Mexico. However, from the simulation results, it can be seen that scenario II cause a higher increase in production per hectare than the scenario I.

Table 10. Three simulation alternatives as the impact of liberalization of output and input market on the farming performance and welfare of farmer household (scenario I)

Endogenous variables	Both P and NIV increase as much as 5%			P increase and NIV increase as much as 10% and 5% respectively			P increase and NIV increase as much as 5% and 10% respectively		
	Mean baseline	simulation	Δ%	Mean baseline	simulation	Δ %	Mean baseline	simulation	Δ %
Y_HA_TH	11881.38	11884.9	0.03	11881.38	11885.64	0.04	11881.38	11885.25	0.03
JKLA	42.06508	42.5364	1.12	42.06508	42.98881	2.20	42.06508	42.53772	1.12
KLP	18.39964	18.36317	-0.20	18.39964	18.38285	-0.09	18.39964	18.34211	-0.31
TREE	246.4782	250.3796	1.58	246.4782	254.2128	3.14	246.4782	250.5843	1.67
TOT_FLAH	345.4049	343.0888	-0.67	345.4049	340.4207	-1.44	345.4049	342.7559	-0.77
IU	42117338	42265048	0.35	42117338	42180970	0.15	42117338	42180166	0.15
CPL	2071655	2073051	0.07	2071655	2073942	0.11	2071655	2066512	-0.25
C_OTHER	353895.9	354816.2	0.26	353895.9	356956.9	0.86	353895.9	356060.3	0.61
UNT	43091191	42567439	-1.22	43091191	42567439	-1.22	43091191	42043688	-2.43

Where P is price of oil palm fresh fruit bunches NIV is the variable cost, Y_HA_TH is annually oil palm production , JKLA is working days of all household labor in owned farming, KLP is number of days of paid male labor in oil palm farming, TREE is number of oil palm tress per hectare, TOT_FLAH is the quantity of all used fertilizer in oil palm farming, IU is farming investment in the current year, CPL is expenditure for basic need goods consumption , C_OTHER is expenditure for consumption of other goods, UNT is farming profit

Simulation of three alternative conditions of market liberalization in the scenario I increase farming investment in the current year up to 0.35, 0.15 and 0.15 percent, respectively. Meanwhile, three simulation alternatives in scenario II lead increase investment in the current year up to 0.35, 0.58 and 0.2 percent, respectively. This finding is the same as Talukder (2014) found for the household of the rice farmer in Bangladesh that market liberalization could increase the farming investment. Nevertheless, simulation results show that both scenarios I and II lead to increase farming investment with the same proportion each other.The impacts of the three alternatives of both scenarios I and II on the inputs demand can be explained as follows: firstly, the simulation of three alternative conditions of market liberalization in the scenario I lead to an increase in the demand for household labor achieves up to 1.12, 2.2, and 1.12 percent, respectively.

The same happens with three alternative simulations for scenario II where the effect of market liberalization increases the demand for household labor as much as 3.31, 3.33, 6.61 percent, respectively. This evidence is in line with the finding of Seshan (2014).

On the contrary, the impact of market liberalization on demand of labor from out of farmer households is negative i.e. decrease the demand for labor from out of household as much as 0.2, 0.09 and 0.31 percent, respectively for scenario I. Meanwhile the scenario II causes demand decreasing of paid male labor from out of household as much as 0.71, 0.21 and 0.22 percent, respectively. This evidence shows that both scenarios I and II lead to an increase in the demand for household labor and decrease the demand for paid male labor from out of the household.

Table 11. Three simulation alternatives as the impact of market liberalization of scenario II on the farming performance and welfare of farmer household

Endogenous variable	P_FE decrease of 5% and Y_TH increase of 5%			P_FE decrease of 10% and Y_TH increase of 5%			P_FE decrease of 5% and Y_TH increase of 10%		
	Mean			Mean			Mean		
	baseline	simulation	Δ(%)	baseline	simulation	Δ(%)	baseline	simulation	Δ(%)
Y_HA_TH	11881.38	12032.36	1.27	11881.38	12178.33	2.50	11881.38	12024.83	1.21
JKLA	42.07	43.46	3.31	42.07	43.46	3.33	42.07	44.85	6.61
KLP	18.40	18.27	-0.71	18.40	18.36	-0.21	18.40	18.36	-0.22
TREE	246.48	253.97	3.04	246.48	250.15	1.49	246.48	265.47	7.71
TOT_FLAH	345.40	355.88	3.03	345.40	357.53	3.51	345.40	362.46	4.94
IU	42117338.00	42264651.00	0.35	42117338.00	42360705.00	0.58	42117338.00	42199567.00	0.20
CPL	2071655.00	2075974.00	0.21	2071655.00	2075389.00	0.18	2071655.00	2072656.00	0.05
C_OTHER	353895.90	358804.90	1.39	353895.90	362037.10	2.30	353895.90	355845.60	0.55
UNT	43091191.00	43091191.00	0.00	43091191.00	43091190.00	0.00	43091191.00	43091191.00	0.00

Where P_FE is price fertilizer, Y_TH is production in current year, Y_HA_TH is annually oil palm production, JKLA is working days of all household labor in owned farming, KLP is number of days of paid male labor in oil palm farming, TREE is number of oil palm tress per hectare, TOT_FLAH is the quantity of all used fertilizer in oil palm farming, IU is farming investment in the current year, CPL is expenditure for basic need goods consumption , C_OTHER is expenditure for consumption of other goods, UNT is farming profit.

Secondly, three alternative conditions of market liberalization in the scenario I lead to increasing the demand for a new tress of oil palm for replanting up to 1.58, 3.14 and 1.67 percent, respectively. Meanwhile, for scenario II, the increasing achieve up to 3.04, 1.49, and 7.71 percent, respectively. This evidence indicates that both scenario I and II have an increasing effect to demand new trees for replanting.

Thirdly, three alternative conditions of market liberalization in the scenario I lead to decreasing the demand for fertilizer i.e. 0.67, 1.44, and 0.77 percent, respectively. Conversely, for 3 alternative simulations in scenario II make an increasing of fertilizer demand up to 3.03, 3.51 and 4.94 percent, respectively.

There are three endogenous variables as representing the household welfare i.e. farming profit (UNT), expenditure for basic need goods consumption (CPL) and expenditure for consumption of other goods (C_OTHER). The impact of both scenario I and II on those three endogenous variables is explained as follows: Firstly, impact of three alternative conditions in the scenario I still increase the consumption of basic need goods. When the price of both output (P) and the variable cost (NIV) are raised by the same proportion then consumption increase as much as 0.007 percent. When increasing product price is higher than the variable cost, then consumption increase as much as 0.11 percent. But when in a simulation the increasing price of the product is smaller than the variable cost so its effect decreases the consumption of basic need goods.

Meanwhile, the simulation of three alternative conditions in scenario II increases basic need goods consumption up to 0.21, 0.18 and 0.05 percent, respectively. Secondly, the simulation of three alternative conditions in the scenario I increase the consumption of other goods up to 0.26, 0.86, and 0.61 percent, respectively. The same evidence happened when implementing three alternative conditions in scenario II i.e. increasing of other goods consumption up to 1.39, 2.3 and 0.55 percent. Thirdly, three alternative simulations in the scenario I decrease farming profit as much as 1.22, 1.22, and 2.43 percent, respectively, but in the scenario II indicate that no change of the profit farming after simulation being done.

CONCLUSION

The simulation impact of scenario I where the assumption of removal export tariff barrier and no input subsidies on the household economy of oil palm farmers are implemented give the results namely; (a) increasing the farming performance of oil palm because of an increase of production as well as farm investment. (b) It still has an impact on increasing consumption of basic need goods if the percentage increase in output prices is the same or higher than the proportion of the increase in the variable cost. But if the increase in output price is lower than the increase in variable cost, it will reduce the consumption of basic need goods. (c) contribute positively to the increase in consumption of other goods, and (d) reduce farming profits.

The Scenario II which express situation where government removed export tariff but still give fertilizer subsidy for the smallholder farmers give effects i.e. (a) improving the farming performance cause increase production as well as a farming investment; (b) increasing the consumption of basic need and other goods and (c) not changing farming profit. The scenario II, which the assumption of removal export tariff and no input subsidies on the household economy of oil palm farmers are implemented, give a more positive impact on the farming performance and farmer's welfare than the scenario I, that the removal export tariff and fertilizer subsidy simultaneously implemented in simulation.The results of this study indicate that the adoption of a free market for the oil palm economy should only be applied in the output market but not for the input market. Liberalization of the output market but still give protection in the input market at least subsidized fertilizer will contribute positively not only to farming performance i.e. farm production and investment but also to farmer household welfare i.e. increased farming profit and consumption of basic need commodities and other goods which bought in the market.

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